

CLIMATE COLLAPSE

The Pentagon's Weather Nightmare

The climate could change radically, and fast. That would be the mother of all national security issues.

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Global warming may be bad news for future generations, but let's face it, most of us spend as little time worrying about it as we did about al Qaeda before 9/11. Like the terrorists, though, the seemingly remote climate risk may hit home sooner and harder than we ever imagined. In fact, the prospect has become so real that the Pentagon's strategic planners are grappling with it.

The threat that has riveted their attention is this: Global warming, rather than causing gradual, centuries-spanning change, may be pushing the climate to a tipping point. Growing evidence suggests the ocean-atmosphere system that controls the world's climate can lurch from one state to another in less than a decade—like a canoe that's gradually tilted until suddenly it flips over. Scientists don't know how close the system is to a critical threshold. But abrupt climate change may well occur in the not-too-distant future. If it does, the need to rapidly adapt may overwhelm many societies—thereby upsetting the geopolitical balance of power.

Though triggered by warming, such change would probably cause cooling in the Northern Hemisphere, leading to longer, harsher winters in much of the U.S. and Europe. Worse, it would cause massive droughts, turning farmland to dust bowls and forests to ashes. Picture last fall's California wildfires as a regular thing. Or imagine similar disasters destabilizing nuclear powers such as Pakistan or Russia—it's easy to see why the Pentagon has become interested in abrupt climate change.

Climate researchers began getting seriously concerned about it a decade ago, after studying temperature indicators embedded in ancient layers of Arctic ice. The data show that a number of dramatic shifts in average temperature took place in the past with shocking speed—in some cases, just a few years.

The case for angst was buttressed by a theory regarded as the most likely explanation for the abrupt changes. The eastern U.S. and northern Europe, it seems, are warmed by a huge Atlantic Ocean current that flows north from the tropics—that's why Britain, at Labrador's latitude, is relatively temperate. Pumping out warm, moist air, this "great conveyor" current gets cooler and denser as it moves north. That causes the current to sink in the North Atlantic, where it heads south again in the ocean depths. The sinking process draws more water from the south, keeping the roughly circular current on the go.

But when the climate warms, according to the theory, fresh water from

melting Arctic glaciers flows into the North Atlantic, lowering the current's salinity—and its density and tendency to sink. A warmer climate also increases rainfall and runoff into the current, further lowering its saltiness. As a result, the conveyor loses its main motive force and can rapidly collapse, turning off the huge heat pump and altering the climate over much of the Northern Hemisphere.

Scientists aren't sure what caused the warming that triggered such collapses in the remote past. (Clearly it wasn't humans and their factories.) But the data from Arctic ice and other sources suggest the atmospheric changes that preceded earlier collapses were dismayingly similar to today's global warming. As the Ice Age began drawing to a close about 13,000 years ago, for example, temperatures in Greenland rose to levels near those of recent decades. Then they abruptly plunged as the conveyor apparently shut down, ushering in the "Younger Dryas" period, a 1,300-year reversion to ice-age conditions. (A dryas is an Arctic flower that flourished in Europe at the time.)

Though Mother Nature caused past abrupt climate changes, the one that may be shaping up today probably has more to do with us. In 2001 an international panel of climate experts concluded that there is increasingly strong evidence that most of the global warming observed over the past 50 years is attributable to human activities—mainly the burning of fossil fuels such as oil and coal, which release heat-trapping carbon dioxide. Indicators of the warming include shrinking Arctic ice, melting alpine glaciers, and markedly earlier springs at northerly latitudes. A few years ago such changes seemed signs of possible trouble for our kids or grandkids. Today they seem portents of a cataclysm that may not conveniently wait until we're history.

Accordingly, the spotlight in climate research is shifting from gradual to rapid change. In 2002 the National Academy of Sciences issued a report concluding that human activities could trigger abrupt change. Last year the World Economic Forum in Davos, Switzerland, included a session at which Robert Gagosian, director of the Woods Hole Oceanographic Institution in Massachusetts, urged policymakers to consider the implications of possible abrupt climate change within two decades.

Such jeremiads are beginning to reverberate more widely. Billionaire Gary Comer, founder of Lands' End, has adopted abrupt climate change as a philanthropic cause. Hollywood has also discovered the issue—next summer 20th Century Fox is expected to release *The Day After Tomorrow*, a big-budget disaster movie starring Dennis Quaid as a scientist trying to save the world from an ice age precipitated by global warming.

Fox's flick will doubtless be apocalyptically edifying. But what would abrupt climate change really be like?

Scientists generally refuse to say much about that, citing a data deficit. But recently, renowned Department of Defense planner Andrew Marshall sponsored a groundbreaking effort to come to grips with the question. A Pentagon legend, Marshall, 82, is known as the Defense Department's "Yoda"—a balding, bespectacled sage whose pronouncements on looming risks have long had an outsized influence on defense policy. Since 1973 he has headed a secretive think tank whose role is to envision future threats to national security. The Department of Defense's push on ballistic-missile defense is known as

his brainchild. Three years ago Defense Secretary Donald Rumsfeld picked him to lead a sweeping review on military "transformation," the shift toward nimble forces and smart weapons.

When scientists' work on abrupt climate change popped onto his radar screen, Marshall tapped another eminent visionary, Peter Schwartz, to write a report on the national-security implications of the threat. Schwartz formerly headed planning at Royal Dutch/Shell Group and has since consulted with organizations ranging from the CIA to DreamWorks—he helped create futuristic scenarios for Steven Spielberg's film *Minority Report*. Schwartz and co-author Doug Randall at the Monitor Group's Global Business Network, a scenario-planning think tank in Emeryville, Calif., contacted top climate experts and pushed them to talk about what-ifs that they usually shy away from—at least in public.

The result is an unclassified report, completed late last year, that the Pentagon has agreed to share with FORTUNE. It doesn't pretend to be a forecast. Rather, it sketches a dramatic but plausible scenario to help planners think about coping strategies. Here is an abridged version:

A total shutdown of the ocean conveyor might lead to a big chill like the Younger Dryas, when icebergs appeared as far south as the coast of Portugal. Or the conveyor might only temporarily slow down, potentially causing an era like the "Little Ice Age," a time of hard winters, violent storms, and droughts between 1300 and 1850. That period's weather extremes caused horrific famines, but it was mild compared with the Younger Dryas.

For planning purposes, it makes sense to focus on a midrange case of abrupt change. A century of cold, dry, windy weather across the Northern Hemisphere that suddenly came on 8,200 years ago fits the bill—its severity fell between that of the Younger Dryas and the Little Ice Age. The event is thought to have been triggered by a conveyor collapse after a time of rising temperatures not unlike today's global warming. Suppose it recurred, beginning in 2010. Here are some of the things that might happen by 2020:

At first the changes are easily mistaken for normal weather variation—allowing skeptics to dismiss them as a "blip" of little importance and leaving policymakers and the public paralyzed with uncertainty. But by 2020 there is little doubt that something drastic is happening. The average temperature has fallen by up to five degrees Fahrenheit in some regions of North America and Asia and up to six degrees in parts of Europe. (By comparison, the average temperature over the North Atlantic during the last ice age was ten to 15 degrees lower than it is today.) Massive droughts have begun in key agricultural regions. The average annual rainfall has dropped by nearly 30% in northern Europe, and its climate has become more like Siberia's.

Violent storms are increasingly common as the conveyor becomes wobbly on its way to collapse. A particularly severe storm causes the ocean to break through levees in the Netherlands, making coastal cities such as the Hague unlivable. In California the delta island levees in the Sacramento River area are breached, disrupting the aqueduct system transporting water from north to south.

Megadroughts afflict the U.S., especially in the southern states, along with winds that are 15% stronger on average than they are now,

causing widespread dust storms and soil loss. The U.S. is better positioned to cope than most nations, however, thanks to its diverse growing climates, wealth, technology, and abundant resources. That has a downside, though: It magnifies the haves-vs.-have-nots gap and fosters bellicose finger-pointing at America.

Turning inward, the U.S. effectively seeks to build a fortress around itself to preserve resources. Borders are strengthened to hold back starving immigrants from Mexico, South America, and the Caribbean islands—waves of boat people pose especially grim problems. Tension between the U.S. and Mexico rises as the U.S. reneges on a 1944 treaty that guarantees water flow from the Colorado River into Mexico. America is forced to meet its rising energy demand with options that are costly both economically and politically, including nuclear power and onerous Middle Eastern contracts. Yet it survives without catastrophic losses.

Europe, hardest hit by its temperature drop, struggles to deal with immigrants from Scandinavia seeking warmer climes to the south. Southern Europe is beleaguered by refugees from hard-hit countries in Africa and elsewhere. But Western Europe's wealth helps buffer it from catastrophe.

Australia's size and resources help it cope, as does its location—the conveyor shutdown mainly affects the Northern Hemisphere. Japan has fewer resources but is able to draw on its social cohesion to cope—its government is able to induce population-wide behavior changes to conserve resources.

China's huge population and food demand make it particularly vulnerable. It is hit by increasingly unpredictable monsoon rains, which cause devastating floods in drought-denuded areas. Other parts of Asia and East Africa are similarly stressed. Much of Bangladesh becomes nearly uninhabitable because of a rising sea level, which contaminates inland water supplies. Countries whose diversity already produces conflict, such as India and Indonesia, are hard-pressed to maintain internal order while coping with the unfolding changes.

As the decade progresses, pressures to act become irresistible—history shows that whenever humans have faced a choice between starving or raiding, they raid. Imagine Eastern European countries, struggling to feed their populations, invading Russia—which is weakened by a population that is already in decline—for access to its minerals and energy supplies. Or picture Japan eyeing nearby Russian oil and gas reserves to power desalination plants and energy-intensive farming. Envision nuclear-armed Pakistan, India, and China skirmishing at their borders over refugees, access to shared rivers, and arable land. Or Spain and Portugal fighting over fishing rights—fisheries are disrupted around the world as water temperatures change, causing fish to migrate to new habitats.

Growing tensions engender novel alliances. Canada joins fortress America in a North American bloc. (Alternatively, Canada may seek to keep its abundant hydropower for itself, straining its ties with the energy-hungry U.S.) North and South Korea align to create a technically savvy, nuclear-armed entity. Europe forms a truly unified bloc to curb its immigration problems and protect against aggressors. Russia, threatened by impoverished neighbors in dire straits, may join the European bloc.

Nuclear arms proliferation is inevitable. Oil supplies are stretched thin as climate cooling drives up demand. Many countries seek to shore up their energy supplies with nuclear energy, accelerating nuclear proliferation. Japan, South Korea, and Germany develop nuclear-weapons capabilities, as do Iran, Egypt, and North Korea. Israel, China, India, and Pakistan also are poised to use the bomb.

The changes relentlessly hammer the world's "carrying capacity"—the natural resources, social organizations, and economic networks that support the population. Technological progress and market forces, which have long helped boost Earth's carrying capacity, can do little to offset the crisis—it is too widespread and unfolds too fast.

As the planet's carrying capacity shrinks, an ancient pattern reemerges: the eruption of desperate, all-out wars over food, water, and energy supplies. As Harvard archeologist Steven LeBlanc has noted, wars over resources were the norm until about three centuries ago. When such conflicts broke out, 25% of a population's adult males usually died. As abrupt climate change hits home, warfare may again come to define human life.

Over the past decade, data have accumulated suggesting that the plausibility of abrupt climate change is higher than most of the scientific community, and perhaps all of the political community, are prepared to accept. In light of such findings, we should be asking when abrupt change will happen, what the impacts will be, and how we can prepare—not whether it will really happen. In fact, the climate record suggests that abrupt change is inevitable at some point, regardless of human activity. Among other things, we should:

- Speed research on the forces that can trigger abrupt climate change, how it unfolds, and how we'll know it's occurring.
- Sponsor studies on the scenarios that might play out, including ecological, social, economic, and political fallout on key food-producing regions.
- Identify "no regrets" strategies to ensure reliable access to food and water and to ensure our national security.
- Form teams to prepare responses to possible massive migration, and food and water shortages.
- Explore ways to offset abrupt cooling—today it appears easier to warm than to cool the climate via human activities, so there may be "geo-engineering" options available to prevent a catastrophic temperature drop.

In sum, the risk of abrupt climate change remains uncertain, and it is quite possibly small. But given its dire consequences, it should be elevated beyond a scientific debate. Action now matters, because we may be able to reduce its likelihood of happening, and we can certainly be better prepared if it does. It is time to recognize it as a national security concern.

The Pentagon's reaction to this sobering report isn't known—in keeping with his reputation for reticence, Andy Marshall declined to be

interviewed. But the fact that he's concerned may signal a sea change in the debate about global warming. At least some federal thought leaders may be starting to perceive climate change less as a political annoyance and more as an issue demanding action.

If so, the case for acting now to address climate change, long a hard sell in Washington, may be gaining influential support, if only behind the scenes. Policymakers may even be emboldened to take steps such as tightening fuel-economy standards for new passenger vehicles, a measure that would simultaneously lower emissions of greenhouse gases, reduce America's perilous reliance on OPEC oil, cut its trade deficit, and put money in consumers' pockets. Oh, yes—and give the Pentagon's fretful Yoda a little less to worry about.

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