



Drumbeat: June 22, 2012

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[The Fracking of America](#)

It's almost impossible to overestimate the importance of fracking to the natural gas industry and the nation. It's also difficult to understate the controversy surrounding the environmental issues of the rock fracturing technology.

Our special report, "[Who's Winning The Natural Gas Game?](#)" addresses both issues and more.

Just a few years ago, the operating assumption of both government and the industry was that the U.S. was running out of recoverable natural gas and would soon be importing large amounts to meet our needs. Shipping terminals to receive liquefied natural gas from abroad needed to be built — and fast.

Now, the industry is talking about [a 100-year supply](#) and is building export terminals to ship our liquid natural gas to other countries.

[In Western Pennsylvania, an Energy Boom Not Visibly Stifled](#)

SMITHFIELD, Pa. — From his farm nestled far from the big cities, in the wooded hills above the Monongahela and Cheat Rivers, David Headley has not heard much about the battles in Washington over regulations that Republicans say are stifling a domestic energy revolution.

At the ground level of that revolution Mr. Headley, a 53-year-old former body shop owner and unemployed bus driver, does not see any regulations at all.

For three years, he and his wife, Linda, have wrestled with the land men, natural gas drillers and pipeline builders who are turning this very sleepy corner of Western Pennsylvania into an energy boom land. The farm Mr. Headley bought in 2006 for his semiretirement has become something of a nightmare. Gas wells leak. Drilling blowouts have spewed fine, chalky bentonite into trout-stocked Georges Creek, turning it a milky white. A spring where his wife's three horses once watered now bubbles and belches. Touched with a flame, it will ignite.

[Editorial: Exporting natural gas would not hurt U.S.](#)

Barely a decade ago, it looked as if the U.S. was running so low on domestic gas that it would have to begin importing larger and larger supplies of liquefied natural gas (LNG) from abroad. Today — thanks largely to the new domestic supplies unlocked by hydraulic fracturing, or "fracking" — forecasts suggest the U.S. not only has enough gas to meet its own needs for the next 100 years, but also enough to sell it to countries that don't have enough. Japan, for example, desperately needs gas to take up the slack for the nuclear power plants it shut down after last year's tsunami.

[Opposing view: Call a timeout on gas exports](#)

If we open up the United States' new natural gas supply to the world market, the same market forces that govern the cost of oil around the globe will take hold of natural gas. In other words, the cost of natural gas for American consumers will skyrocket and the United States will sacrifice a once-in-a-lifetime competitive advantage.

[Crude Oil Trades Near Eight-Month Low, Heads for Weekly Decline](#)

Oil traded near an eight-month low below \$80 a barrel in New York and headed for a second weekly decline amid signs of a global economic slowdown that may curb fuel demand.

Futures were little changed after decreasing 4 percent yesterday, the biggest drop this year. German business confidence fell to the lowest in more than two years in June as the worsening sovereign debt crisis clouded the economic outlook. The Federal Reserve Bank of Philadelphia's economic index yesterday signaled the biggest contraction in manufacturing in almost a year.

[Gas prices could hit \\$3 by autumn](#)

With production up, oil inventories at 21-year highs and tepid consumer demand, gas prices have fallen for 11 weeks. They're expected to drop more sharply after the peak summer driving season.

"Demand just isn't there," says Brian Milne of energy tracker Televant DTN, noting an Energy Department report that demand for fuel over the past four weeks has fallen 5% below year-ago levels. "It's been dreadful."

[Jet Fuel Gets Olympic Spur as European Refineries Shut](#)

European jet fuel purchases are set to reach the highest levels in more than a year as the London Olympics and Euro 2012 soccer tournament boost travel during the summer months just as refineries in the region are shuttered.

Imports from the Middle East and Asia will increase to about 1.9 million metric tons this month, according to the median estimate in a Bloomberg News survey of two traders

and three brokers. That's the most since at least March 2011, according to data compiled by Bloomberg. Stockpiles fell to the lowest since 2008, PJK International data show.

[Russia to Take Anti-Crisis Measures at \\$80 Oil Price](#)

"If the oil price falls and goes lower than \$80 a barrel, if the growth in the economy falls around 0-1 percent, and if we see that incomes fall sharply below what we forecast in the budget, that will be grounds for introducing anti-crisis measures," Siluanov said on Russia 24 TV.

[Oil decline gives Asia economies breathing room](#)

SINGAPORE--This spring's tumble in crude oil prices has relieved inflationary pressure and given Asian policy makers room to maintain stimulus measures as the global economic picture darkens -- provided oil prices remain low.

[Crude Oil: Supply Exceeds Demand For The First Time In A Decade](#)

Since May, the price of crude oil (OIL) has fallen from \$106/barrel to \$78/barrel (chart 1). It is very likely that the price of crude oil will continue to decline because for the first time in a decade, supply is exceeding demand.

[Storm Cluster Off Yucatan Better Defined as Chris Weakens](#)

A storm cluster just north of the Yucatan Peninsula is becoming better defined and may move into the central Gulf of Mexico as Tropical Storm Chris weakens off Newfoundland, the National Hurricane Center said.

A swath of rain and storms across the Caribbean from Mexico to Cuba and Florida has a 70 percent chance of forming into a tropical cyclone within 48 hours, the Miami-based center said in a 5 a.m. Atlantic time advisory. Floods and heavy rain may occur from southern Florida to the Yucatan through tomorrow.

[Stuart Staniford: Latest Saudi Production](#)

The chart above shows all the latest publicly available oil-production data for Saudi Arabia. The black line is the average and probably of most interest to the average reader. The data are not zero-scaled to better show changes. The red line far below the others is the in-country oil-rig count and should be read against the right scale.

Saudi Arabian production is always of great interest for one reason or another; the current reason is to know, if oil prices keep falling below the current level of \$92 (Brent),

at what point they will start to cut production to support prices. My guess is that it won't be too much further, if any at all.

[Energy Bill to Boost U.S. Output Passes House, May Die in Senate](#)

The Republican-led U.S. House passed legislation seeking to increase oil production and stall Environmental Protection Agency rules, sending the measure to the Senate where Democrats probably will let the bill die.

[Abu Dhabi moves to boost gas supply](#)

Abu Dhabi National Oil Company (Adnoc) has signed an agreement with Germany's Wintershall and Austria's OMV to develop a technically challenging gasfield in the inhospitable desert of Al Gharbia.

The development of domestic sources of natural gas has become a priority in the light of the rapid growth in electricity consumption in Abu Dhabi, driven by ambitious industrial plans and increasing household use.

[Osaka Gas to invest in Cabot's Texas shale gas, oil project](#)

(Reuters) - Osaka Gas Co, Japan's second biggest supplier of city gas, will pay \$249 million for a stake of 35 percent in a Texas shale gas and oil project run by Cabot Oil & Gas Corp, aiming to boost investment returns from the potentially lucrative upstream business.

As Asia's demand for liquefied natural gas (LNG) rises, several Japanese companies have already tapped shale gas projects in North America, with some companies aiming to deliver LNG to Japan.

[Gazprom and EDF team up in Europe power generation](#)

MOSCOW (Reuters) - Russia's Gazprom and France's EDF agreed to jointly build and acquire existing gas-fired power plants in Europe, Gazprom said on Friday.

"The agreement also states that Gazprom will be exclusive gas supplier for jointly-owned power stations," Gazprom said about the cooperation with EDF, which is also its partner in the Moscow-backed South Stream pipeline project, designed to deliver Russian gas to Southern Europe.

[Statoil: Barents Sea Shareholders Yet to Resolve Gas Investment Issues](#)

ST. PETERSBURG, Russia--The three shareholders in a giant natural gas project in the Baring Sea have yet to resolve a number of issues before a final investment decision on the complex development can be taken, Statoil SA Chief Executive Helge Lund said.

"As you know, Shtokman has had issues related to commerciality and profitability, but we are working on that," said Mr. Lund. "The parties still have some ground to cover."

[SOCAR ups gas supplies to Russia](#)

The State Oil Company of Azerbaijan (SOCAR) exports four million cubic meters of gas per day to Russia compared to 2.4 million cubic meters as of May 18, a source in oil and gas sector told Trend on Thursday.

"Export of gas to Russia is carried out continuously and at present the volume of gas supplied under contract is four million cubic meters per day," the source said.

[Putin Pushes International Oil CEOs for Access to Assets](#)

President Vladimir Putin asked the chief executive officers of U.S. and European energy producers to grant Russian companies access to international assets, holding out some of the world's biggest untapped resources as a prize.

[Japan's Mitsubishi renews Iran oil imports deal - sources](#)

(Reuters) - Japanese trading house Mitsubishi Corp has renewed its annual oil purchase deal with Iran but cut the loading volume to comply with U.S. sanctions against the Islamic nation, trade sources said on Friday.

[China May Iranian crude oil imports up 39 percent](#)

China's crude oil imports from Iran in May returned to year-ago levels following a significant drop in the first four months of the year, rising nearly 39% month on month to 2.22 million mt (524,100 b/d), according to official customs data received by Platts Friday.

[Yemen sends soldiers to protect its LNG](#)

(Reuters) - Yemeni soldiers have been deployed to protect the gas pipeline feeding the Yemen LNG export terminal, its energy minister said on Thursday, as the country tries to shield its biggest industrial asset from further attacks.

Yemen's oil and gas pipelines have been repeatedly sabotaged since anti-government protests created a power vacuum in 2011 that armed groups have exploited, causing

fuel shortages and slashing export earnings for the impoverished country.

[Aubrey McClendon relinquishes chairman role at Chesapeake](#)

Aubrey McClendon, Chesapeake Energy's chief executive and co-founder, is stepping down from his role as chairman of the embattled company.

Archie W. Dunham, former chairman of ConocoPhillips, has been appointed by Chesapeake's board as the company's new independent non-Executive chairman. McClendon remains a company director and will continue to serve as Chesapeake's CEO and president, the company said in a statement.

[EPA says much of Kalamazoo River, or 34 miles, to open 2 years after 840,000-gallon oil spill](#)

DETROIT — Nearly all of the Kalamazoo River is being reopened for recreational use and the cleanup of a massive oil spill nearly two years ago is in its final stages, federal, state and local officials announced Thursday.

[680,000 wells hold waste across US -- with unknown risks](#)

Over the past several decades, U.S. industries have injected more than 30 trillion gallons of toxic liquid deep into the earth, using broad expanses of the nation's geology as an invisible dumping ground.

No company would be allowed to pour such dangerous chemicals into the rivers or onto the soil. But until recently, scientists and environmental officials have assumed that deep layers of rock beneath the earth would safely entomb the waste for millenia.

There are growing signs they were mistaken.

[Fukushima Plant Faces Typhoon Summer With Added Tornado Threat](#)

Tokyo Electric Power Co.'s crippled Fukushima nuclear plant faces its second typhoon season since the March 11 disaster last year, raising the risk of further radiation leaks if storms thrash exposed pools of uranium fuel rods or tanks holding contaminated water.

[Not the Right Man to Lead Japan](#)

What many observers see as bold leadership, I see as the handiwork of a leader beholden to Japan's powerful utilities and bereft of fresh ideas. This judgment also applies to Noda's push to raise taxes. It's the easy and obvious thing to do, not something to inspire trust that Japan's leaders are considering new and creative ways to

manage the economy.

[California to Open Investigation Into San Onofre Later This Year](#)

California regulators will open an investigation into Edison International's San Onofre nuclear power plant this year.

The California Public Utilities Commission wants more clarity from federal nuclear regulators before starting its probe, Michael Peevey, president of the state agency, said at a meeting in San Francisco today.

[B.C. Liberals declare natural gas a clean energy source](#)

The B.C. Liberal government is deeming natural gas a "clean" source of energy to clear the way for the development of a liquefied natural gas extraction project in northern British Columbia, reversing a key environmental policy of the Gordon Campbell era.

[Investing in Energy Independence](#)

"The era of low-cost energy is almost dead. Popeye is running out of spinach."

Those ominous words were uttered by former Commerce Secretary Peter G. Peterson in 1972.

They've been haunting us ever since.

At that point — just two years after hitting our peak in oil production — reality should have set in. Unfortunately, it didn't.

[Peoria 'Prepper' speaks out](#)

Bob got his start in the "Prepper" lifestyle because of what we see daily at the gas pump.

Before the economy went sour in 2008, Bob said he learned about "peak oil."

He explained a geologist discovered in 1957 that all oil fields follow the same pattern — big production under high pressure in the beginning then dwindle in production. Since oil is a finite resource it has to run out at some point.

"We're past the peak of domestic oil available. We hit that point in the 70's," Bob said.

"We have easily accessible food because of oil, but oil is a diminishing commodity. Worldwide we probably passed the peak in 2010."

[Which U.S. airport is offering free public transportation?](#)

The clean-fuel Silver Line buses have been in operation since 2005, have room for luggage and make the trip in from the airport in 20-40 minutes (depending on which terminal you board at), a bit longer than it takes to drive.

The 90-day, free-ride pilot program, called "On Us," should be a hit with many of the city's summer visitors, who might otherwise pay \$25 or more for a cab ride into the city. But a major goal of the program is to convince locals to switch to the bus and stop paying to park their cars in the airport's central garage.

[Cyclist accused of vehicular manslaughter over pedestrian's death pleads not guilty](#)

Software developer Chris Bucchere, 36, is accused of recklessly speeding downhill through a red light and into an intersection crowded with pedestrians in the city's Castro District on March 29. He struck Sutchi Hui, 71, who was crossing the street with his wife and died of his injuries four days later.

The case, a rare felony prosecution of a bicycle rider for a fatal accident, comes amid a 71 percent increase in bike traffic in San Francisco in the past five years. It also marks the third instance in which a pedestrian has been killed by a cyclist during the past year in the Bay Area.

[The Russian renewable energy market-a green giant which remained untapped](#)

Renewable energy is not yet on the forefront of Russia's policy agenda. This allows us to operate outside the conflict situation, as it is the case with organizations operating in the oil and gas industry. Interestingly, Russians may not have a renewable energy agenda, but they do have an agenda for modernization, for innovation, for diversification of their economy. The renewable energy legislation or better say initiative fits under this already existing framework. So, renewable energy is not the most urgent issue for Russia right now, but Russian policymakers, companies and the general public do understand that it creates opportunities for jobs, cleaner air, new technology and new type of industry.

In that sense, sustainable energy and renewable sources are not only complementary to the already existing market, but are a possibility to earn more than when using traditional sources. The more Russia produces its own energy on its own territory with renewable sources, the more they will have available for export to Europe. It is not a secret that the gas prices in Europe are still higher, compared to the domestic prices. Keeping this in mind, there could truly be a win-win situation.

[The Global Poor Can Lead the Solar Revolution](#)

China announced on March 20 that it would raise retail gasoline prices to more than \$5 a gallon. Two days later, the government announced its intention to cap consumption of coal at 3.9 billion tons a year, only 10 percent above its current level.

Concern for the environment is not driving these moves. Instead, they are a byproduct of economic fundamentals, including the fact that importing oil at more than \$100 a barrel and coal at \$125 a ton or more threatens China's record trade surpluses. Indeed, in the past three years, high prices for imported oil and coal have contributed to three trade deficits in China.

[Abu Dhabi plans huge waste-fired power plant](#)

Abu Dhabi National Energy Company, better known as Taqa, has signed an agreement to build a waste-fuelled power plant that would be among the largest of its kind in the world.

The plant, a first for the UAE, is part of a wider project to drastically reduce the amount of rubbish that is buried in landfills in the desert.

[To Tackle an Invasive Weed, Bringing In the Hooved Pros](#)

On a sweltering afternoon on Staten Island, the New York City parks department unveiled its latest weapon in the war on phragmites, an invasive weed that chokes the shoreline: goats. Twenty Anglo-Nubians, to be exact. With names like Mozart, Haydn and Van Goat, and with floppy ears and plaintive bleats, they did not seem fearsome. But on Thursday they were already munching inexorably through the long pale leaves in the first phase of a wetland restoration at what will soon be Freshkills Park.

[Heart attacks more likely where traffic is louder](#)

The louder the traffic near people's homes, the greater their risk of heart attack, a new study from Denmark says.

The researchers tracked more than 50,000 study participants for nearly 10 years and found that for every 10 decibels of added roadway traffic noise, the risk of heart attack increased 12 percent.

[Navistar Fined by EPA Over Technology Built With Agency](#)

The U.S. Environmental Protection Agency is fining diesel-engine maker Navistar International Corp. for shortcomings in pollution-control technology the agency helped it develop.

"EPA is entangled in a blatant conflict in regulating a business partner," Jeff Ruch,

executive director of Public Employees for Environmental Responsibility, said in an e-mail. Ruch's group, a Washington-based watchdog of state and federal environmental agencies, uncovered the Navistar-EPA business connections in documents it obtained through the Freedom of Information Act and shared with Bloomberg News.

[Fire Threat Up as Vintage Air Arsenal Shrinks](#)

As federal authorities confront the destructive start of what threatens to be one of the fiercest wildfire seasons in memory, they are relying on a fleet of ancient planes converted from other purposes to do the dangerous, often deadly, work of skimming the smoldering treetops to bomb fires with water and flame retardant.

The contractor-owned planes, refurbished from military use and leased by the United States Forest Service, have been hobbled by accidents and mechanical problems, leading to growing safety concerns and calls for a major overhaul. A decade ago, the government had 44 large tanker planes at its command. Now, with fires raging from California to Colorado to Wyoming, the regular fleet is down to nine.

[Relief in Every Window, but Global Worry Too](#)

In the ramshackle apartment blocks and sooty concrete homes that line the dusty roads of urban India, there is a new status symbol on proud display. An air-conditioner has become a sign of middle-class status in developing nations, a must-have dowry item.

It is cheaper than a car, and arguably more life-changing in steamy regions, where cooling can make it easier for a child to study or a worker to sleep.

But as air-conditioners sprout from windows and storefronts across the world, scientists are becoming increasingly alarmed about the impact of the gases on which they run. All are potent agents of global warming.

[My Air-Conditioner Envy](#)

While in Pune, India, I visited Rajendra Shende, head of the Terre Policy Center, whose office is cooled by what he says is the first hydrocarbon air-conditioner in India. It is made by Gree, a Chinese company. Although they are not available on the general market, Dr. Shende managed to obtain one — to stay cool, naturally, but also to prove that hydrocarbons, which are flammable, can be safely used in home air-conditioning units provided that they are properly cared for and serviced. During our two-hour interview, the machine was quiet and the office was comfortable.

I want one. But before Americans can buy them, the E.P.A. would need to fast-track approvals of new chemicals for home air-conditioning use. Appliance manufacturers would have to develop safety and servicing standards and train repair people how to work with the new machines. The kind that Dr. Shende has uses a simple hydrocarbon that is not patented, so companies may have less incentive to promote it.

[To ensure future food supply, we must address difficult questions](#)

By 2050, it's estimated that there will be an additional two billion people on Earth. With parts of the globe already facing resource shortages, consider for a moment what it will take to feed that nine billionth person.

To ensure the future food supply, we must address a series of complex, interconnected and often conflicting issues. We have to produce more food with limited farmable land, and we must do so in a way that promotes water and soil conservation and improves the livelihoods of farm workers and agricultural communities.

[In United States, there's a lot of food being wasted](#)

In the United States, "farm to fork" has become "farm to dumpster" as American farms, processors, manufacturers, grocers, restaurants and homes increasingly waste food.

The Environmental Protection Agency says that food waste has increased dramatically, rising 50 percent between 1974 and 2003, and recently replaced paper as the largest single component in our landfills.

[Planting fresh produce in D.C.'s 'food deserts'](#)

To reach Jimmy Singleton's "corner store" at the Marbury Plaza Apartments in Ward 7, residents must take the elevator down to the basement and navigate a series of barren, unmarked hallways until they find a nondescript doorway that leads to Marbury Market. For the hundreds of residents here, this is their nearest grocery store.

The co-owner learned the dangers of trying to survive on the market's junk food-heavy stock — chips, sodas, candy bars, sticky buns and the like. Not long after he bought the store in 2005, Singleton turned it into his primary feeding trough.

"In a year's time, I had gained about 75 pounds," he says. "I got so big, customers started talking about me."

[1.5 million children in imminent danger of starvation in West Africa](#)

One-and-a-half-million children are in imminent danger of starvation in West Africa, according to The United Nations Children's Fund, despite recent pledges of international aid.

As world leaders gathered for the Rio+20 conference on sustainable development, aid workers warned there were only four weeks left to treat the effects of acute hunger before the rainy season makes huge swathes of the Sahel region inaccessible.

Across western Africa, communities are caught between climate change, conflict and poverty -- yet the global economic crisis means international priorities lie elsewhere.

[Climate Change, Vulnerability and Human Mobility: Perspectives of Refugees from the East and Horn of Africa](#)

Climate change drives people into harm's way, says UN Refugee Chief

A new report based on scores of personal testimonies from refugees in Eastern Africa finds that climate change can make people more vulnerable and can also play a part in driving them into areas of conflict and ultimately across borders and into exile.

[Climate change to worsen hunger as U.N.'s Rio+20 begins](#)

As leaders from more than 130 nations convene a United Nations conference on sustainable development Wednesday, new research shows how climate change will likely exacerbate a key issue: hunger.

The number of undernourished women and young children could increase 20% and affect one of every five within a decade because of climate change's impact on food production, according to an analysis by the World Health Organization and other groups. Today, one in seven or 495 million women and children under age 5 lack sufficient food, the report says, adding population growth will worsen the problem.

[Dreaming Up Whole New Carbon Markets](#)

The Department of Energy is weighing the possibility of developing a market for carbon dioxide as a commercial product.

[An Earth Summit Draws on Oil, Mining and Utility Largess](#)

RIO DE JANEIRO – The cups at the water coolers here at Rio+20, the global sustainability conference taking place Wednesday through Friday, are made of rough biodegradable corn fiber rather than plastic. Vans running on second-generation ethanol made from sugar cane bagasse take conference members, free of charge, from the hotels on the Copacabana beach to the conference center an hour away.

There, speedy Wi-Fi is offered to tens of thousands of participants so they can avoid printing out Rio+20 documents, and biodiesel generators power the million square feet of conference grounds.

Some of this is financed by millions of dollars in financial support from Brazil's largest energy, extraction and petroleum corporations. Those include businesses like the mining giant Vale, voted the "worst company of the year" in the 2012 Public Eye Awards, and

Eletrobras, the state electricity company, a partner with Vale in developing the Belo Monte dam project on the Xingu River.

[Diplomats agree on "weak" text for Rio+20 summit](#)

RIO DE JANEIRO (Reuters) - Diplomats from over 190 countries agreed on a draft text on green global development on Tuesday to be approved this week at a summit in Rio de Janeiro, but environmentalists complained the agreement was too weak.

The summit, known as Rio+20, was supposed to hammer out aspirational, rather than mandatory sustainable development goals across core areas like food security, water and energy, but the draft text agreed upon by diplomats failed to define those goals or give clear timetables toward setting them.

It is "telling that nobody in that room adopting the text was happy. That's how weak it is," the European Union's climate commissioner Connie Hedegaard said on social network Twitter.

[From top-down to bottom-up: New directions for climate at Rio+20](#)

More importantly from my perspective, however, was the growing realization that the window of opportunity for stabilizing the earth's climate system was rapidly coming to a close. The urgency of the crisis demanded immediate, extensive emissions reductions. And I firmly believed that a coordinated international effort that mandated reductions from the world's largest emitters was the fairest and most efficient way to stave off climate disaster.

[Hillary Clinton's Plan to Get Serious About Global Warming](#)

The secretary of state's new plan to deal with pollutants other than fossil fuels could be a game changer.

[Russia to cut greenhouse gas emissions by 25 percent](#)

Rio de Janeiro (IANS/RIA Novosti) Prime Minister Dmitry Medvedev has said Russia will reduce greenhouse gas emissions by 25 percent by 2020 in comparison to 1990.

"I confirm that by 2020 greenhouse gas emission in Russia will be 25 percent less than the 1990 level," Medvedev said at the conference on Sustainable Development Climate.

Russia is ready to be a member of a global agreement on greenhouse gas emissions, he said. "But a truly global one, that involves all the major economies, not just some of them."

[UN Reaps Pledges Worth Billions for Sustainability Drive](#)

United Nations officials will detail today pledges worth billions of dollars to curb the use of fossil fuels, conserve water and encourage wider use of renewable energy, part of a global effort to promote economic growth that doesn't strain the planet's resources.

[General Assembly rewrites rising seas bill](#)

RALEIGH - A rewrite of a bill that controls how North Carolina prepares for climate change along the coast is headed to the General Assembly next week.

A conference committee met Thursday morning to rework the bill and reject language lamented by the scientific community that would limit the state to using historical data to prepare for rising sea levels.

[Last 50 years were Australia's hottest: study](#)

For the first time scientists have provided the most complete climate record of the last millennium and they found that the last 50 years in Australia have been the warmest.

The researchers from Melbourne University used 27 different natural indicators like tree rings and ice cores to come to their conclusion, which will be a part of the next United Nations intergovernmental panel on climate change report.

[Arctic climate more vulnerable than thought, maybe linked to Antarctic ice-sheet behavior](#)

First analyses of the longest sediment core ever collected on land in the terrestrial Arctic, published this week in Science, provide documentation that intense warm intervals, warmer than scientists thought possible, occurred there over the past 2.8 million years.

Further, these extreme warm periods correspond closely with times when parts of Antarctica were ice-free and also warm, suggesting strong inter-hemispheric climate connectivity. "The polar regions are much more vulnerable to change than we thought before," say the project's Co-Chief scientists Martin Melles of the University of Cologne, Germany, Julie Brigham-Grette of the University of Massachusetts Amherst, USA, and Pavel Minyuk of Russia's North-East Interdisciplinary Scientific Research Institute in Magadan.



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