

ADDRESSING THE CLIMATE CRISIS

with Networks of
the Willing
and Committed

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The climate science debate is over. Climate change will fundamentally alter life as we now know it and the window for slowing it down is closing. The issue must be the top priority for every sector of society.

In spite of 25 years of international efforts to make climate change a top priority, nations have failed to find solutions to reduce greenhouse gas emissions. In fact, the rate of emissions has increased. In the face of the growing crisis, citizens have used the Internet to create hundreds of global solution networks focused on climate change to mobilize scientists, watchdogs, advocates, policy experts and delivery experts to address the problem.

These climate change networks are doing the best they can, but we recommend a “second generation” approach, a governance network that enables collaboration among hundreds of networks for the purpose of mobilizing public action to reduce greenhouse gas emissions. This requires a new governance model, leadership, a robust technical platform and the will to act now.



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Overview by Don Tapscott

In a 2008 landmark paper on the topic of the effects of atmospheric CO₂ NASA's Jim Hansen and his colleagues said:

If humanity wishes to preserve a planet similar to that on which civilization developed and to which life on Earth is adapted, paleoclimate evidence and ongoing climate change suggest that CO₂ will need to be reduced from its current 385 ppm to at most 350 ppm, but likely less than that...If the present overshoot of this target CO₂ is not brief, there is a possibility of seeding irreversible catastrophic effects.¹

In addition to identifying the critical level of atmospheric CO₂ at 350 ppm, they also raised concern about the range of greenhouse gases that are impacting the environment, including methane coming from agriculture and waste management practices and thawing permafrost. Adding to the urgency of the CO₂ measurements was the concern expressed by NASA scientists about what they called “slow” climate feedback including ice sheet disintegration, migration of vegetation and releases of even more damaging greenhouse gases (GHGs) from soil, thawing tundra and the warming oceans, all of which are contributing to climate change at an increasing rate.

Five years later, in 2013, near the summit of Mauna Loa in Hawaii, carbon dioxide levels in the atmosphere reached 400 parts per million and are projected to continue to rise. The last 25 years of international and national efforts to elevate climate change to a top international priority have resulted in a failure to reduce or even significantly slow the rate of greenhouse gas emissions. These rates are projected to continue to rise toward a point from which the world may not be able to return.

The stakes in developing a new model are high and every sector of society, not only national governments, needs to be engaged. We need a mobilization of the resources of humanity, not dissimilar in scope to the two great world wars, but different in that we are all fighting for the same cause.

Already addressing this looming global emergency is a panoply of global solution networks (GSNs) focused on climate change. They represent governments, NGOs, citizen groups and academia, and each is working on the aspect of the problem that it can impact with its expertise and influence. This project, ably led by Dr. Edward Marshall, is among the first to set out to understand how this array of Internet-enabled networks can make a genuine difference. It looks at how citizens are using technology to mobilize scientists, watchdogs, advocates, policy experts and innovators to reduce GHG emissions. Networks like the Urban Climate Change Research Network, the Climate Reality Project, Climate-KIC, C40 Cities, and the National Oceanic and Atmospheric Administration's Digital Coast, for example, have significantly advanced the cause and made climate change an international priority. But as important and noble as these efforts are, they are not enough.



Given the small time window of 35 years to reduce CO₂ emissions by close to 80 percent by 2050, and our unsuccessful track record to date, it is time for a second-generation approach, a new way of thinking and acting to solve this crisis. It is time to launch a Global Climate Governance Network—a network of climate change GSN's. This meta-network will dramatically increase global collaboration among the hundreds of networks around the world, mobilize unprecedented public action, strengthen leadership capabilities and increase awareness of financial resources, best practices, and innovations required to reduce greenhouse gas emissions.

Government, industry, civil society and academia—each has an important role to play and each can make vital contributions to the climate challenge. A global Climate Governance Network is essential to bring greater coherence, shared purpose and dynamism to the world's effort to mobilize action at every level and in every sector of society.

“...the emergence of a digital network connecting the thoughts and feelings of most people in every country of the world... offers the greatest source of hope that the healthy functioning of democratic deliberation and collective decision making can be restored in time to reclaim humanity's capacity to reason together and chart a safe course into the future.”

*The Future:
Six Drivers of Global Change*
Former US Vice President
Al Gore



Introduction

Measurements of CO₂ have been taken at Mauna Loa since 1958, when they were recorded at 315¹ ppm, a significant rise from the early 20th century, when the average was 280 ppm.² Climate scientists tell us we may be approaching a tipping point past which reversing the progression of warming may not be possible. And the leading catastrophic impacts will result in far more severe consequences for the most vulnerable peoples, cities and nations. The United Nations Intergovernmental Panel on Climate Change (IPCC) released April 14, 2014 noted that:

Human influence on the climate system is clear. This is evident from the increasing greenhouse gas concentrations in the atmosphere, positive radiative forcing, observed warming, and understanding of the climate system.³

Eric Rignot, a climate scientist at the University of California at Irvine, in a paper soon to be published by Geophysical Research Letters, looked at 40 years of ground, air surveillance and satellite data and discovered that the huge West Antarctica ice sheets are melting at what he termed an “unstoppable” rate. It is estimated that the loss of the ice will result in 4-12 feet (1.2-3.6 meters) of global sea level rise, which is a bigger increase than the UN expert panel predicted in 2013. It may take 100 years, but the fact that this disintegration is considered irreversible should set off emergency alarms around the world.⁴

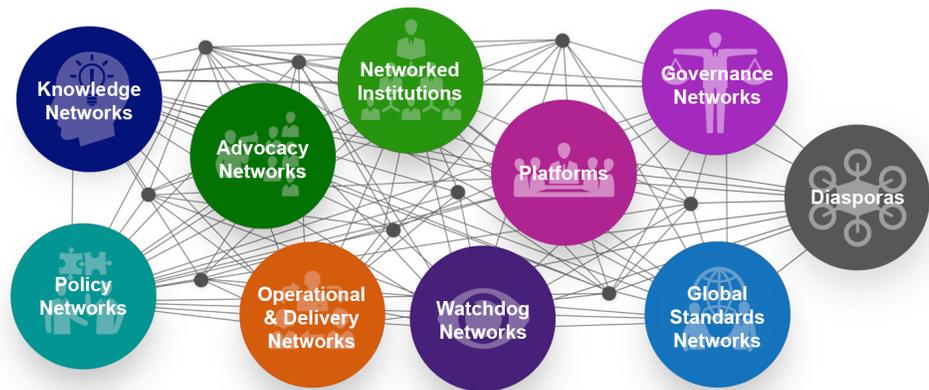
Since the Earth Summit in Rio de Janeiro in 1992, the international community has been gathering periodically in hope of coming to an agreement on a plan of action. The United Nations Framework Convention on Climate Change convenes these meetings, and in 1997 developed the Kyoto Protocol, which became the foundation for global action. In 2001, the United States pulled out of the accord, undermining the progress of the initiative. China, Canada, Australia, and lately India, raised additional concerns about commitments and pledges they were being asked to make. The result is that greenhouse gas emissions have continued to rise, reaching historic levels and accelerating with no end in sight. CO₂ alone is increasing by 2 ppm per year and more.

Ultimately, the failure to act collectively and globally, can be attributed to competing self-interests, nation-states jostling for power and position, powerful economic forces pushing and shoving to get a bigger piece of an ever-shrinking resource pie, and the apparent disregard for honoring agreements and commitments made before the community of nations.

The urgency for meaningful global action is real, and has led to the creation of what can be described as Global Solution Networks that are increasing awareness, sharing knowledge, science and best practices, mobilizing communities and citizens, advocating for policy initiatives, and implementing concrete actions. And they are actively engaged in adaptation and mitigation work.



Don Tapscott has developed a criteria and a taxonomy for these networks. To be considered a GSN, networks must have a diverse set of stakeholders, be focused on a global problem, be utilizing the power of the digital revolution and be self-organized in terms of governance. GSNs are not non-governmental organizations (NGOs), nor are they government entities. They are typically non-profit networks that have emerged from the commitment of their members to address a major global issue.⁵



Ten Types of Global Solution Networks

Five of the ten types of global solution networks play an especially valuable role in addressing climate change:

- **Knowledge Networks:** These are the educators and scientists who are focused on creating awareness, bringing climate science to life, convey new information, and publish
- **Watchdog Networks:** These networks offer new tools that help citizens observe the impact of climate change, enable the development of new insights, and connect the data to generate action.
- **Advocacy Networks:** Mobilizers of communities, these networks create enthusiasm for the work of other networks and organizations, provide training and capability development, and lead campaigns to encourage action.
- **Policy Networks:** These networks are advisors to governments, NGOs and business. They translate community needs to policy makers and public policy to communities.



- **Operational and Delivery Networks:** The innovators and the “doers;” they implement programs and processes on such solutions as carbon capture, supply chain sustainability, investment in carbon-reducing ventures, and they implement climate adaptation and mitigation.

From these climate change networks we have learned that transforming our relationship with fossil fuels is possible. But it will take immediate, concerted and collective action on the part of an expanded and well-resourced governance network for climate change, along with concerted, concrete actions by every nation, international organizations, private corporations, and NGOs. Global solution networks in climate change can mobilize the public will and collective actions of communities around the world, but will need substantial investment in their infrastructure and expansion to do so.

Time for Urgent Action

The science debate is over. Climate change is caused by humans. The IPCC, in their April 2014 report, punctuated that conclusion:

Global atmospheric concentrations of carbon dioxide, methane, and nitrous oxide have increased markedly as a result of human activities since 1750 and now far exceed pre-industrial values determined from ice cores spanning many thousands of years. The global increases...are due primarily to fossil fuel use...⁶

Disastrous Consequences

Increasing average global temperatures at 4°C, according to the IPCC in March 2014, threatens our very way of life. And the World Bank has forecast the possibility of reaching that temperature level by the end of the century, or sooner.⁷ The IPCC articulates a host of consequences that include severe health risks for large urban populations due to inland flooding; death, injury and compromised health in low-lying coastal areas due to storm surges, flooding and sea level rise; systemic risks due to extreme weather events whether they are hurricanes or heat waves, drought or floods; lack of access to food and drinking water; and the breakdown of marine, inland and terrestrial ecosystems.⁸



The World Bank summarized the risks this way:

The 4°C scenarios are devastating: the inundation of coastal cities; increasing risks for food production potentially leading to higher malnutrition rates; many dry regions becoming dryer, wet regions wetter; unprecedented heat waves in many regions, especially in the tropics; substantially exacerbated water scarcity in many regions; increased frequency of high-intensity tropical cyclones; and irreversible loss of biodiversity including coral reef systems.⁹

The bottom line is that everyone, in every part of the planet, will be severely impacted, particularly the most marginalized populations. As the World Bank put it, “The lack of action on climate change not only risks putting prosperity out of reach of millions of people in the developing world; it threatens to roll back decades of sustainable development.”¹⁰

Given these dire predictions, what has the international community been doing about it?

The Efforts and Failures of Traditional Institutions to Reduce Emissions

In 1992, the United Nations Conference on Environment and Development (UNCED) convened the Earth Summit in Rio de Janeiro, a major gathering of 172 governments, 2,400 NGOs and 17,000 individuals. One of the outcomes of this gathering was the creation of the United Nations Framework Convention on Climate Change (UNFCCC) in 1994.¹¹ Article 2 of the Convention’s mandate was as follows:

...the ultimate objective is to stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.¹²

Since its inception, the UNFCCC has offered an international forum for discussions on the reduction of greenhouse gas emissions and solutions for the problems of climate change. After many multinational conferences there is now an international awareness of the critical nature of the climate change challenge, even as greenhouse gas emissions continue to increase.



The UN Framework Convention on Climate Change: The Best of Intentions

Between 1992 and 2014, the UNFCCC convened representatives from around the world in a series of meetings with the aim being the development of collective and global action strategies to reduce greenhouse gas emissions. The Kyoto Accord of 1997 stood out as one of the more hopeful signs that climate change could be effectively addressed at the international level. Those who attended agreed to a 5.2% reduction below 1990 levels in their emissions, and to do so by 2012.¹³ But there were significant players who later left the accord or chose not to participate, taking the power out of the agreement. Subsequent meetings from Montreal and Cancun to Copenhagen, Durban and Warsaw continued to put forth agreements to reduce emissions, monitor emissions, create transparency of actions, offer mitigation strategies, develop technology, build capacity and promote a fund to help developing nations.

Some participants have taken decisive action, while others have not acted at all. Most notably, major contributors to global GHG emissions, China and India, continue to hold out on implementing the targets, and the United States has only recently begun to do so. The 2020 emission reduction pledges from countries attending the Copenhagen convention in 2009 were non-binding. The money to support a number of the initiatives has yet to be allocated. But in spite of some delays, there was a pledge of \$100B US each year for climate financing for developing countries by 2020, and there has been yet another commitment to have new targets by 2015.¹⁴

The Emissions Gap Continues to Widen

It is clear that the UNFCCC was well intentioned, and that it did increase the awareness and raise the priority of the climate change crisis for the world's leaders and targets have been set. Nonetheless, GHG emissions have continued to increase and some national governments have failed to act on the targets.

The United Nations Environment Program (UNEP) defines the emissions gap as “the difference between emission levels in 2020 consistent with meeting climate targets, and levels expected in that year if country pledges and commitments are met.” To achieve the 2°C global warming target by 2050, CO₂ emissions have to be 55% below what they were in 2010.¹⁵ But CO₂ emissions have actually grown by about 40%; we have seen measurements in excess of 400 ppm, global mean temperature has risen by a very high .4°C, and oceans have warmed .28°C.¹⁶ In 2010 developing nations were responsible for 60% of all emissions, the developed world was responsible for only 40%, a reversal of previous trends.



The Prediction

To put it another way, the UNEP, in November of 2013, predicted the following:

As it becomes less and less likely that the emissions gap will be closed by 2020, the world will have to rely on more difficult, costlier and riskier means after 2020 of keeping the global average temperature increase below 2°C. If the emissions gap is not closed, or significantly narrowed, by 2020, the door to many options limiting the temperature increase to 1.5°C at the end of this century will be closed.¹⁷

According to the IPCC, even more likely is a 4°C warmer world in 2100 or sooner, with all of the impacts on people, ecosystems and our way of life.

Why Have Nation-States Failed to Close the Emissions Gap?

Centuries of embedded divisions based on cultural, political, economic, geographic and developmental differences, private greed and national self-interest have all contributed to the failure of nation-states to address the climate change issues. The explanation is anthropological, historical and nation-specific. Not until recent history has there been a sense that the nations of the world are interdependent. Nation-states acted in their own interest, building empires, plying the seas for riches, and fighting wars to protect their resources. The colonial legacy disempowered an entire hemisphere of the world, and left deep scars that remain to this day.

The result is that, in spite of over two decades of the UN meetings on climate change, there is still little progress in bringing powers-that-be to the table to address the crisis. With 195 countries negotiating at the same time, the process is incredibly complex and critically underfunded. Many of the developing nations involved in the discussions feel that they have a right to “catch up” with the development that benefitted the developed world at the expense of the global climate. It is a huge global and historic challenge to develop leadership and accountability for the well being of the entire planet. Attempts to squeeze a one-size-fits-all solution onto a huge array of competing interests has stymied efforts to date.

While successful international negotiations will be essential to continued progress on curbing and even reversing GHG emissions, there is little doubt that international negotiations alone will be insufficient. The urgency to identify and deploy new solutions has opened up an opportunity space for global solution networks to mobilize the knowledge and ingenuity of committed stakeholders around the world.



Former US Vice President Al Gore on Climate Change¹⁸

In his recent book, *The Future: Six Drivers of Global Change*, Nobel Peace Prize winner Al Gore offers a *tour de force* on six global mega trends that are shaping the future. He outlines his prescriptions for tackling a range of urgent global environmental challenges, including climate change.

On one hand, Gore paints a mostly grim picture of environmental degradation as a result of human population growth and rising consumption, in which he tells us not only about global warming caused by fossil fuels, but also about topsoil depletion, fishery depletion and the depletion of critical minerals.

“During the last century alone, we quadrupled the human population,” writes Gore. “By way of perspective, it took 200,000 years for our species to reach the one billion mark, yet we have added that many people in just the first thirteen years of this century.” With unchecked population growth and worldwide industrialization, Gore warns that humankind has embarked on “an unplanned experiment with the planet” in which nothing less than “our world is at stake.”

On the other hand, Gore cites the rise of global networks and enlightened public opinion as sources of inspiration and capability for resolving the climate crisis, though for practical reasons he insists that nation-states will remain essential actors. “Because nation-states retain the exclusive power to negotiate policies and implement them globally,” writes Gore, “the only practical way to reclaim control of our destiny is to seek a global consensus within the community of nations to secure the implementation of policies that protect human values.”

However, Gore is very clear that nation-states alone will not be sufficient. Networks of the willing and committed will be critical to convincing nations to act, he argues, pointing to a long history of social movements that have changed the world:

“The abolition movement, the anti-apartheid movement, the promotion of women’s rights, restrictions on child labor, the anti-whaling movement, the Geneva Conventions against torture, the rapid spread of anticolonialism in the 1960s, the ban on atmospheric nuclear testing and successive waves of the democracy movement—all gained momentum from the sharing of ideas and ideals among groups of committed individuals in multiple countries who pressured their governments to cooperate in the design of laws and treaties that led to broad-based change in much of the world.”

The outcome of the struggle to shape humanity’s future that is now beginning will be determined by which networks prevail in the battle for influence:

In a million theaters of battle, the reform of rules and incentives in markets, political systems, institutions and societies will succeed or fail depending upon how quickly individuals and groups committed to a sustainable future gain sufficient strength, skill and resolve by connecting with one another to express and achieve their hopes and dreams for a better world.

Whether the forces of enlightened public opinion will prevail over clashing values and conflicting interests remains to be seen.



Enter Global Solution Networks for Climate Change

Thanks to the Internet, digital technology and social media, it is possible to engage individuals around the world. Hundreds of climate change networks have sprung up in the last 20 years. They hold the promise of filling the collective action gap. They are involved in research, awareness raising, advocacy for policy action, community organizing, capacity building, and providing network platforms for other networks. On every continent individuals have taken action through the Internet to work together to address different parts of the crisis. But another type of network is needed as well. Don Tapscott argues forcefully for what is called a Governance Network for climate change—a network of networks across the Internet:

We need to mobilize the world, every institution and the human population to reduce carbon. The world has been mobilized before, most recently in World War II—but we were on different sides. We can now create a global network where we're all on the same side.¹⁹

How Networks are Transforming Global Climate Change

Global solution networks build a bridge from awareness to action. They are interdependent, collaborative, engaging, multi-stakeholder based and, when joined together, provide global collaboration and action.

Of the ten types of global solution networks identified, five network types are playing especially valuable roles in addressing climate change.



Network Type	Network Roles	Functions
Knowledge Networks	Educators and Scientists	<ul style="list-style-type: none"> • Create awareness • Bring climate science to life • Convey new information; knowledge-sharing • Blog and publish
Watchdog Networks	Observers	<ul style="list-style-type: none"> • New tools to see climate change impacts • Enable new insights • Provide access to new data available through the Internet • Connect data to need for action
Advocacy Networks	Mobilizers	<ul style="list-style-type: none"> • Mobilize communities • Action campaigns to raise awareness, protest public private sector actions, or to influence policy • Training and capability development
Policy Networks	Policy Advisors and Brokers	<ul style="list-style-type: none"> • Advise government • Advise business • Connect the public and policy makers • Convene strategic dialogues
Operational and Delivery Networks	Innovators, Investors and Implementers	<ul style="list-style-type: none"> • Innovate on carbon capture • Increase supply chain sustainability • Develop climate change technologies • Public sector doers—make things happen

Knowledge Networks: Educators and Scientists Advancing Understanding of Climate Change Risks

The primary function of knowledge networks is to develop and disseminate new thinking, research and ideas that can be applied to global problems. Their emphasis is on the creation of new ideas, not their advocacy. They are the conveyers of both new data and historical data. In the realm of climate change, they build on and interpret the detailed research conducted by the United Nations' Intergovernmental Panel on Climate Change (IPCC), research that has achieved a 97% consensus in the scientific community that climate change is being caused by human activity. There are two climate change knowledge networks that play a critical role in informing policy and actions.



Urban Climate Change Research Network: Using Climate Science to Help Cities Plan for Climate Change Impacts

In 2007, Dr. Cynthia Rosenzweig of NASA Goddard Institute for Space Studies, and colleagues Steven Hammer, now at the World Bank, and Dr. William Solecki, now at Hunter College, realized that there was little hard research being used at in discussions about climate change at major conferences.²⁰ They determined to form a research network that would be designed to bring climate science to cities. With the 70% world's population living in cities, the need to address the particular issues of climate change in urban areas was evident and UCCRN was born.

UCCRN is a consortium of individuals and institutions dedicated to the analysis of climate change mitigation and adaptation in cities. As Somayya Ali, Director of UCCRN said about the origins of UCCRN:

The challenge for UCCRN is that cities do not always recognize the importance of the science of climate change in making their decisions. Our goal is to help cities like New York and Dar es Salaam make climate change decisions based on the data.²¹

It began with only 40 members and, as they attended global climate change conferences, gave papers, and built a website, gradually their membership grew to what is now more than 550 individuals and institutions from cities of all sizes around the world. Members are climate scientists, air quality experts, urban sustainability managers, urban designers and planners and others concerned about the impact of climate change on cities. They are an inclusive network with virtually no restriction on membership.

The mission of UCCRN is to institutionalize a sustained state-of-the-knowledge assessment process of climate change science tailored for urban needs while drawing on the experience of cities as they act to adapt to and mitigate the impacts of climate change and disaster risk. To this end, they created the ARC3, the Assessment Report on Climate Change and Cities, which will soon issue its second report that includes contributions from 100 authors and focuses on 17 critical topics. Other goals include:

- Leading the research and action on urban climate change;
- Developing a shared research agenda on urban climate change issues with stakeholders;
- Facilitating research collaborations within and across cities;
- Enhancing cutting-edge scientific, economic and planning related research.²²

What differentiates UCCRN is that they do all of their scientific modeling—predictions of temperature increases, sea level rise, precipitation data—in-house. For example, when New York City asked UCCRN for an assessment of its exposure to climate-related risks in the wake of Hurricane Sandy, their



model looked at 6 factors including the thermal expansion of the ocean, local ocean height and loss of ice. They were able to determine the optimal height for sea walls that will withstand future hurricanes or extreme weather events. Without the benefit of this modeling, cities like New York would be guessing at what infrastructure modifications would be effective. The UCCRN also helped the cities of Singapore and Rio de Janeiro, as well as cities in Vietnam and China.

The modeling work is housed in the Goddard Institute for Space Science, and has been used by the Intergovernmental Panel on Climate Change in their projections. Focusing primarily on scientists (while other networks focus on international negotiations and national policies), UCCRN is now the largest and most recognized platform that climate scientists can use to connect with each other.

UCCRN is also known by cities as the climate science resource that uses actual scientific data to help develop policy decisions. One of their more recent successes was the signing of an agreement with the Durban Adaptation Charter to be the official climate science knowledge provider for cities who are signatories of the charter. Other partnerships, with the C40 Cities, the United Nations Environment Program, and with the International Council for Local Environmental Initiatives, recognize the importance of their scientific work as a basis for policy.

The impact of the network is increasing through its participation in major global conferences, its research assistance to cities and its growing membership. UCCRN is also forging partnerships with the UN's post-2015 Sustainable Goals project and the London School of Economics Cities' Global Economy project, while regional hubs are being set up in Africa, Paris, Australia and Latin America so that researchers and city officials can work collaboratively.

UCCRN is governed by a Secretariat in New York, with a Steering Committee of 25 members from all over the world, representing a balance between the developing and developed world. This group has input into major decisions, strategic guidance and funding opportunities for the network. The ARC3 report, however, has multiple authors, working groups and an input process that lends to the legitimacy of UCCRN's work.

Equally important is the caliber of experts in the network and their support from the UN, DAC, C40, ICLEI, NASA and other organizations who value their science. As with other networks, transparency, inclusiveness, accessibility and relationships are essential to their legitimacy and accountability.

Like other networks, UCCRN experiences the challenges of making effective use of technology and acquiring adequate funding. Their technical platform is a website, combined with social media connectivity. Members connect through email, and through the creation, with a Danish University and Hunter College, of a portal on their website where members can share case studies and best practices. This new platform will significantly boost the capacity to link climate scientists with each other, with cities and with the public.



The second challenge for UCCRN is having sufficient funding to grow their network and extend their impact. They receive small grants institutions like USAID, the African Development Bank, and the Inter-American Development Bank to support programmatic work, but staff members are employed by other organizations. They also receive in-kind funding to support their conferences. Substantial and sustained funding would ensure their continued success in enabling cities to more accurately predict the impact of climate change on infrastructure, people, and resources, and plan appropriate action.

Other Climate Change Knowledge Networks		
Network	Target Audience	What They Do
Climasphere, United Nations network representing 72 corporate & non-profit organizations & equal number of organizations like the Gates Foundation www.climasphere.org/	General public; an online community	Aggregates up-to-date climate related news and content; hosts expert blogs; shareable infographics and materials for the community
Climate Exchange Network of Africa http://cenafrica.net/ ; a network of researchers, policy makers & practitioners	Vulnerable households across the African continent that are impacted by climate change	Interactive platform that brings cutting-edge science to build capacity, share best practices and strengthen institutions for climate adaptation
Australian Climate Change Education Network www.climatemovement.org.au/groups/ascent/ ; help people make lifestyle changes to curb global warming	General public; younger generations as a focus	Climate change education to reduce energy consumption, fossil fuels

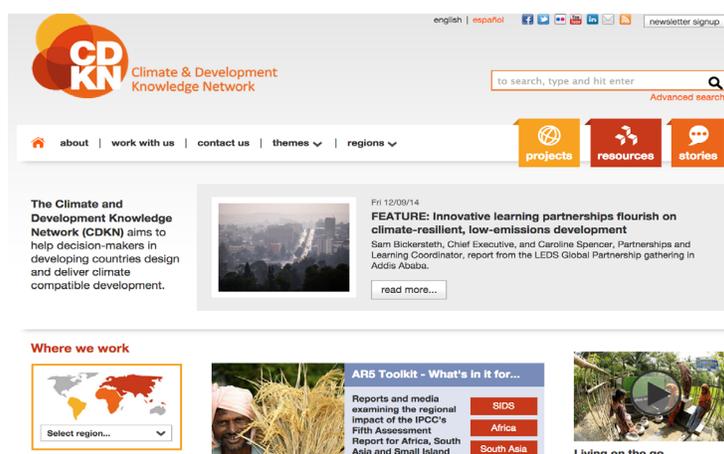
The Climate and Development Knowledge Network: Bringing Climate Change Support to the Poorest and Least Developed Countries

The Climate and Development Knowledge Network (CDKN) is a unique collaboration of government, business and civil society that connects experts in climate change and sustainable development in the developed world with those in the developing world, or Global South, much of which is most vulnerable to changing climate.

CDKN is able to provide support through its alliance organizations and procure the best services from around the world. They strive to deliver the highest quality technical advice, forge uniquely effective partnerships, and drive the latest and best thinking on climate compatible development. Within the broad scope of climate compatible development, they work across four strategic themes:



1. Climate compatible development strategies and plans
2. Improving access to climate finance in developing countries
3. Strengthening resilience through climate-related disaster risk management
4. Supporting climate negotiators representing the least developed and most vulnerable countries.



CDKN is highly dependent on technology, using the web to publish policy briefs, case studies, distribute film and multimedia presentations, as arrange remote consultations on sustainable development. One of its programs, for example, provides knowledge and technical support for negotiators participating in international climate change meetings (such as the Africa Group of Negotiators and Coalition of Rainforest Nations), as well as a forum for collaboration for some of the most vulnerable areas and countries in the world,

A Perspective on Climate Change Knowledge Networks

The first step in any change as fundamental as a significant reduction in greenhouse gas emissions is knowledge. Whether they work for the United Nations, Goddard Institute of Space Science or the National Oceanic and Atmospheric Administration, climate scientists have methodically documented the essential facts needed to inspire immediate global action to reduce greenhouse gases in the atmosphere. Internet-based networks are instrumental in expanding the reach for understanding and awareness among peoples around the globe.

The greatest successes of this first generation of knowledge networks have been the ability to engage targeted audiences, like city leadership or international negotiators, and to provide specific science and information to



make informed choices or to negotiate new policies and standards. Basing public policy on actual climate science data has had a significant impact.

Another emerging trend is linkage and collaboration with unrelated stakeholders. For example, UCCRN reached out to local government officials with their climate science data. Over time, they forged collaborative relationships with C40 Cities, the Durban Adaptation Charter and others.

Such efforts are promising, but it is time for knowledge networks to do substantially more by expanding their connectivity to the full spectrum of stakeholders who need data, models, and analysis to educate, inform public policy and mobilize citizen action.

Knowledge networks are largely transparent and credible given that their work is based in hard data. But their impact is severely limited, in some cases, by a lack of funding and access to technology platforms that could significantly increase their ability to innovate and influence the decisions of key stakeholders. It is time for the funding community to pool its resources to support knowledge networks at a level that will broaden audiences, deepen integration into decision-making systems and generally get to the next level of scale and impact.

Watch Dog Networks: Visualizers Transforming Our Understanding of Climate Change Impacts

The role of watchdog networks is scrutiny—monitoring deforestation and sea level changes, and tracking GHG emissions by corporations, communities and nations. The observation of these impacts can result in public action. It can inform policy decisions and private actions. Through the Internet, these observation tools are accessible to all, and provide a window on global warming and how it may affect the world. Data-enhanced imagery, provides powerful insights.

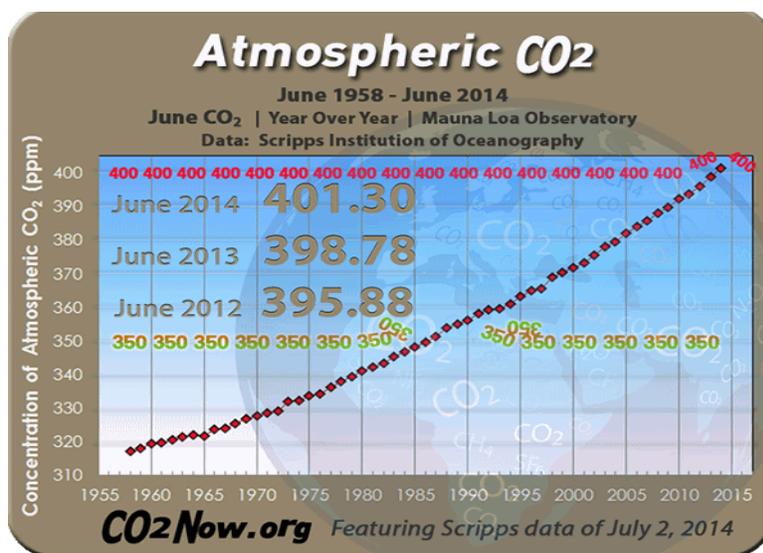
Documenting the Carbon Bubble

Understanding how much carbon exists in the world today, who owns it, and who is using it is critical information for climate change advocates and policy makers. A number of networks have developed important tools to collect, analyze and visualize data related to what is called “unburnable carbon” and document the release of greenhouse gases for the purpose of developing new policies. Unburnable carbon is the amount of carbon (coal, oil, gas) that must be left in the ground if we are to return to 350 ppm of CO₂ emissions.

Monthly CO₂ emissions data is published by CO2Now.org, a watchdog website that distributes data to the world through the Internet. The Scripps Institute of Oceanography began precision monitoring of CO₂



levels at the Mauna Loa Observatory in 1958. The following chart shows that the world's CO₂ emissions continues to climb, even at increasing rates. The rate of emissions is speeding up, not slowing down.



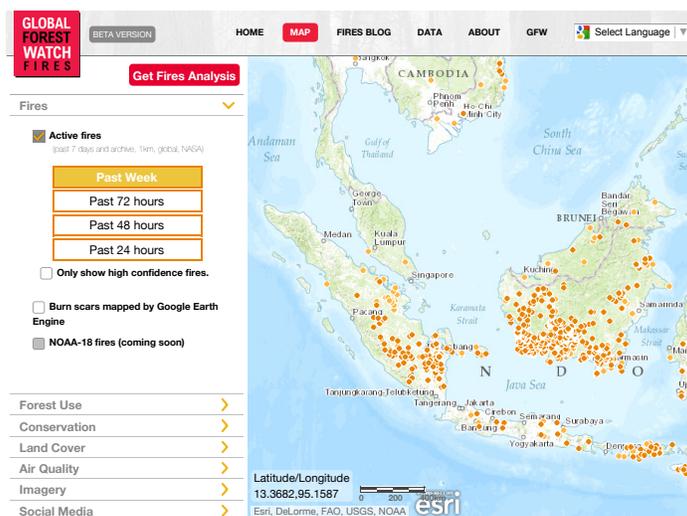
Carbontracker.org is a project of Investor Watch, a non-profit company established in 2009 to align capital markets with efforts to tackle climate change. To do this requires knowing where the carbon is. This network developed an innovative, interactive tool that lets the public know how much carbon is “unburnable,” whether it is oil, gas or coal, and which companies own it. Carbontracker alerts people to the fact that, although energy corporations control more unburnable carbon than the world can absorb in 100 years, they are exploring for more deposits.

Another way to track carbon is by having local governments monitor and document it. The Carbon Cities Climate Registry was launched in 2010 at the World Mayors Summit on Climate in Mexico City, as a way to help local governments measure and report the use of greenhouse gases, emissions inventories and the results of climate mitigation/adaptation actions. This registry is the leading global reporting platform for local climate actions. Cities can sign up with the registry and are able to report their energy and climate commitments, as well as their emissions and the results of their climate mitigation or adaptation efforts. The results are published in Annual Reports of CCCR, and have been used at UN climate conferences in Durban, Doha and Warsaw. These publications accomplish increased transparency and accountability and ensure the credibility of local climate actions. The Carbon Tracker report, “Unburnable Carbon” points out that, “Using just the reserves listed on the world’s stock markets in the next 40 years would be enough to take us beyond 2°C of global warming.”²³



Monitoring Global Deforestation

The second largest source of carbon emissions after the burning of fossil fuels is deforestation due to forest fires, clearing of forests for commercial use, or disease. One of the more innovative deforestation tracking tools was developed when Google teamed up with Global Forest Watch and used Google Earth's mapping capability to identify exactly where deforestation is happening in real time. The user can zoom in on any place in the world and see how much deforestation has occurred. (See Global Solution Networks case study on Global Forest Watch.)



University of Maryland's Earth Engine Partners offers similar mapping technology and provides historical perspective covering the years 2000 to 2012 at the global, regional and local levels. The same zoom-in capabilities allow the user to pinpoint the status of forests in a particular location.

Google technology that provides the deforestation maps and has gone one step further in 2014 with the donation of 50 million hours of free cloud computing time for the US government. This technology capacity will assist the Climate Data Initiative to help organizations and communities access public data in order to look at climate conditions in their areas. The Google Earth engine is the technological platform for this innovation, which brings together the world's satellite imagery with tools to help detect climate changes.

Predicting Sea Level Rise

The Intergovernmental Panel on Climate Change is predicting significant sea level rise in the next few decades as the effects of climate change warm the oceans and melt glacial and sea ice. Some locations, like Miami, Florida, are already experiencing the challenges that come with rising oceans.

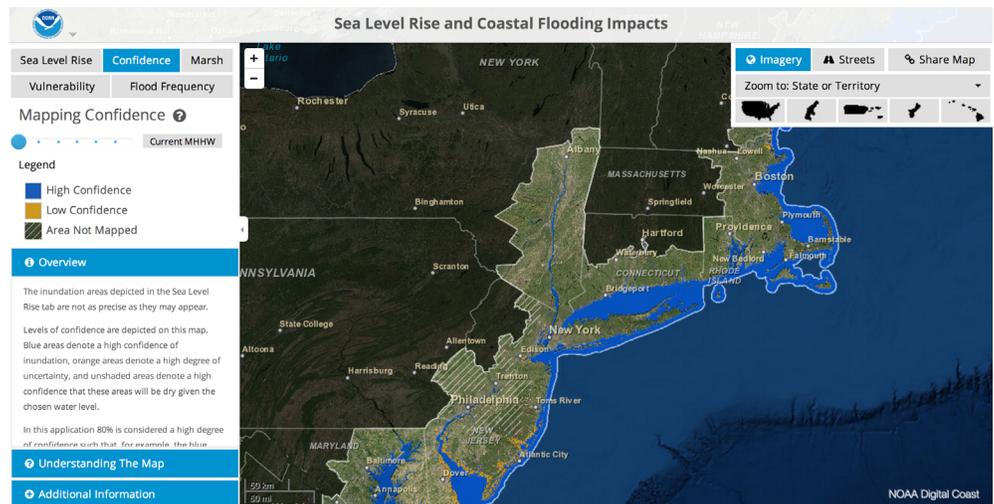
In 2007, the National Oceanic and Atmospheric Administration in the United States created the Digital Coast Partnership (DCP) for the purpose



of meeting the demand for information on sea level rise and flooding and the related impacts on communities, property, marine life and the coastal ecosystem. DCP started with 8 partners that included the American Planning Association, Urban Land Institute, Nature Conservancy, Coastal States Organization, the National Estuary Research Association, the National States Geographic Council, the Association of State Flood Plain Managers and the National Association of Counties. There are also contributing members, including universities, with over 100,000 diverse stakeholders represented.²⁴

The geospatial development was completed by ESRI, a leading geospatial information provider in Redland, California. This capability is available to anyone with access to the Internet. It provides data on the US only, but is considered a best practice, and could be replicated by others.

This visualization tool provides a way of assessing any jurisdiction's vulnerability to sea level rise and flooding.



The NOAA visualization tool provides these key features:

- Displays potential future sea levels
- Provides simulations of sea level rise at local landmarks
- Communicates the spatial uncertainty of mapped sea levels
- Models potential marsh migration due to sea level rise
- Overlays social and economic data onto potential sea level rise
- Examines how tidal flooding will become more frequent with sea level rise



Examples of Investor Network on Climate Risk (INCR) Impact

- **Curbing Deforestation:** Dunkin Donuts and Starbucks joined a dozen other consumer giants in agreeing to source 100% certified sustainable palm oil for their food products; this will slow rampant destruction of carbon-storing forests in Indonesia and Malaysia.
- **Protecting California's Climate Law:** Dozens of INCR members push successfully to defeat Proposition 23, a 2010 referendum that would have overturned the state's landmark greenhouse gas reduction law.
- **Spurring Record Clean Investment:** At the 2012 Investor Summit, Bloomberg New Energy Finance announced that global clean energy investment hit a record \$260 billion in 2011, a 500% increase from the \$52 billion in 2004.

Source: Celebrating 10 Years of Investor Success, INCR, 2014

As Nicholas Schmidt, the leader of Digital Coast said:

This technology needs proactively to be made available to all governments around the world. But it's a cultural issue, not a technological one. There are institutional and political barriers to the use of this innovation. Making this information widely available will strengthen the ability of politicians, government officials, and the public to collaborate.

Preparation for sea level rise is critical for coastal communities. The Digital Coast technology provides the data and perspective decision-makers need to plan effectively and adapt.

A Perspective on Climate Change Watchdog Networks

By their very nature, watchdog networks, bring a new level of transparency and accountability to the public conversation on how to reduce greenhouse gas emissions and the impacts of climate change on communities and countries. But each network is successful primarily in its own sphere of influence. Watchdog networks have developed innovative tools, accessed new technologies like Google Earth, created an online presence, engaged multiple stakeholders, and developed ways for the public to visualize the impact of climate change in real time. However, they largely operate in silos by function, which limits their impact. In addition, while their data is available to the public, the relationship between these networks and the public is largely passive.

Advocacy Networks: Mobilizing Communities to Act on Climate Change

Advocacy networks seek to change the priorities and policies of governments, corporations or other institutions. In the climate change arena, this means global networks that are actively engaged in bringing the reality of climate science to bear on the public policies of governments at all levels, as well as actions taken by the private sector that are sustaining a high carbon economy.

350.org: Mobilizing a Global Movement

Bill McKibbin and the 350.org team are mobilizing a world climate change movement using distributed, grassroots organizing to run adaptive, locally-driven campaigns in every corner of the globe. They believe that the climate crisis is about power and that the only way there will be meaningful action on climate change is to counter the power of the fossil fuel industry with the power of people taking collective action. They use online tools to facilitate their activities.





According to McKibbin, 350.org:

...has mobilized 20,000 demonstrations in 191 countries to urge shareholder divestment in fossil fuel companies. We see an emerging fossil fuel resistance, like the movement against the Keystone XL Pipeline. We see our role as pushing Governments from the outside.²⁵

When asked what he felt the world needed to do to reduce carbon emissions, he response was, “Go fast!”

The Climate Reality Project: Mobilizing the Globe for Action

This global network of activists is focused on creating a global culture shift, a movement that demands action on climate change. Members of the Climate Reality Project see this shift as a social revolution. Begun by Nobel Laureate, and former US Vice President Al Gore, this movement is directed at getting people to take the climate crisis seriously, to see its urgency, and to act.

As CEO Ken Berlin put it,

We've got a problem and we've got to work together. To this end, we're helping to develop climate leadership capability in 100 countries, and with 8 countries to implement campaigns for binding reduction of carbon dioxide.²⁶

To this end, Climate Reality sees itself as a media factory, using cutting edge communications and technology to build a global network of 5 million connected people. They are constantly innovating around how to use the Internet more effectively. They follow a number of thought leaders in the behavioral sciences to determine how best to communicate Internet-based messaging. As a result, Climate Reality is looking at as many platforms as possible.



Through their internet-based campaigns, social networks and personal networks, Climate Reality helped amplify the Keystone XL pipeline protests of other groups, and elevate it on the public agenda. As Hayley Moller, Project Director at Climate Reality said,

The result of this collaboration is that it is impossible to go to any policy discussion on energy in Washington, DC without the Keystone XL pipeline being raised.²⁷

In addition to Internet mobilization efforts, Climate Reality is building local community action capability for climate change organizing. The Climate Reality Leadership Corps now has 7,000 trained community leaders from all over the world. In March 2014 alone, over 700 community and business leaders completed the 3 days of training in Johannesburg, South Africa. Over 1,000 have signed up for a future training in Australia. Brazil is next.

From a global solution networks perspective, perhaps one of the most interesting internet-based innovations in climate change is Climate Reality's 24 Hours of Reality that will have its fourth year of implementation on September 16-17, 2014, just prior to the UN Climate Summit in New York. Governments are the ultimate audience of this global mobilization effort, but people from every part of the world collaborate to address a critical issue—this year it is Climate Change Solutions. Operating exclusively on a network platform, one way they measure the impact of an innovation like this is the number of views. In 2011 there were 8.6 million views; 2012 had 16.8 million views and 65.9 million Tweets; 2013 had 20 million views, and even more are anticipated in September 2014.

Climate Reality has other metrics to measure their impact. For example, on May 9, 2014, over 80,000 signatures were submitted to the EPA in support of its new regulations on CO₂ emissions from coal-fired power plants. Impact is measured by engagement on the website: how many viewers, how many pages opened, how long visitors stay on the website, the number signing petitions and return viewers. The number of people trained is also a key measure. Advocacy groups view measurable impact as the Holy Grail. It is very hard to show cause and effect given the number of groups that are engaged in climate change advocacy.

Unlike many other advocacy groups that were surveyed, Climate Reality is eager to expand its Internet footprint. With more resources, they would like to have the same capability as Amazon—to segment their audiences, do message testing and focus groups and tailor their focus to each segment. Like other advocacy groups, more funding is a need, as is the need to keep down transaction costs when dealing with networks and to increase speed.

Ceres: Mobilizing Business Leaders for Sustainability

After 25 years, Ceres now works with over 130 civil society organizations and advocates and 80 corporations, and investors worldwide to improve corporate strategies and public policies on climate change and increase sustainability for company supply chains. Lance Pierce, Executive



Director of Ceres, said that this coalition was formed in 1989:

This coalition was formed in 1989 response to the Exxon Valdez oil spill. Some industry members recognized there was an environmental cost of doing business and a need for increased accountability. Six months after the spill, a group of investors launched Ceres, a nonprofit organization, to tackle this problem.²⁸

The vision was to promote a world in which business and capital markets promote the well-being of society and protect the earth's environment.

By 2001, Ceres' members took on the challenge of climate change after President George W. Bush withdrew US participation in the 1997 Kyoto Protocol. Recognizing that climate change leadership would have to come from some place other than the government, they decided to mobilize large investors to take action, and in 2002 published a white paper called "Value at Risk," showing the linkage between climate change impacts and investment risks.

In 2003, Ceres launched the Investor Network on Climate Risk (INCR). Membership then began to seek full disclosure of their climate risks, including carbon-reducing regulations on its coal-fired power plants. By 2009, the Securities and Exchange Commission had made "climate risk disclosure" a mandatory requirement for publicly traded companies. In 2012, Ceres brought 450 financial leaders together at the United Nations for a summit on climate risk and energy solutions that produced an investor action plan calling for greater private investment in low carbon technologies and tougher scrutiny of climate risks across investment portfolios.

By 2013, frustrated by a US Congress that was still in a stalemate on climate change, 33 founding companies issued a Climate Declaration, which asserted that "tackling climate change is one of the greatest economic opportunities of the 21st century" and urged federal policymakers to take action. Signed by all the founding companies at its release, the Climate Declaration today has more than 750 signatories. In June of 2013 President Obama mentioned the Climate Declaration in his speech on climate change as proof that the business community supports legislative action. Al Gore acknowledged that the Declaration has helped change the conversation in Washington.²⁹

In January 2014, Ceres released "Investing in the Clean Trillion," a report with 10 recommendations for limiting global warming to 2°C and avoiding the worst effects of climate change. This report concluded that the world must invest an additional \$36 trillion in clean energy to meet the 2°C goal. Clean energy investment is currently at about \$250 billion a year.³⁰ To close the investment gap, Clean Trillion makes recommendations in 3 areas that are expected to produce results in the years to come:



- Mobilize action to scale up clean energy investment;
- Promote green banking and debt capital markets;
- Reform climate, energy and financial policies.

Boosting capital allocations to clean energy is essential to meeting the Clean Trillion goal of doubling annual global clean energy investment by 2020 and hitting \$1 trillion per year by 2030. Elevating these levels, however, requires that key institutional investor considerations be met.

A Perspective on Advocacy Networks

Climate change advocacy networks have difficulty inspiring change, in large part because they are significantly underfunded compared with the large fossil fuel companies which invest millions of dollars each year in political campaigns, lobbying, opposition research and think tanks supporting their positions.

Most global climate change advocacy networks, by comparison, have started small. A key part of their growth is the ability to engage a larger and larger population in the cause. Success in advocacy networks seems to depend on:

- A central focus a high value public concern that attracts participation;
- Leadership with the passion, patience, and resilience to stay the course;
- A clear “enemy”, like the fossil fuel industry, to mobilize public opinion and action;
- A high visibility leader like Al Gore;
- A broad, multi-stakeholder coalition of leaders in business, academia or the non-profit sector who will bring the credibility and prestige of their organizations to bear on the cause of the network;
- A specific, easily understood target, like 350 ppm, that has meaning and relevance to a large number of people, or picking specific projects where measurable results can be achieved, like 24 Hours of Reality, and then producing and communicating them.

Above all, the expansion of the audience and participants comes from having a robust web presence that provides information, access, events, reports and other useful data to the public. All social media platforms need to be utilized, and leveraging the Internet for greater access will build the coalition. Related to this is having a targeted marketing strategy that, through data mining, can identify specific groups and/or geographies where people will have an affinity for the issue being advocated. Finally, if advocacy networks could think “out of the box,” and collaborate with other climate change networks, they could all gain access to a larger audience for their specific causes.



Policy Networks: Organizing to Get Commitments to Reduce CO₂ Emissions

Climate change policy networks play a number of roles, ranging from advising governments and being a broker between governments and NGOs, businesses and civil society organizations. They also support policy development, push for alternative policies, and convene their members to focus on critical policy choices. In other instances, they build local capacity to address the climate crisis. With the approaching 2020 deadline to achieve carbon reduction targets even as CO₂ emissions are still increasing, global climate change policy networks must push harder for concrete legislation and governmental action.

Responding to the Climate Change Crisis

Formed in 1989, the Climate Action Network (CAN) is a worldwide network of over 850 NGOs in more than 100 countries, working to promote government and individual action to limit human-induced climate change to ecologically sustainable levels. CAN members achieve this goal through information exchange and the coordinated development of NGO strategies on international, regional and national climate issues. While not a true multi-stakeholder network in its own right, CAN serves as an interface between NGOs and the public and private sectors and thereby constitutes an important hub in global climate change policy debates.

The CAN vision is:

A world striving actively towards and achieving the protection of the global climate in a manner which promotes equity and social justice between peoples, sustainable development of all communities, and protection of the global environment.³¹

To implement this vision, CAN supports and empowers civil society organizations to influence the design and development of an effective global strategy for reducing greenhouse gas emissions. Regional networks are involved in international climate negotiations, where they raise awareness and advocate for policy change. They also work to hold global, regional, state-based organizations and the private sector accountable for their commitments to reduce their contributions to activities that create climate change.

CAN's Charter provides a clear governance system based on a set of values, with a representative structure where members in General Assemblies come to "sufficient consensus" on issues and resolutions they are debating. There is a commitment to transparency, accountability and democracy that provides legitimacy as a platform of networks committed to influencing policies and actions in member states.³²



Some Climate Action Networks Around the World			
Name and Website	Geographic Region	Scope of the Network	What The Network Does
Regional Environment Center www.rec.org	Central & Eastern Europe	17 countries	Broker relationships between governmental organizations, businesses, and civil society to impact national policies; evaluate data; methodology guides for decision-makers; facilitate policy implementation
Australian Climate Movement www.climatemovement.org.au/	Australia	134 climate action groups across the country	A platform for groups to connect, access resources, share successes, collaborate to improve the movement; resource directory on climate science; campaigns; blog site; calendar of events
Climate Action Network of South Asia www.cansouthasia.net	South Asia	112 NGOs from 7 countries	Influence the design and development of strategies for greenhouse gas reduction; work with local, regional and international organizations, government agencies and universities
Southeast Asian Network on Climate Change www.sean-cc.org	Southeast Asia	10 countries	Strengthen coordination of climate change policies at national and regional levels; focus on energy efficiency, renewables; integrating with Asia-Pacific Adaptation Network
China Civil Climate Action Network www.climatenetwork.org/profile/member/china-civil-action-network-can-china	China	Network of NGOs	Strengthen the knowledge base and capacity of stakeholders to work on climate science, policy and public engagement
U.S. Climate Action Network www.usclimatenetwork.org	United States	122 NGOs, business networks, universities, civil society organizations	Broker role, convening dialogues; a hub for strategy, information exchange, engagement; issue campaigns; created Southeast Climate and Energy Network

Climate Action Network-Europe: Influencing Climate Change Policy

One of the oldest climate change policy networks in Europe is CAN-Europe, representing 125 NGOs in 25 European nations. Started in 1989, CAN-Europe grew out of the climate change discussions at that time, well before the UN Rio Earth Summit in 1992. It aligns with the vision of CAN International, and has a primary regional mission to support and empower civil society organizations so that they can influence the development of strategies to reduce greenhouse emissions and promote equity and sustainable development.



Carbon Capture and Storage Association (CCSA): Working to Reduce CO₂ Emissions by 19%

<http://www.ccsassociation.org/>

Based in London, CCSA is a growing partnership of 55 oil, gas, power plant, academic, financial, consulting firms and construction companies that is leading the charge on carbon capture technology. Begun in 2006, CCSA's overriding goal is to reduce CO₂ emissions by 19% by moving the UK toward a low carbon economy. CCSA is a policy adviser on regulatory issues and incentives for carbon capture (CCS), informs the public on the benefits of CCS, provides a forum for information exchange on energy conservation and CCS, and encourages the development of carbon capture and storage both in the UK and internationally.

Judith Shapiro of CCSA said: "Our most notable successes have been getting carbon capture and storage on the European policy agenda, in 2011, after 6 years of pushing, getting CCS into the Kyoto Protocol as an amendment, and creating 300 years of storage capability 2 KM underwater."³⁷ It has also shown that without CCS there would be a 138% increase in the cost of meeting the goal of 450 ppm.

CAN-Europe works closely with, and is partially funded by, the European Union Commission. It keeps the pressure on the EU and member nations to adopt policies and honor commitments to reduce greenhouse gas emissions. It is a broker between the EU Commission and the national members in its network, and plays an intermediary role in policy circles representing the positions of member states, and works to ensure specific regulations are in place on emission standards that will achieve the 2030 climate change targets. It also monitors EU and nation state actions, and mobilizes climate actions to hold them accountable.

Other more notable successes, according to Wendel Trio, the Executive Director, are:

...the adoption of an energy efficiency directive by the European Union, which CAN-Europe had promoted. They were able to make the goals of that directive more ambitious than the EU members states wanted. A second success was the EU's adoption of the second CO₂ reduction commitment of the Kyoto Protocol as the result of CAN-Europe members pressuring them.³³

CAN-Europe is led by an eight-member board representing country organizations as well as leading NGOs like Oxfam and the World Wildlife Fund. Two General Assemblies provide legitimacy, accountability and transparency. They have also signed a transparency pledge with the EU Commission. Decisions in the Assemblies are made by sufficient consensus, and conflicts are resolved through dialogue and compromise. Throughout the year, there are working groups on specific climate subjects, providing members a way to influence the direction of CAN-Europe, and a way to communicate and provide feedback.

Like many other global climate change networks, CAN-Europe is challenged by how best to use the Internet to expand its impact, measure its success and promote fund-raising. But its greatest challenge is one beyond their scope of influence—reluctance of EU leaders to take a stand for drastic greenhouse gas reductions. Trio said that their culture is "Everybody jumps, or nobody jumps."³⁴ Right now, nobody is jumping.

A Perspective on Policy Networks

Top-down, government-centric approaches to policy development are ill suited for complex challenges like climate change that require diverse inputs and actions from a multitude of actors and sectors. The most appropriate vehicles for policy creation are multi-stakeholder policy networks that use digital platforms to enable citizens, industry and civil society to participate in policy development and implementation. In the research on global climate change policy networks, there are at least four factors for impact and success:



- Strong, focused and deliberate leadership at the board and executive level is essential;
- Clear vision and mission that captures the attention and commitment of members;
- Sufficient credibility with governmental leadership making it more likely to achieve legislative and regulatory impact;
- Broad constituent base so that policy-makers see a reason to listen to and act on proposals.

Climate-focused policy networks exist on every continent and represent thousands of NGOs, and potentially millions of people. As international policy negotiations continue, there is an opportunity to leverage the capability of emerging policy networks to gather recommendations for specific actions, learn from their successes, and disseminate lessons learned to all countries. Moreover, their connection to local communities could strengthen the legitimacy and inclusiveness of international proceedings by providing a channel for genuine citizen engagement.

As policy networks look to increase their scope and impact, they should seek out opportunities to coalesce, affiliate, and coordinate, not only with other policy networks, but with knowledge, watchdog and advocacy networks. United and aligned, each will each then have more clout and impact in international policy negotiations.

Operational and Delivery Networks: Acting to Reduce GHG Emissions and Mitigate Climate Change Impacts

Industrial and technological innovation are necessary, and potentially quite powerful, tools for reducing GHG emissions. So too is the mobilization of the private sector resources to finance an increased scale of action. After all, advocacy networks and knowledge networks can raise awareness and establish a case for action. Policy networks can create a legal and regulatory framework that promotes and even requires action. But only operational and delivery networks can actually invent and deliver the changes that stakeholders seek. Consisting of innovators, investors and urban policy implementers, these networks are focused on collective action to reduce CO₂ and other greenhouse gas emissions.

Industrial Innovation: The Emerging Carbon Capture Technology

The Intergovernmental Panel on Climate Change has reported that global carbon dioxide emissions must be reduced by 50-85% by 2050. To achieve this will require the application of all available low-carbon technologies at a scale and rate far greater than current efforts. We know that renewables,



nuclear power and improvements in energy efficiency will play an increasing role in moving the world toward a low carbon economy, but more is needed.

The International Energy Agency estimates that energy demand could increase by as much as 45% by 2030. Much of this will be fulfilled by fossil fuels—in the developing world, approximately two new coal-fired power stations are opened every week. Carbon capture and storage (CCS) is an emerging technology that will de-carbonize energy, generating low carbon power to help meet increasing energy demand. CCS could reduce global carbon dioxide emissions by 19% and reduce the cost of fighting climate change by 70%. In effect, CCS is a bridge technology that, when combined with renewable energy sources and energy conservation, can help the world reduce emissions while moving to a cleaner energy solution.³⁵

One exciting possibility is that CCS, combined with burning biomass for energy, could actually result in negative carbon dioxide emissions. As plants grow, they absorb carbon dioxide from the atmosphere. If they are then burned and the released carbon dioxide captured and stored, there is a net reduction in carbon dioxide in the atmosphere.

On April 17th, 2014, the European Commission gave the green light for a 300M Euro grant to the White Rose carbon capture and storage project in the United Kingdom. According to the BBC, the carbon gas will be siphoned off from a new coal-fired power station and will be piped into and stored in undersea rock formations. Carbon capture technology is new, but it is considered to have great potential in the effort to reduce carbon emissions. This project will involve the construction of a new coal-powered plant next to the existing Drax facility in Selby, Yorkshire. When it is up and running, it will provide power to 630,000 families and capture 90% of its CO₂ emissions, 2 million tons per year.³⁶

Other Carbon Reducing Networks:

Network	What It Does
Carbon Cities Climate Registry http://citiesclimateregistry.org/	Tracks the reduction of CO ₂ emissions by cities; Tokyo has shown a 22% reduction in CO ₂ emissions after the 3rd year of a cap and trade program; national and local stakeholders working together
The Forest Carbon Partnership https://www.forestcarbonpartnership.org/	The Forest Carbon Partnership is a global partnership of governments, businesses, civil society, and Indigenous Peoples focused on reducing emissions from deforestation and forest degradation. It assists developing countries in their efforts to reduce emissions from deforestation and forest degradation and foster conservation, sustainable management of forests, and enhancement of forest carbon stocks.

Climate-KIC: Knowledge and Innovation Community: Mobilizing the Private Sector Through Innovation

Based in London, the European private sector has a world-class network focused on climate change. Climate-KIC is a Swedish-sponsored network of



13 nations in the UK and Europe that was started by the European Institute of Technology. (<http://www.climate-kic.org/>) There are 27 partners including universities, research centers and corporations. For its business stakeholders, it convenes the most influential and commercially minded players in the climate change space and helps link demand-side players with supply-side innovators to accelerate innovation and implementation. It brings business, academic and public partners together to collaborate on innovation projects that identify, develop and bring to market climate change adaptation and mitigation technologies. It provide funding, coaching and training.

In the innovation space, Climate-KIC creates new products, services and jobs that have a global impact on climate change. It recruits entrepreneurs to become change agents, and work with students to become climate change entrepreneurs. It also works with start-up companies and cities on climate change innovations.

Climate-KIC is focused on bringing ideas to market in 8 areas: greenhouse gas monitoring, adaptation services, transition implementation, sustainable city systems, the built environment, land and water, industrial symbiosis, and developing a bio-economy. With its partners, KIC co-invests in projects to take product and service innovations to market through an existing business, a new joint venture, or a spin-off company through one of its academic partners. KIC provides commercial market opportunities for climate change innovations that contribute to the fight against climate change.

Re-using CO₂ emissions as an industrial feedstock has potential for widespread application and could be a powerful tool for climate change mitigation. A benchmarking assessment of established and potential CO₂ reuse areas will support innovation in this sector. With 34.5 billion tons of carbon dioxide emitted over 2012, CO₂ is one of the major contributors to anthropogenic climate change. Although carbon capture and storage (CCS) is already high on climate change mitigation agendas, unfortunately less is being said about the utilization of captured carbon or CO₂ from other industrial sources (CDU). The primary advantage of CDU over only CCS is the ability to produce a saleable product, thereby using CO₂ as an industrial feedstock for fuels, chemicals and materials. In this way, it has the potential to offset the cost of development of CO₂ capture technologies, whereas CCS alone requires the application of strict penalties or economic support for uptake by industry. CDU might be considered as an added value as a part of the CCS value chain. Furthermore, the use of CO₂ apart from CCS has the additional benefit of displacing some of the need for conventional oil and gas feedstocks, a key driver for chemical companies.

These are two of many examples of the innovations that public and private sector and academic partners across Europe are investing in. The site has case studies of results that have been achieved in each of the 8 areas of focus. One of the most important elements of their success is the high degree of collaboration among multiple partners. As CEO Mary Ritter said on April 4, 2014 (<http://www.climate-kic.org/>):



Collaboration between entrepreneurs and academics within European countries, regions and cities, across the Atlantic and throughout the world can beat climate change as we find and bring to market new solutions to adapt to and stop further climate change.

Tracking Our Carbon Footprint

It is critical that there be tracking tools for individuals, households, and corporations. The following table provides what could be called first generation CO₂ tracking methods at each level:

CO ₂ Tracking Level	Organization & Tracking Tool	Website
Individual and Household	Nature Conservancy: carbon footprint calculator that provides the number of tons of CO ₂ used in a year based on a short form that asks questions about energy use, driving and flying, food and diet, and recycling	http://www.nature.org/greenliving/carboncalculator
Organizations, Supply Chains, and Products	Carbon Trust: tracks the carbon footprint of organizations, value/supply chains, and products; they help reduce these footprints through efficiency measures; produce assessments and certifications; have helped these organizations reduce carbon emissions by 53.5 million tons; 28,000 certifiable product carbon footprints; Footprint Expert software used in 17 countries	www.carbontrust.com/client-services/footprinting/footprint-measurement/ ; footprinting guide is at: www.carbontrust.com/media/44869/j7912_ctv043_carbon_footprinting_aw_interactive.pdf
Corporations	Climate Corps, Environmental Defense Fund: EDF provides funds for students to work with individual companies, like Home Depot and Caesars in Las Vegas, to reduce their carbon footprint through energy efficiencies; assessments, innovative strategies, and implementations	http://edfclimatecorps.org/

A Perspective on Operational and Delivery Networks

The climate crisis will not be effectively addressed unless climate science and policies are turned into tangible, concrete results. With only a handful of governments providing sufficient incentives to spur private sector investment in carbon reduction, it increasingly falls to GSNs to set targets for the use of renewable energy, and encourage programs to gradually increase the percentage of total energy supply that comes from renewables.

Carbon capture and storage (CCS), along with carbon dioxide utilization (CDU) are just two of many essential technologies that need to be dramatically expanded around the world. Governments can be encouraged through advocacy to provide tax incentives and disincentives to spur the power industry into using carbon capture and storage technology. And greater, and more structured collaboration between the public, private, NGO and academic sectors could increase investment and greatly



accelerated development of these and other technologies. The use of Internet-based networks and social decision-making tools brings these stakeholders together.

The bottom line is that substantial investment in proven, successful innovation is needed—in the range of at least billions of dollars. Right now, innovations such as carbon capture and storage are largely located in the developed world. Expansion to the developing world could provide immediate results. Global networks are a way to extend the availability of these technologies to the less developed and most vulnerable countries in Africa, South Asia, Asia and Latin America.

In Closing

All of the global solution networks in climate change reviewed have one thing in common: the goal of survival of the planet. These networks have sprung up all over the world as citizens have become aware of the increasing risk posed by climate change and the inability of international and national governments to reduce emissions. These networks have engaged multiple stakeholders and have tended to operate within what have become silos of independent action. There is virtually no coordination, affiliation or collaboration between these networks, meaning they are competing for scarce resources and failing to leverage their collective power to achieve the goal.

While many of these networks have had significant achievements on their own, leadership by the United Nations Framework Convention on Climate Change, has contributed to their collective success in the elevation of climate change to the top of the international policy agenda.

Their breadth of activities—including research, monitoring, collective community action, advising heads of state, innovating new technologies, leveraging financial investment, innovating new approaches to CO₂ reduction and implementing concrete actions—gives some idea of what is required to reverse the current emission trend.

There are gaps in leadership, lost opportunities for collaboration, limits to Internet and social media capability, insufficient investment, and impediments on the ability to speed up the pace CO₂ remediation. The solution: a second-generation approach to global solution networks in climate change that will force public and private actions on a global scale to drastically reduce carbon emissions, a revolution in how we think about collective action—so that our planet will survive.



Increasing the Impact of GSNs on Climate Change: Recommendations for Action

The climate science debate has, with a few stubborn exceptions, been settled. The climate change crisis is upon us now. We have seen a high of 401.33 ppm of CO₂ in the atmosphere, and it is continuing to rise at an alarming rate. Despite their best intentions, the international protocols to reduce carbon emissions have not produced meaningful results. We may be nearing the tipping point. As the scientists of the Intergovernmental Panel on Climate Change have warned us, the stake we have in meeting the climate change crisis is the survival of life as we know it. The paradigm of international meetings, reports, commitments and more meetings is not working. This approach did get us to the point where climate change is on the top of the policy agenda for most countries, but it will not reverse the damage that has been done, or forestall what is likely to be ahead.

We need to supplement existing efforts with a second-generation approach to address this crisis by putting all sectors of society on a “war footing” to mobilize the public will to action, and to motivate decisive collective action to reduce emissions to net zero carbon emissions by 2050. Every sector has a critical role to play in this global campaign, including global solution networks.

A Second Generation Approach for Global Solution Networks in Climate Change: A Governance Network Focused on Mobilizing Collective Action to Reduce CO₂ Emissions to Net Zero by 2050

The work that has been done to date can be called a first generation approach to global climate change networks (1989-2014). During the past quarter century, each network grew up independent of the others, competed for limited funds, operated within a specific niche or silo in the climate change market, and worked to expand its influence, membership, resources and impact. There was little if any collaboration, some coordination when it met the needs of each group, but largely independent strategies and actions. The use of digital technology, the Internet and social media varied according to the technical sophistication and resources of the group. Funding was most often minimal compared to the magnitude of the problem.

Like government and international institutions, the impact of climate change networks has been limited by many factors, including better funded fossil fuel companies and their lobbyists and think tanks; the great recession of



2008 from which countries are still emerging many years later; the denial by some that climate change is manmade despite the science; a political atmosphere in some countries that has been toxic for constructive responses; and a lack of global leadership to lead the charge. There have been exceptions to this, such as C40, Climate-KIC, Ceres, and The Climate Reality Project, but even those networks have operated within the first generation paradigm—operating independently in an increasingly interdependent world.

A second-generation approach to how global solution networks in climate change work together to reduce CO₂ emissions to net zero is called for—a network of networks that can provide a framework to mobilize climate change networks for global collective action. Climate Reality Project CEO Ken Berlin suggests,

There is tremendous potential for a meta-network. In fact, I think it's critical we begin now. The starting point is to begin a dialogue among existing climate change networks to create a coalition that can begin mobilizing millions around the world in this campaign through a meta-network platform. We must work together to reduce CO₂ emissions to net zero.³⁷

The Mission of a Global Governance Network for Climate Change

The mission of this governance network would be to support GSNs in climate change to mobilize the public to act on reducing GHG emissions to net zero by 2050. This meta-network would be a beacon for the hundreds of climate change networks around the world, providing a framework and platform for them to collaborate with each other regionally and by area of expertise, so that they can accelerate their impact in reducing emissions.

10 Principles Guiding a Climate Change Governance Network

1. **Urgency of Action:** The time to act is now. 350 ppm must be achieved by 2050. The problem requires immediate and urgent action at a scale not seen since World War II.
2. **Global in Scope:** Every sector in every society on the planet is affected by climate change, requiring a global mobilization effort.
3. **Mobilization of Public Will to Act:** A focus on supporting climate change networks in their efforts to mobilize public action to reduce carbon emissions.



4. **Collective Good:** The overall intent of action directed to the benefit of the collective good of everyone on the planet.
5. **The Most Vulnerable:** Priority focus will be on those populations that are most vulnerable to climate change impacts.
6. **A Collaboration Revolution:** Interdependent collaboration among climate change networks with and between governments, the private sector and civil society, and facilitated by these networks; they must develop new ways of working together for the common good, and do so using social media, the Internet and new forms of governance.
7. **A Global Technology Platform:** A platform to connect climate change networks so that they can communicate, collaborate and engage to accelerate the reduction of carbon emissions.
8. **Encourage Local Experimentation:** Support climate change campaigns that create individual, household and community projects or experiments in reducing CO₂ and then share lessons learned and best practices.
9. **Promote Investment:** Promotion of higher levels of investment in networks that disseminate knowledge, scientific awareness, new technologies, innovations, tools and best practices for reducing GHG emissions.
10. **Leverage Market Forces:** Help climate change networks leverage market mechanisms to provide incentives for carbon capture and storage, renewables, innovation, climate adaptation and sustainability practice.

Potential Roles of a Climate Change Meta-Network

Governance: A governing body could be representative of all types of climate change networks as well as all geographic regions on the planet. It would serve by providing strategic leadership for the meta-network, setting priorities for supporting climate change networks, and providing a forum for learning about successes, lessons learned and best practices, and by setting targets for action, and holding organizations and governments accountable for results. It would have to operate in a transparent and accountable manner.

Technology Platform: A robust technology platform that enables climate change networks to communicate with each other, share best practices, document case studies, disseminate new technologies, provide access to tools, processes and information, and problem-solve with each other.



Expanding Accessibility of Climate Science Knowledge: There would likely be an exponential increase in the number of audiences that have access to the data, bridging international boundaries through an aggressive expansion of the internet platforms and media capability, and the growth of a new industry where climate scientists consult with governments and corporations to provide them with data and concrete ways to reduce emissions. Linking the variety of network types with climate innovation networks like Climate-KIC would begin to connect the dots to fuel this movement with new technologies.

Consolidating Watchdog Networks—a Dashboard Network: A consolidation of critical climate change data and metrics would enable the civil society organizations, NGOs, and others to see, in one place, where the world stands in the race to reduce GHG emissions and climate change impacts. Consolidation can be accomplished by creating a Climate Change Dashboard network that captures the key metrics for measuring climate change, monthly CO₂ levels, the rate of deforestation annually, and the number of centimeters of sea level rise annually. Through the Internet and social media, alerts and press releases would be used to provide many stakeholders with real-time data they can use to reduce emissions and climate change impacts.

Leveraging Policy Networks to Strengthen International Negotiations: Greater leverage would ensure that the international negotiations process makes better use of climate change policy networks, and would provide a way to leverage expertise in order to accelerate the pace of countries keeping their commitments. In this way climate change policy networks would be partners in the climate negotiations process.

Coordination and Collaboration of Policy Networks: Rather than acting alone or in loose federations, networks could coalesce, affiliate and coordinate, not only with other policy networks, but also with knowledge, watchdog and advocacy networks. The meta-network could provide a way for them to align and work together to use their collective power and energy to forcefully pursue a legislative and regulatory agenda that would be comprehensive in its impact on GHG reduction

A Global Innovation Network: Building on the success of innovation networks like Climate-KIC, substantial investment in this type of multi-stakeholder network can contribute to solving the toughest technical, scientific and engineering problems this crisis faces. The meta-network could help GSNs leverage successes into additional investment so that they can discover the next generation of carbon capture technology, reforestation, renewable energy and water desalinization. The pace of implementation needs to pick up dramatically, with major investments from industry, development banks and national governments. The dissemination of these innovations must be swift and broad, with intellectual capital and patents accessible to all, especially the most vulnerable populations, through an open source network for climate change innovation.



Connecting the Dots Between Funders and Climate Change Projects: The International Energy Agency has said there is a \$36 trillion gap between what is presently being invested in climate change and clean energy and what is needed, resulting in the Ceres Clean Trillion initiative pledging \$1 trillion a year until 2050 from the investor community. This level of financing is absolutely essential. The meta-network could address the need to connect funders with entrepreneurs, corporations, academic and technical research organizations that have projects related to reducing GHG emissions.

A Final Thought

It is time for a second-generation approach to global solution networks in climate change, an approach in which interdependence and collaboration are the new paradigm. Through a governance network for climate change, these global solution networks can work with stakeholders from all sectors to mobilize the public will, encouraging individuals to act now to reduce GHG emissions to net zero by 2050. The window is closing. The time for action is now.



Appendix of Climate Change GSNs Researched

Knowledge Networks

- UCCRN, Urban Climate Change Research Network: <http://uccrn.org/>; see also <http://www.youtube.com/watch?v=XbxfY2UOeOo> for a urban leadership training initiative
- Climasphere: <https://www.climasphere.org/#!home>
- Climate Central: <http://www.climatecentral.org/>
- African Climate: <http://africanclimate.net/>
- Climate Exchange Network of Africa: <http://cenafrica.net/>
- Southern Africa Climate Change Network: <http://www.saccnet.org/>
- Climate and Development Knowledge Network: <http://cdkn.org/>
- ASCENT – Australian Climate Change Education Network –a project of the Climate Movement:
<http://www.climatemovement.org.au/groups/ascent/>
- Stockholm Environmental Institute: <http://www.sei-international.org/>

Watch Dog Networks

- carbontracker.org: www.carbontracker.org
- Carbonn Climate Cities Registry: <http://citiesclimateregistry.org/>
- CO₂ Now: www.co2now.org
- Bloomberg New Energy Finance: www.bnef.com
- Earth Engine Partners, University of Maryland, <http://earthenginepartners.appspot.com/science-2013-global-forest>
- Global Forest Watch.org: <http://www.globalforestwatch.org/>
- Digital Coast, NOAA: <http://www.csc.noaa.gov/digitalcoast/>
- Carbon Cities Climate Registry: www.carboncitiesclimateregistry.org



Advocacy Networks

- Climate Reality Project (Al Gore) <http://climaterealityproject.org/>
- Climate Action Network, Latin America: <http://www.can-la.org/es/>
- 350.org: www.350.org
- Australian Climate Movement: <http://www.climatemovement.org.au/>
- Ceres: www.ceres.org/

Policy Networks

- Global Water Partnership <http://www.gwp.org/>
- C 40 Global Leadership for Climate Change <http://www.c40.org/>
- China Civil Climate Action Network (CCAN): <http://www.climatenetwork.org/profile/member/china-civil-climate-action-network-can-china>
- Climate Action Network, Europe <http://www.climnet.org/>
- Middle East Action Network: <http://www.climatenetwork.org/category/region/middle-east>
- SEAN-CC—Southeast Asian Network on Climate Change <http://www.sean-cc.org/>
- Climate Action Network South Asia: <http://cansouthasia.net/about-us/>
- Regional Environment Center (Central and Eastern Europe): <http://www.rec.org/topicarea.php?id=11>
- CANSA, Climate Action Network, South Asia: <http://cansouthasia.net>
- Climate Network Africa: [http://aros.trustafrica.org/index.php/Climate_Network_Africa_\(CNA\)](http://aros.trustafrica.org/index.php/Climate_Network_Africa_(CNA))
- Go Fossil Free: www.gofossilfree.org

Network Platforms

- Climate Action Network, International: <http://www.climatenetwork.org/>
- USCAN—US Climate Action Network: <http://www.usclimatenetwork.org/>
- Climate Movement.org Australia <http://www.climatemovement.org.au/>
- REDD + Partners: <http://reddpluspartnership.org/en/>



- Claris LPB: www.claris-eu.org
- Regatta-UNEP: <http://www.cambioclimatico-regatta.org/index.php/en/>

Operational and Delivery Networks

- World Wildlife Fund <https://worldwildlife.org/threats/climate-change>
- Climate-KIC, European Union, <http://www.climate-kic.org/>
- Caribbean Community Climate Change Centre (CCCCC) <http://www.caribbeanclimate.bz/>
- ICLEI: <http://www.iclei.org/iclei-global/who-is-iclei.html>
- Carbon Capture & Storage Association: <http://www.ccsassociation.org/>
- REDD+: www.REDDpluspartnership.org
- Nature Conservancy, www.nature.org/
- Carbon Trust, www.carbontrust.com
- Environmental Defense Fund Climate Corps, www.edfclimatecorps.org



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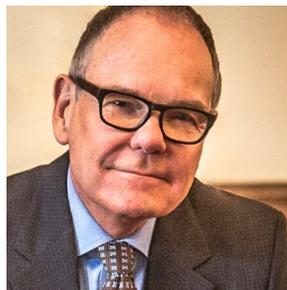
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- ³⁴ Ibid.
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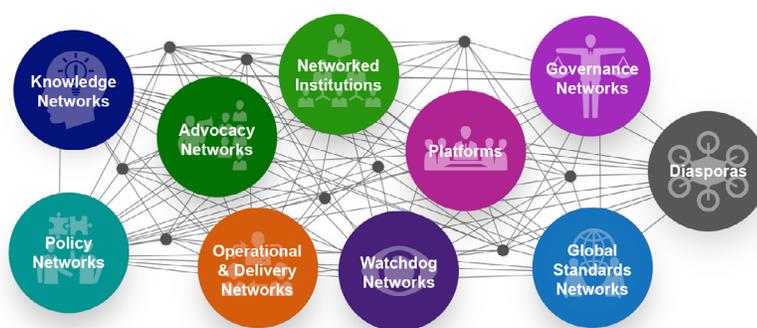
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Ten Types of Global Solution Networks