

# A WITCH'S BREW

## ARCTIC WARMING + GLOBAL CLIMATE CHANGE

**The Arctic**—at the center of the sky-blue flag of the United Nations—is more a focus of governments and peoples today than ever before. This is partly because of the region's abundant resources and its growing impact on global climate change.

The mostly frigid, ice-bound Arctic is warmer now than it has been in recorded human memory. Because of atmospheric change, the Arctic Sea's temperature is rising, and the glaciers and ice packs are melting. The warming of the permafrost which covers much of the Arctic, is unleashing long-frozen methane greenhouse gases into the atmosphere, thus compounding its effect on climate change.

This big sea change—literally and figuratively—is helping to trigger increased appetite for the area's rich natural resources on land and underwater. More than 30 percent of the world's untapped mineral resources, including precious metals, are found in this northern band at the top of the world with a total population of 4 million inhabitants.

The warming of the Arctic has a cause-and-effect impact on ocean rise and climate change. As snowcaps melt, previously hidden resources become ever more accessible. Thus the pull for increased commercial activity.

The grounding of Shell Oil's huge ocean drilling rig during a winter storm in the Gulf of Alaska on New Year's Eve 2012 underscores the need for more careful, even skeptical, international attention rather than any posture of benign neglect

security issues plaguing the region. Some more is required:

1. An ambitious international campaign of public awareness and public diplomacy to better educate peoples and governments around the world to the vital stakes involved.

2. The U.S. Congress to sign the International Law of the Seas, first approved in 1983 and signed by 164 countries since, to allow the U.S. to protect its sovereign rights in the area and gain some "street cred" for its concern about environmental protection.

3. United Nations support of the Arctic Council to undertake more rigorous regulations and moral suasion to best

balance public interests and private appetites in the region.

—Crocker Snow Jr., Director, Edward R. Murrow Center for Public Diplomacy, Fletcher School, Tufts University



The mix is a witch's brew. Private companies—oil and gas, mining, shipping and even tourism—want to invest more in the region at just the time that governments and international organizations are more aware of the dangers of limited oversight.

The 8-member Arctic Council (Russia, Finland, Sweden, Norway, Iceland, Greenland, Canada, the U.S.) is, more than any organization, in the position of doing something about it. Operating below the radar of most of the rest of the world, the Arctic Council quietly started addressing some of the key scientific, political, economic, environmental, safety and



## A Scientist's Portrait of Arctic Amplification

### Aging the Face of Mother Nature with the Jet Stream

It seems as though the weather gods have gone berserk in recent years, as nearly every day the headlines report unusual droughts, floods, prolonged cold and snow, heat waves, or unusual weather events happening somewhere around the globe. According to NOAA's Climate Extreme Index, an accounting of various extreme weather events in the U.S., the frequency is clearly on the rise, particularly since the mid-1970s. The \$64B question is: How much of the increase in extreme events can be linked to human-caused climate change?

Scientists have been reluctant to weigh in on this question. In the past few years, however, a flurry of studies have appeared in peer-reviewed literature documenting connections between climate change and the uptick in extreme weather events. Most of these implicate the rapidly rising concentrations of greenhouse gases in the atmosphere, particularly carbon dioxide, which is now more abundant than it has been in at least 800,000 years.

Some impacts are clear. We know that the **warmer atmosphere** contains more energy, which can add fuel to storms and exacerbate droughts and heat waves. As the atmosphere has warmed, the amount of **moisture** it contains has also increased owing to increased evaporation from warmer oceans and the larger moisture-holding capacity of warmer air. This additional moisture not only enables storms to produce more rain and snow, but as that water vapor condenses, heat is released that provides additional energy that can be tapped by weather systems.

#### Superstorm Signs

Coastal communities are already feeling the effects of **higher sea levels**, as any storm that comes ashore adds surge and high seas to an elevated water level, increasing the likelihood of flooding. **Warmer ocean temperatures** contribute to sea-level rise and also may enable tropical storms to survive farther away from the tropics and lengthen the tropical storm season. These factors almost certainly contributed to Superstorm Sandy's remarkable path of destruction as it formed late in the season and tracked up the eastern seaboard where ocean temperatures were abnormally warm.

Recent research has revealed some less intuitive links between climate change and the escalation of extreme weather. The Arctic is warming two to three times faster than the rest of the northern hemisphere owing primarily to sea-ice loss, earlier snow melt on Arctic land in spring, and an increase in the northward transport of moisture into the Arctic.

This so-called **Arctic amplification** means that the

temperature difference between the Arctic and mid-latitudes is weakening. This is important because the west-to-east winds of the jet stream are driven by that temperature difference.

The jet stream is a fast river of wind high in the atmosphere that takes on a wavy path as it encircles the northern hemisphere, forming the boundary between warm air to the south and cold air to the north. As its westerly flow weakens, the waves in its trajectory tend to take larger north-south swings. These waves control weather systems on the

surface: conditions tend to be clear and dry in the part of the wave where winds blow from the northwest, and it's generally stormy where winds come from the southwest.

As the waves increase in size because of Arctic amplification, they progress eastward more slowly, which means that the weather associated lasts longer in any particular location.

Larger waves also form "blocks," which are like back-eddies in a stream that tend to prevent the jet-stream waves on either side—and the weather associated with them—from moving at all.

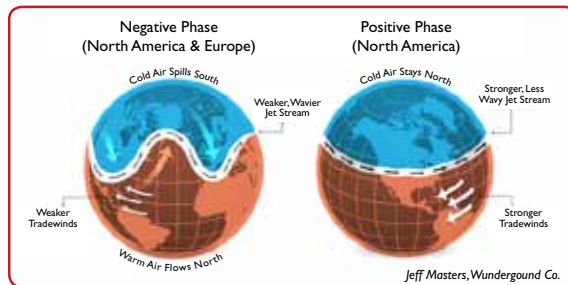
#### Blocking Arctic Amplification

Large excursions of the jet stream caused many of the recent extreme weather events, such as the unusually cold, snowy winters experienced recently in Europe and Alaska, the unprecedented flooding in Spain and China, and the record-warm winter during 2011/2012 in the eastern U.S.

New research suggests that increased blocking may be connected to Arctic amplification. For example, progressively earlier snow melt in northern Siberia, which allows the soil to dry out and warm earlier in spring, has been implicated in recent summer heat waves and drought in Eurasia. Most likely the similar snow losses in northern Canada played a role in the heat wave and drought in the U.S. during the summers of 2011 and 2012. The strong high-pressure block that was in place over northeast Canada when Sandy tracked up the eastern seaboard helped steer her on her unusual westward path toward New Jersey.

The shifting patterns are sketching out the portrait of climate change that models have projected for years. Mother Nature's face is not aging slowly or gracefully, the wrinkles and scars caused by accumulating greenhouse gases are already visible. The good news? Extreme weather is also chiseling fissures and gaping holes in the climate deniers' bunker, leaving a crumbling foundation for their arguments.

—Jennifer Francis, Research Professor and co-founder of Rutgers Climate and Environmental Change Department



## Two Arctic Observers Cited with IPCC in 2007 Nobel Prize

### Change "Pollution-Control" to "Clean-Development" Treaty

The Arctic is melting because of actions taken in the rest of the world where most people live and which generate the heat trapping gases and black carbon that is causing the problem. Just over 20 years ago, the world agreed to a process to address the heat-trapping gases being added to the atmosphere, and by 2005 was implementing the Kyoto Protocol that required industrial nations to begin slowly reducing their emissions by the end of 2012. The U.S. did not join, Australia joined late and Canada has just pulled out of the treaty system. Despite this, the modest goal was met by the rest of the developed countries, yet concentrations of carbon dioxide and most other heat-trapping gases have continued to grow, and the negotiations system is stymied and not moving forward.

I argue that this is because we are negotiating the wrong treaty. We have structured a pollution control treaty that sets emission reduction targets and timetables for heat-trapping gases. Negotiators call these requirements "burden sharing." Government leaders oppose them because they believe that increased reductions will interfere with their

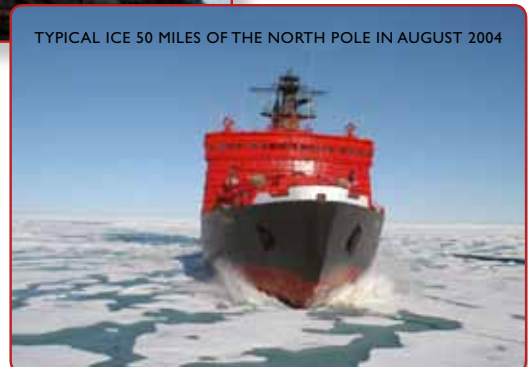
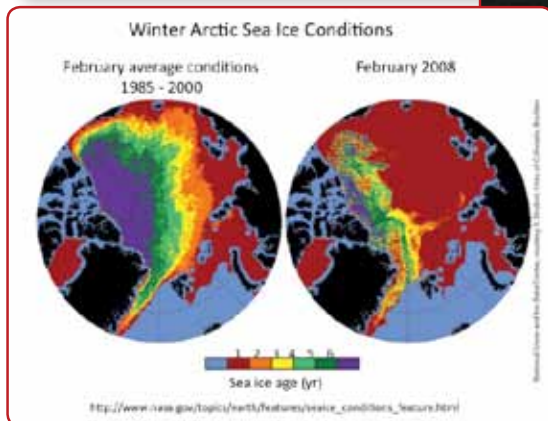
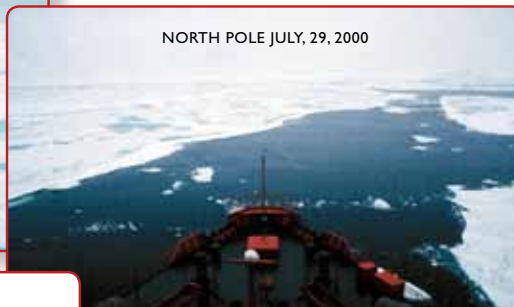
economic development. The problem is not the emissions—it is our underlying model of unsustainable development that is built upon the heavy reliance on fossil fuels as the energy source of our economy. So it is not in any nation's interest to agree to emission reductions—even though this would address climate change, which is surely in the interest of all nations. So I propose shifting from burden-bearing to opportunity-sharing. People want and need energy services such as light, heat, computer and entertainment services and mobility. They do not want "energy" or carbon dioxide from the burning of fossil fuels. So I propose a mutual gains strategy of providing energy services for all in the most efficient, clean manner possible. Turn the treaty into a clean-development treaty from a pollution-control treaty, and improve well being while producing much less carbon dioxide and other heat-trapping gases.

—Bill Moomaw, Professor of International Environmental Policy, Fletcher School, and author of Intergovernmental Panel on Climate Change (IPCC) recognized with Al Gore for the 2007 Nobel Peace Prize.

### The Thinner Ice Equation

James McCarthy, professor of Biological Oceanography at Harvard has surveyed and photographed changes in sea ice in and around the North Pole from Russian and Coast Guard

icebreakers and research vessels since the 1990s as evidence of warming ocean temperatures. These photographs are from his keynote talk at the Inquiry.





# The Arctic Nations and their Numbers:

*The Arctic Triangle Index prepared exclusively by the Warming Arctic staff and researchers measures and compares Arctic countries by their resources, infrastructure and social systems. Contact crockersnowjr@tufts.edu.*

## What do you know about the Arctic?

1. How is "the Arctic" most usually defined?

- ☐ Those lands and water above the Arctic Circle?
- ☐ Those countries with Arctic indigenous populations?
- ☐ Based on media temperature of 50 degrees or less in July

2. How many people inhabit the Arctic?

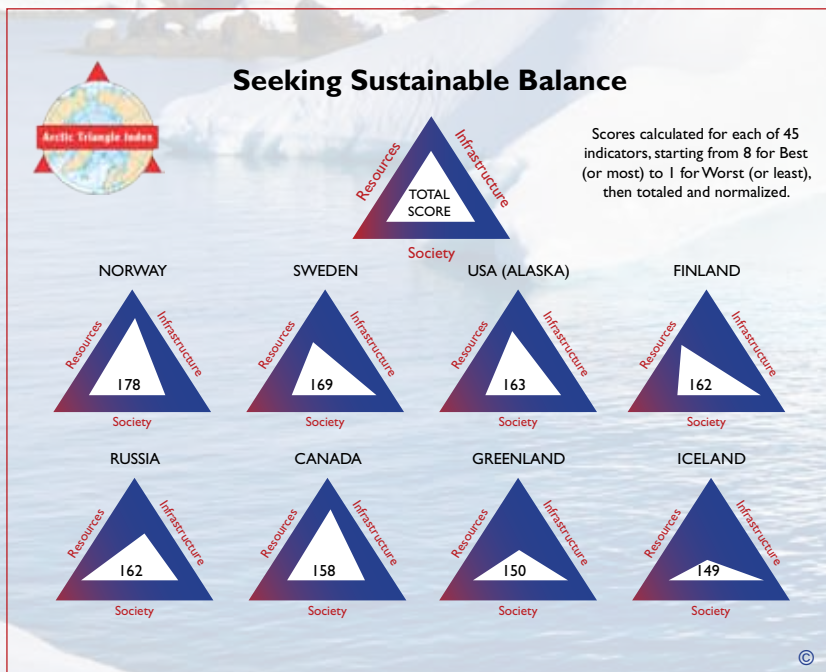
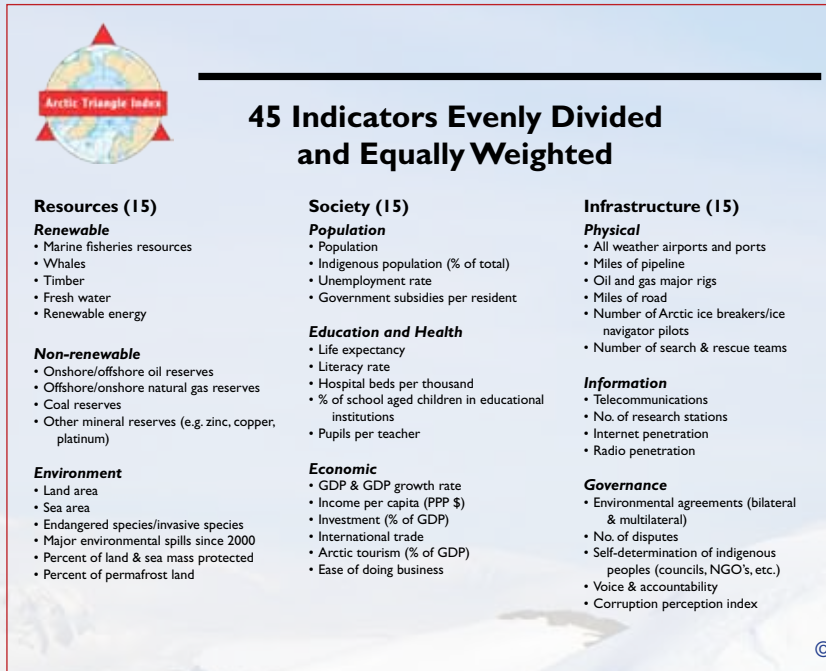
- ☐ 40,000
- ☐ 400,000
- ☐ 4,000,000

3. How much of the world's untapped mineral resources are found in the Arctic?

- ☐ 15%
- ☐ 30%
- ☐ 40%

4. Which Arctic condition today has the biggest impact on global climate change?

- ☐ Thawing of the permafrost?
- ☐ Rising of sea temperature
- ☐ Calving of Greenland glaciers and ice?



## Arctic Council Priorities

**"As the new chairman of the Arctic Council, our ambassador Leona Aglukkaq will focus on economic growth of the region, sustainable circumpolar communities and safe Arctic shipping."**

Aaron Annable, Canadian Consulate, Boston

# The Independent Arctic Triangle Index

5. How many countries are permanent members of the Arctic Council?

- ☐ Five
- ☐ Eight
- ☐ Twelve

6. What percent of the world's current consumption of oil and natural gas comes from Arctic land or water?

- ☐ 7%
- ☐ 15%
- ☐ 25%

7. What is the ratio of Arctic areas, land and water, compared to the Antarctic?

- ☐ 1.5 to one
- ☐ one to one
- ☐ one to 1.5

8. Which is the largest native indigenous group living in the Arctic?

- ☐ The Sami
- ☐ The Inuit
- ☐ The Chukchi

9. What is the biggest city above the Arctic Circle?

- ☐ Tromso
- ☐ Murmansk
- ☐ Ryejavik

10. How many commercial ships transited the Russian Northern Sea route via the Barents Sea and Arctic Ocean from Scandinavia to Northeast Asia during the summer months since it was newly opened from ice in 2009?

- ☐ 15
- ☐ 90
- ☐ 300

Answers:  
1. three  
2. three  
3. two  
4. one  
5. two  
6. one  
7. one  
8. three  
9. two  
10. two



## How Do the Countries Rank?

RESOURCES	Normalized	Absolute
Arctic Russia	60.85	8
Arctic Canada	51.64	7
Arctic (AK)	46.34	6
Norway	40.91	5
Greenland	39.40	4
Iceland	34.81	3
Sweden	30.00	2
Finland	26.99	1

SOCIETY	Normalized	Absolute
Norway	79.14	8
Iceland	71.56	7
Sweden	71.52	6
Greenland	68.63	5
Finland	68.19	4
Arctic US (AK)	59.60	3
Arctic Russia	56.47	2
Arctic Canada	52.73	1

INFRASTRUCTURE	Normalized	Absolute
Sweden	67.15	8
Finland	66.67	7
Norway	58.40	6
Arctic US (AK)	56.76	5
Arctic Canada	54.05	4
Iceland	42.49	3
Arctic Russia	44.48	2
Greenland	42.26	1

OVERALL	Normalized	Absolute
Norway	178.45	8
Sweden	168.67	7
Arctic US (AK)	162.70	6
Finland	161.84	5
Arctic Russia	161.81	4
Arctic Canada	158.42	3
Greenland	150.29	2
Iceland	148.86	1

Normalized results derived from the following formula:  $(\frac{x}{x_{max}}) \times 8$ , where x is the value of interest for a particular country and category,  $x_{max}$  is the largest value that any country has in that category, and 8 is the largest possible score.

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## Panning for Key Findings

- Norway is consistently top of the Arctic nations in overall scores combining the 45 indicators utilized in absolute or normalized calculations.
- Canada (northern territories) and US (Alaska) are the best balanced between natural resources, infrastructure and social systems to help allow equitable, environmentally aware Arctic development.
- Russia and Iceland are the most imbalanced.
- Pollution problems in the Far North come mostly from outside the Arctic.
- Emergency oil spills—land or sea—represent a major risk due to limited capacities in distant, dark, icy Arctic conditions.
- Territorial disputes are an irritant but do not seem a source of political conflict to handicap Arctic resource development.
- Recent example of Russia and Norway cooperation in North Atlantic / Barents Sea fish catch may be a model for all area countries.
- The Arctic Council, celebrating its 12th anniversary, is a repository of balanced research and consensus decision-making in the North.

## Indigenous Arctic Insights

**"A new and increased role for Arctic Indigenous peoples is needed to take into account the dramatic changes impacting the fragile Arctic ecosystem, which are the homelands of Inuit, Sami and other Arctic Indigenous peoples. Even the single issue of ice-free navigation of the Arctic Ocean itself necessitates a comprehensive response with direct and effective involvement of Indigenous peoples. To realize the important elements of good governance requires genuine political will and political climate change."**

Dalee Dorough, Inuit leader and ambassador University of Alaska, Anchorage

# Climate Change Concerns in The Big Three

*The Yale Project on Climate Change Communication, established in 2005, has undertaken public awareness surveys in the U.S., China and India. Here are highlights:*

## American Insights

*From interviews with 1061 U.S. adults between August 31 and September 12, 2012.*

- ▲ A large majority of Americans (77%) say global warming should be a “very high” (18%), “high” (25%), or medium priority (34%) for the president and Congress.
- ▲ A large majority of Americans (88%) say the U.S. should make an effort to reduce global warming, even if it has economic costs.
- ▲ Majorities support funding more research into renewable energy resources (73%), tax rebates for people who purchase energy efficient vehicles or solar panels (73%), regulating carbon dioxide (CO<sub>2</sub>) as a pollutant (66%), and eliminating all subsidies for the fossil-fuel industry (59%).

## Chinese Concerns

*National telephone survey of 4,169 Chinese adults with Research Center of Renmin University and Oxfam Hongkong:*

- ▲ 93% of respondents think climate change is happening; 55% say that climate change is caused mostly by human activities, while 38% say that climate change is caused mostly by natural changes in the environment.
- ▲ 78% say that they are either very (23%) or somewhat worried (55%) about climate change. 14% are not very worried and 8% are not at all worried.
- ▲ Majorities of respondents say that if nothing is done to address it, over the next 20 years climate change will cause more droughts and water shortages, severe floods, disease epidemics, extinction of plants and animal species and families, and food shortages in China.

## Indian Mind Shifts

*Based on national survey in Nov/Dec 2011 of 4,031 Indian adults, 75% urban and 25% rural*

- ▲ Only 7% of respondents said they know “a lot” about global warming, while 41% had never heard about it or said “I don’t know.” After hearing a short definition of global warming, 72% said they believe global warming is happening, 56% said it is caused mostly by human activities, 50% said they have already personally experienced the effects.
- ▲ Scientists were the most trusted sources of information about global warming (73%), followed by the news media (69%), and environmental organizations (68%). Government and religious leaders were trusted by about half of respondents.
- ▲ 54% said that India should be making a large or moderate-scale effort to reduce global warming, even if it has large or moderate economic costs.

## Inquiry Participants

### Speakers

**Craig Altemose**, Founder, Better Future Project  
**Aaron Annable**, Consulate General of Canada  
**Kenneth J. Boda**, Commander, U.S. Coast Guard  
**Robin Chase**, Former CEO, Zip Car  
**Dalee Sambo Dorough**, Professor, U Alaska  
**Jennifer Francis**, Professor, Rutgers  
**Heather Goldstone**, Reporter, WGBH  
**Kwong Bong Kwan**, former ambassador to China, Seoul Korea  
**James McCarthy**, Professor, Harvard University  
**William Moomaw**, Professor, Tufts University  
**Kartikeya Singh**, Fletcher pro-doc  
**Crocker Snow**, Director, Murrow Center

### Moderators

**Scott G. Borgerson**, Managing Director, Cargometric  
**Steve Curwood**, Founder, Living on Earth

### Observers

**Rasmus Bertelsen**, Energy Lecturer, Aalborg University, Denmark  
**Andrew Cockerill**, University Relations, BP  
**Antje Danielson**, Tufts Institute of Environment  
**Karin Chamberlain**, Triangle Index research  
**Erin Donahue**, Trade Commissioner

**Carolina Echeverri**, The Fletcher School  
**Melissa Freitag**, The Fletcher School  
**Yang Fu**, The Fletcher School  
**George Gamota**, Defense and Space Securities Group  
**Allan Henrikson**, Professor, of Diplomacy, The Fletcher School  
**Marques Jacques**, Canadian Consulate  
**Eli Kintisch**, Program of Science, MIT  
**George Kosar**, Corporate Relations, Tufts  
**Val Livada**, Sloan School, MIT  
**Linda Malik**  
**Gilbert Metcalf**, Professor of Economics, Tufts  
**Kyra Montagu**, Walter & Duncan Gordon Foundation  
**Nancy Nolan**, Lexington Climate Coalition  
**Rachael Parrish**  
**David Peterson**  
**Cammy Peterson**, The Fletcher School  
**Ben Rabe**, The Fletcher School  
**Ryan Siewert**, The Fletcher School  
**Alden Smith**  
**Doug Struck**, Founder, the Daily Climate Blog  
**Elizabeth Terry**, NSTAR  
**Abigail Trafford**, writer/lecturer  
**Mieke van der Wansem**, Associate, The Fletcher School  
**Timothy Weiskel**, Cambridge Climate Research Asscts.  
**Jed Willard**, Ash Institute, Harvard  
**Kimberley Wilson**, Lecturer, The Fletcher School



# Can the Media Be Objective about Climate Change?

*The media has a dilemma covering climate change. The phenomenon is slower than watching grass grow, and shows itself more typically with data points and temperature or sea level gradients than in human interest stories. It revolves around science and peer studies. In the effort to be objective, climate skeptics are often given equal media space and time with the vast majority of scientists who accept current data. Two experienced environmental journalists highlight the issue.*

## Media Failings

This is more than an environmental crisis; it's an existential threat, and should be treated like one, without fear of sounding alarmist, rather than covered as something only environmentalists care about. We're rapidly running out of time to address climate change in any meaningful way and avoid global climate catastrophe, with incalculable human suffering.

In face of this situation, [the media] are failing. Your so-called "objectivity, your bloodless impartiality, are nothing but a convenient excuse for what amounts to an inexcusable failure to tell the most urgent truth. As climate scientists sound increasingly alarmed, there's virtual silence in the mainstream media.

In crisis coverage, there's an assumption that readers want and deserve to know as much as possible. In crisis coverage, you "flood the zone." You shift resources. You make hard choices. The climate crisis is the biggest story of this, or any, generation—so why the hell aren't you flooding the climate "zone," putting it on the front pages and leading newscasts with it every day.

A journalist's ultimate responsibility is to the public. And yet, by that measure, you're failing. It's time for you to level with the public about the severity, scale and urgency of the crisis we face.

—Wen Stephenson, former editor and producer at The Atlantic, Boston Globe, Frontline and current climate activist

## Politics in the Weather

**"Climate change got politicized as an issue when Al Gore won the Nobel Prize for An Inconvenient Truth. It's become a proxy war for the Congress now."**

Craig Altomose, Better Future Project, Cambridge

## Dilemma of the He-Said-She-Said

At their cores, science and journalism are strikingly similar pursuits. Both scientists and journalists are truth seekers whose credibility—and, thus, success—rests on their objectivity. In science, objectivity is rigidly enforced as part of the methodology of any experiment or observation. Objectivity during data collection is essential to ensure

that interpretations of said data, and conclusions drawn from them, are as accurate as possible. In contrast, journalistic objectivity has come to connote an end product that presents two or more sides to any story and specifically refrains from drawing any conclusion about their relative merits.

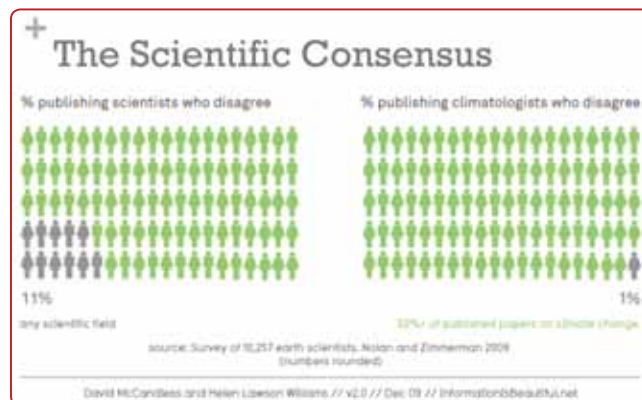
Such he-said-she-said journalism has contributed to the public misunderstanding of certain scientific issues, such as climate change and evolution, by perpetuating the misperception that these ideas are the subject

of major debates among scientists. However, he-said-she-said journalism appears to be on the decline as a norm at mainstream media outlets. Some media thinkers propose a redefinition of journalistic norms to more closely mirror scientific method, incorporating practices such as referencing, reproducibility, transparency, and collaboration.

—Heather Goldstone, Ocean Science Ph.D. from MIT and Woods Hole Oceanographic Institute, and Science Editor for WGBH



FROM GRAND NORD



## The Other Side of Arctic Warming

### Deserts and Yellow Dust Invading East Asia

It seems as if we are constantly preparing to fight the last war and completely unprepared for new challenges. But one need only travel to the edge of the Kubuqi Desert in Inner Mongolia to see that mankind faces threats on an unprecedented scale that call for our united action. We must use the full extent of our imagination to come up with solutions to this crisis through new global alliances that require us to completely rethink terms like “security” as we create a new civilization that can lead humans from the dark night of endless consumption to a hopeful future.



When I arrived in Beijing in 1998 to serve as ambassador to China, I was greeted by the yellow dust storms. When I had established myself at the Beijing Embassy, I asked my staff to conduct a survey about the origins and implications of the yellow dust, and how it arose from the rapid desertification of land in China.

I learned from that report my staff gave me that the amount of desert in China was increasing at a rate of 2400 square kilometers a year and that nothing had yet been successful in slowing down that alarming rate of environmental transformation. I was alarmed. I felt we needed to do something, and to do something together with China.

#### Making the Desert Visible

President Kim Dae Jung visited China in November of 1998 and I proposed to him that we should include the combating of desertification as one issue for the “common agenda” of Korea-China cooperation to be discussed. President Kim agreed and we started in earnest a dialog on the desertification between Korea and China for the very first time. One of the first breakthroughs we had was persuading KOICA (Korea International Cooperation Agency)

to provide funding for combating desertification in China. But persuading both the Koreans and the Chinese of the importance of the issue, and the need to work together, was a long process.

#### Future Forest and The Great Green Wall

I founded Future Forest in 2001 as an NGO focused on combating desertification through close cooperation with China. Future Forest annually dispatches its Green Corps volunteers, a group of more than 100 young students, to Northwest China to plant trees in arid regions in danger of desertification.

We focused our work on the Kubuqi Desert. The Kubuqi Desert, one of seven great deserts in China, has expanded to 450 kilometers west of Beijing and, as the desert closest to Korea, is one of the sources of yellow dust that has caused environmental damage in Korea.

Our greatest achievement was the building of a strip of trees to stop the spread of the desert known as the Great Green Wall. The Great Green Wall has revolutionized land management in the moving-dune desert region by introducing a unique sustainable planting that fixes permanently the moving sands.

The Great Green Wall is of ultimate significance because of its impact on Chinese perceptions and resulting changes in policy. Since China is the “lurching giant” in the global ecosystem, we must encourage the most populous country with second largest deserts, to perceive desertification as a phenomenon that is both a vital threat and at the same time one that can be stopped through policy and action.

—Kwon Byung Hyun, former Korean Ambassador to China, and president of the Korea-China Economic Development Association and Director of Future Forest



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