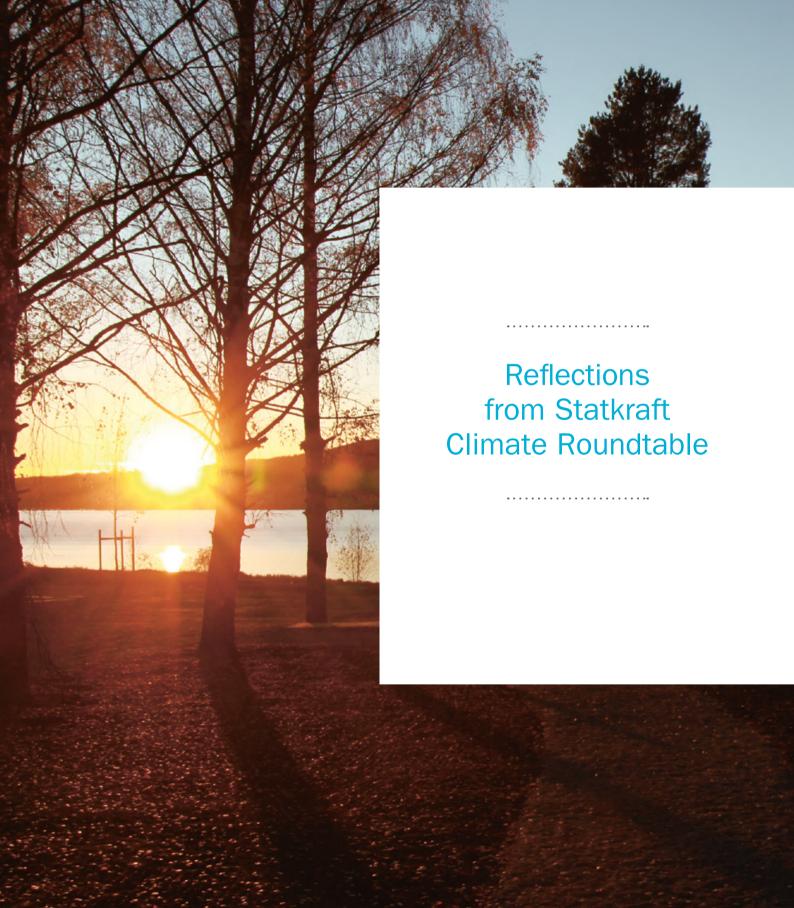
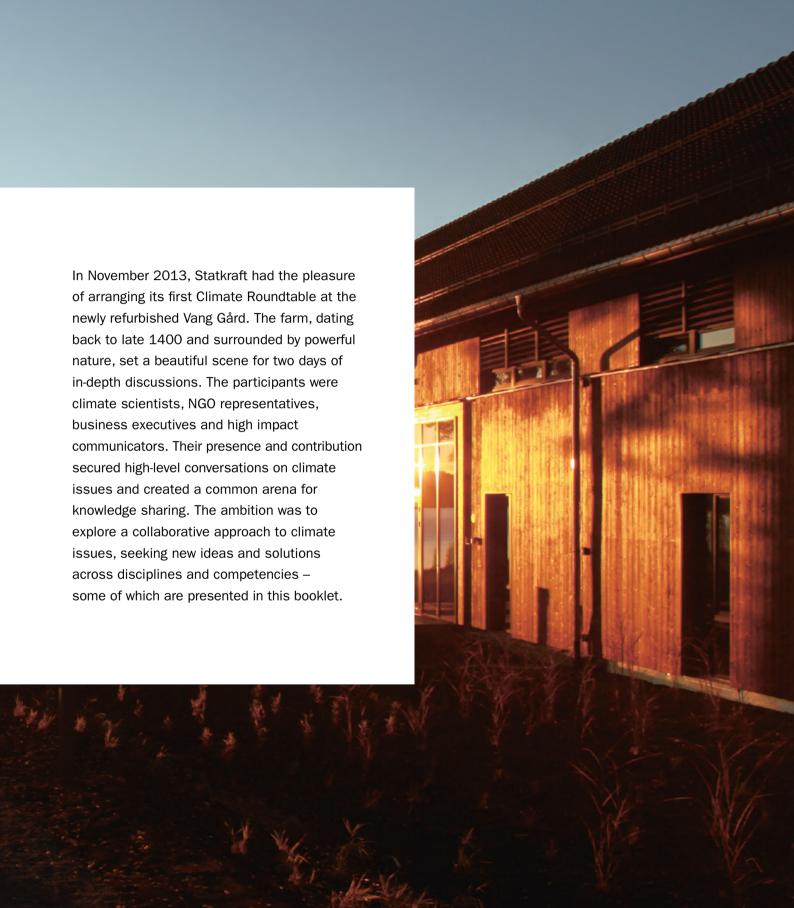


Climate
Roundtable

Chasing New Ideas





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Reinventing growth - the collaboration imperative By Gabrielle Walker

Chasing New Ideas

All too often, growing a business and combatting climate change are considered to be two conflicting goals. In Statkraft, we strongly believe that creating a resilient business and tackling climate issues must go hand in hand. You cannot achieve the first objective, without addressing the second. Climate change is real, and it is affecting the daily lives of millions of people, all over the world. It is high on the political agenda, and the climate debate is forming both political and popular discourse. Any company that wants to thrive must take this mass movement into consideration and act accordingly, to avoid becoming the Kodak Company of our time.

It was Statkraft CEO, Christian Rynning-Tønnesen's personal initiative to invite a group of scientists, business leaders and NGO's to the first Climate Roundtable at Vang Gård. He hoped to create an arena where a small group of people could come together to share ideas, knowledge and experience, and to explore the power of collaboration across disciplines. One output from the Climate Roundtable at Vang Gård, is this booklet. A booklet designed to share some of our thoughts with a wider audience. Another output is the fact that the Climate Roundtable will be a regular event, hopefully creating a setting for in-depth discussions, knowledge sharing, and inspiring us all to chase new ideas for how to achieve growth and progress whilst tackling climate change.

To set the tone in this booklet, we invited Professor Hans Joachim Schellnhuber, the father of the 2 degrees trajectory, to present his thoughts on tipping points, non-linearities and inequalities. His story is important, outlining how the developing world is now footing the bill for growth in the developed world and how the urgency of the issue is irrefutable. What can we do to curb climate change? How can we reduce inequalities? And how do we secure resilient businesses? These are the million dollar questions. And we hope that input from McKinsey partner and member of the New Climate Economy initiative, Jeremy Oppenheim, chief scientist in Xyntéo, Gabrielle Walker and Myles Allen will help us all to get closer to some of the answers. Their perspectives are different, but they all point us in the same direction – business, politics and organisations need to collaborate to make brave, long-term decisions to secure a sustainable future. Choices businesses have to make today might seem risky, but at the end of the day, not making them can be the riskiest path of all.



By Bente E. Engesland SVP Corporate Communication, Statkraft



Climate Change: Nonlinearities and Inequalities

Recent devastating storm events such as Hurricane Sandy and Typhoon Haiyan epitomize two fundamental characteristics of human-made climate change: On the one hand, those storms are related to strongly nonlinear systems, where small changes of certain components may generate complex, powerful effects throughout. On the other hand, with regard to the consequences for the affected populations, they reveal strong inequalities that characterize contemporary societies worldwide and that may be aggravated by climate change. Albeit the storm damages in developed New York and developing Tacloban City on the Philippines cannot easily be compared, in both locations the poorest part of the respective population suffered most after all.

If climate change continues unabated, many nonlinearities and inequalities of similar nature – but also lurking in the realm of the unexpected and unseen – may unfold in the future.

Among the nonlinearities that climate change scientists deal with on a daily basis, I am personally most worried about the so-called tipping elements in the Earth system. These are large-scale features of our planet, which may undergo major, irreversible transitions if pushed beyond a threshold by continued global warming. Examples include the grand polar ice sheets in Antarctica and Greenland, the Amazon rainforest, and the tropical coral reefs belt. A 'novel' tipping element, which has only recently been inspected more carefully, is the so-called 'jet stream', a high-speed wind ribbon that separates

cold Arctic air from milder mid-latitude air masses. The jet stream occasionally forms giant waves that, if they last for several weeks, bring about severe weather extremes such as regional heat waves and floods. New research indicates that human-made global warming will increase the persistence of those waves.

Regarding the likelihood of destabilizing some of these tipping elements by anthropogenic interference, recent scientific findings from the Potsdam Institute for Climate Impact Research show, for example, that the slow, but irreversible loss of the Greenland ice sheet may start already if global mean temperature is increased by roughly two degrees centigrade. The complete loss of that ice sheet would imply that sea levels worldwide rose by about seven meters on average and – due to the effects of continental gravity and ocean currents – even much higher regionally.



By Hans Joachim Schellnhuber Founder and Director, Potsdam Institute for Climate Impact Research (PIK) Ocean waters creeping up the shores will rather exclusively hit the poor and unprivileged parts of societies (just like tropical storms or almost any other impact of climate change affect the infrastructural and logistical backbones of our economies), at least as long as there will be hideaways for the well-off, where the amenities of modern civilization continue to exist.

But climate change involves yet another type of fundamental inequalities. There is no better way of visualizing this than looking at the historical emissions of carbon dioxide as they unfold across the globe since the early times of the Industrial Revolution. In the entire world, only Great Britain churns out carbon dioxide from the mid-1700s until the early 19th century, when the Industrial Revolution finally reaches the European continent. By the early 20th century, significant carbon dioxide emissions occur in the Eastern United States, Central Europe, and Japan. Only in the 1970s other regions of the world, such as China and South Africa, start to clearly appear on the global emissions map as well. And since the emission of greenhouse gases has always been and - unfortunately still is - so closely connected to the accumulation of wealth and power, that very 'c-story' also largely explains the distribution of rich and poor in the world of today.

It directly follows from this analysis that the global rich have contributed most to human-made climate change. And a 'fair'

The emission of greenhouse gases has always been and – unfortunately still is – so closely connected to the accumulation of wealth and power. ***

Hans Joachim Schellnhuber

international distribution of future emission rights – consistent with the principle of historical responsibility and the 2°C target – would look rather drastic, if one did not allow for the possibilities of offsetting and international emission trading. Countries like the United States, Germany and even China would have to entirely decarbonize their economies by 2020-2035 (!), while countries such as India or Burkina Faso would be allowed to continue emitting through much of the 21st century.

Last but not least, I cannot emphasize enough that although the decarbonisation of our economies implies costs, it also entails huge opportunities. If the international community – including the major players in the business arena – strengthens its ambitions and starts to effectively curb global emissions now, the world still has a chance to avoid major planetary nonlinearities while tackling many of today's inequalities.



Increasing our Degrees of Freedom – The New Climate Economy Project

Do we have to choose between dealing with climate risk and economic growth? Many political leaders believe that acting more strongly on climate change will cost more than their economies and their public support can bear. In fact, this is a false dilemma. Faster, better growth today could create the wealth and shared prosperity needed to deal with climate risk.

It is clear that if the world is to move towards a significantly more carbon-efficient and climate-resilient pathway of economic growth, a much more compelling economic case for action has to be made. That case needs to be anchored in the opportunity to build a better global economy – one which delivers not only growth and employment, but also reduces local pollution, manages scarce resources better and makes cities more liveable and productive. Let's be realistic. Contributing to a more stable climate system is more likely to be a co-benefit of good policy for many countries rather than the primary, near-term objective.

The New Climate Economy project aims to identify opportunities that can strengthen economic and climate performance at the same time. It always starts with the economic performance agenda – growth, employment, poverty reduction, macrostability and risk management. And it looks to see how good economic policy and good climate risk management can be mutually supportive. The project brings together former heads of government and finance ministers, economists and businesspeople in a Global Commission led by former Mexican

President Felipe Calderón and draws on the expertise of world-leading research organisations like the World Resources Institute in the United States, the Stockholm Environment Institute in Sweden and Tsinghua University in China.

Our starting point is the real-world perspective of economic decision-makers: like the leaders in business and industry present at the Climate Roundtable. This is not an ivory tower exercise. Many of those decision-makers know that something needs to be done about climate risk. They are just not sure what to do or how fast to do it. In many cases, they are also confronted with very powerful lobbies who unsurprisingly want to preserve the carbon-intensive, status quo economy. The research approach of the New Climate Economy project is evidence-based, objective, open, and, importantly, has a near-and medium-term focus. We recognise that decision-makers are understandably more concerned with the next quarter's growth or unemployment figures than with the next century's economic pathway,



By Jeremy OppenheimProgramme Director,
The New Climate Economy





and figure out ways to integrate the climate agenda into their near-term priorities.

However there is no simple, single path to integrate near-term priorities with medium-term economic transformation. As such, the New Climate Economy will also investigate the costs, tradeoffs, uncertainties and challenges of change. For example, continued use of unabated coal may appear to many countries as the cheapest option to increase energy supplies, even though decision-makers know that it is a major source of CO2 emissions. However, coal use may turn out to be surprisingly costly when countries take proper account of the local air pollution effects. Coal-fired power is also a technology which is relatively mature and generates major lock-in effects, limiting the ability for countries to build smarter, more flexible and distributed energy systems. Properly assessed, the "total cost of coal ownership" may be much higher than decision-makers appreciate. Given the 50 year + life of coal plants, it also limits the degrees of policy freedom to respond to likely changes in economic and environmental conditions over the coming decades.

The New Climate Economy is particularly keen to learn from success and highlight and share stories of progress. Leaders will make courageous choices and drive change, but only when they can see realistic alternatives to the current model. For example, China, seeking to maintain economic growth while reducing an unhealthy reliance on coal, has placed the industrial development of clean technologies at the top of its agenda. The C40 group of Cities is promoting best-practices to reduce greenhouse gas emissions and create resilient infrastructure.

Faster, better growth today could create the wealth and shared prosperity needed to deal with climate risk.

Jeremy Oppenheim

Companies like Unilever, IKEA and Wal-mart show how it is possible to drive up resource efficiency – and drive down costs – throughout their supply chains. Driven at global scale, it is quite possible that a resource- and carbon-efficient economy will be a lower cost, lower risk economy than our current 20th century model.

Recent experience in the financial sector has taught us about the need to manage the accumulation of systemic risk. Yet we are also not acting to deal with current systemic risks posed by climate change. These climate-related risks have the potential to make the global financial crisis look like a walk in the park. The task of the New Climate Economy project is to shape a practical climate agenda for leaders in both public and private sectors – creating the kind of economic prosperity that can be passed from one generation to the next. This requires policy settings, investment decisions and international mechanisms which increase, not limit, our degrees of freedom to handle rapid, unpredictable change. Business as usual is not a realistic option.



Green is good

Imagine 18 hours of power cuts every single day. That is the everyday life for the people of Nepal. Available power rotates between the districts of the capital Kathmandu. TV watching and charging of mobile phones need to be planned carefully. Those who can afford it use polluting diesel generators to ensure continuous power supply.

Thanks to majestic mountains and heavy rainfalls, Nepal has the second highest potential for hydropower in the world. Yet, only one per cent of its total hydropower capacity is being utilised.

The people of Nepal are not alone. 2.5 billion people worldwide lack access to modern energy services, most of whom live in emerging markets like Brazil, India, Indonesia, China and Africa. Efforts to increase access to energy are a key prerequisite for progress within health, welfare, employment and education.

The demand for energy will increase. The OECD estimates that by 2050 global energy demand will be 80 per cent higher than it is today. Unless this increase is met by renewable energies, this is a recipe for a climate disaster. For the world to meet the two-degree target, the UN (IPCC) has estimated that renewables' share of world production must increase from 13 to 80 per cent over the same time period.

These facts shed light on opportunities that can be exploited by energy companies with the knowledge and ambition to strengthen economic and climate performance at the same time. It is possible to meet business targets, whilst also laying the foundation for good economic policy and sustainable climate risk management. Statkraft believes this is achievable and profitable to pursue. In addition, these longer-term climate contributions give our business a deeper sense of purpose. By providing pure energy in countries like Nepal, India, Laos and the Philippines, we not only capitalize on a unique Norwegian hydropower heritage; we participate in ensuring sustainable growth in developing markets.

We are indeed seeing some positive signs. In Europe, the share of clean energy has increased by four percentage points over the past five years. On October 3rd 2013, Germany's consumption of renewable energy peaked at 60 per cent based on a combination of solar and wind power.



By Christian Rynning-Tønnesen President and CEO, Statkraft When looking at the recent turmoil in Ukraine and Egypt, both conflicts are interlinked with the need for natural resources, gas and grain respectively. The increasing fight for scarce resources. such as water and food, has the potential to create similar, if not worse conflicts. Failure in combating climate change is not an option. On the contrary, we need an energy revolution based on the increased development and use of renewable energy. This will not only reduce countries' dependency on fuel, but it will also reduce conflicts with other regions, as renewable energy is self-generating. Renewable energy is also becoming more cost-efficient, and the pace of innovation is increasing. By 2025, several of the renewables technologies are expected to reach a cost level where they can compete with coal without subsidies. But this is still not enough to curb the rising CO₂-emissions. China, one of the largest developers of renewable energy today, is at the same time growing its CO₂-emissions at a very fast pace. In 2012, China's emissions increased by 5.9 per cent, which represents 70 per cent of the growth of global emissions.

If we are to be successful in reaching our climate goals, the production of renewable energy must surpass the increase in energy demand. In this work, I believe energy businesses like Statkraft can play an important role. For more than 100 years Statkraft has developed and managed hydropower resources. Today, Statkraft is Europe's largest producer of renewable energy. With hydropower production in an increasing number

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Christian Rynning-Tønnesen

of developing countries, Statkraft is well positioned to become a leading international company in pure energy.

In the years ahead we will grow within hydropower, wind power, district heating and other renewable technologies. This is not only good for local communities and the environment, but also for our own business. By capitalising on our Norwegian heritage, we are also securing future returns for our shareholders – the Norwegian society.

The infamous Wall Street film character Gordon Gekko once said: "Greed is good". Going forward the business slogan should be "green is good".



The Cumulative Carbon Budget and its Implications

One of the most important new findings of the latest Scientific Assessment of the Intergovernmental Panel on Climate Change (IPCC) is the cumulative carbon budget. In the long-term, global temperatures are predominantly determined by total carbon dioxide ($\rm CO_2$) emissions over the entire "Anthropocene" epoch, not by the rate of emission of greenhouse gases in any given decade.

This is illustrated in the figure on the next page, which shows the global average temperature increase plotted against cumulative global ${\rm CO_2}$ emissions from fossil fuel sources and land-use change, both since the mid 19th century. The thin grey line and grey shaded plume shows the expected warming, and range of uncertainty, due to carbon dioxide emissions alone. The coloured lines and orange shaded plume shows the expected warming and range of uncertainty from all anthropogenic sources under a range of scenarios of future emissions of all greenhouse gases and other forms of pollution, from an increasing emissions "business-as-usual" scenario (RCP8.5, red line), and from an aggressive mitigation scenario (RCP3PD, dark blue line).

The RCP8.5 scenario moves off to the top right corner of the figure more rapidly than the RCP3PD scenario, but all scenarios fall on roughly the same line: for a given level of cumulative $\rm CO_2$ emissions, the planet experiences approximately the same level of warming irrespective of whether that $\rm CO_2$ is emitted slowly or rapidly. Warming from non- $\rm CO_2$ anthropogenic sources add half to

one degree to CO_2 -induced warming in both "business-as-usual" and mitigation scenarios.

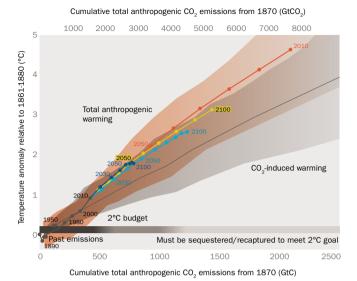
This cumulative carbon budget has profound implications for mitigation policy. Not only does it mean that, to stop climate change, net CO₂ emissions will eventually have to be reduced to zero, but it also means that emissions in 2020, or any other short-term "commitment period" do not, in themselves, determine the risk of dangerous climate change except insofar as they contribute to the cumulative total. This is very important, because the technologies and interventions that might be required to reduce the flow of emissions of various greenhouse gases over the coming decade are in many cases very different from the technologies required to limit the total stock of cumulative CO₂ emissions in the long term. At present, climate policies favour short-term emissions reduction measures, potentially to the detriment of the long-term goal of avoiding dangerous climate change.

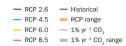


By Myles Allen
Environmental Change Institute, School of Geography
and Environment & Department of Physics,
University of Oxford and Oxford Martin School









Warming in the CMIP-5 multi-model ensemble under the Representative Concentration Pathway scenarios (coloured lines, with orange plume showing the range of uncertainty) and under idealized CO₂-only scenarios (grey line and plume) plotted as a function of cumulative total anthropogenic CO₂ emissions from 1870 onwards – figure SPM10 of IPCC (2013). Black horizontal bar shows historical emissions to date; dark grey bar shows the approximate cumulative emission budget consistent with limiting warming to 2°C; light grey bar shows fossil carbon reserves that, if used, must be sequestered or recaptured if the 2°C goal is to be met.

Based on the modeling results shown in the figure above, and other lines of evidence, the IPCC estimates that, to have a better than 2-in-3 chance of keeping the warming they cause to less than 2°C, total $\rm CO_2$ emissions must be limited to less than one trillion tonnes of carbon (3.7 trillion tonnes of carbon dioxide). Emitting 1.2 trillion tonnes would give an even chance of $\rm CO_2$ -induced warming exceeding 2°C, while 1.5 trillion tonnes would give a 2-in-3 chance of $\rm CO_2$ -induced warming over 2°C. Emissions over the past 250 years add up to over half a trillion tonnes of carbon, and if current trends continue, will exceed one trillion tonnes by the early 2040s.

Total reserves of fossil carbon already exceed the remaining carbon budget consistent with the 2°C goal by at least a factor of two, and developments in unconventional fuels are adding to these reserves faster than they are being consumed. A substantial fraction have relatively low extraction costs, such that they are likely to remain economically competitive, particularly for high energy-density applications such as air travel, regardless of future developments in renewable or nuclear power.

Climate policy therefore boils down to a simple choice between three options:

- One, we emit more than one to 1.5 trillion tonnes of carbon knowing this will impose more than 2°C warming on future generations.
- Two, we introduce an emission control regime so draconian that no one, anywhere in the world, ever, is permitted to burn fossil carbon once the cumulative budget is exhausted.
- Or three, we ensure that, once the budget is exhausted, all further use of fossil carbon can be offset by permanent CO₂ removal.

Given the timescales involved in the carbon cycle, permanent removal requires geological sequestration or re-mineralization, not temporary storage in the biosphere through afforestation. In my view, the only ethical option is three, which suggests a significantly greater emphasis on carbon capture and sequestration in climate mitigation policy.

In my view, the only ethical option is (...) a significantly greater emphasis on carbon capture and sequestration in climate mitigation policy.

Myles Allen



Reinventing growth – the collaboration imperative

Growth used to be a panacea, and it's true that our current growth model has served us very well; it has lifted millions out of poverty, eradicated diseases and created a more open, connected global society. But this model, built for an era of cheap resources, fewer people and centralised power structures, seems to have run out of steam. From dwindling resources and a volatile climate to persistent inequality and societal upheaval, the signs are clear: we need to reinvent growth.

First, the new growth model must generate value for the many, instead of for a small elite. That is not only for social justice – the societies that thrive, and endure, tend to be relatively equal ones. Second, we must stop sacrificing the living standards of future generations to preserve today's wastefulness. And third, we must rebalance the relationship between mankind and nature, so that prosperity need no longer involve laying waste to the environment that ultimately sustains us.

I believe that new ways of working together with non-traditional partners will be key to taking all three of these steps, by bringing in a wider range of stakeholders and helping all involved to see a bigger, more sustainable, longer-term and fairer picture. The main players in these collaborations are likely to be business, society and policymakers. For businesses, collaborations can bring

lower costs, greater value to customers, and strategic ways to differentiate themselves from the crowd. For policymakers, collaborations can help remove perverse incentives and properly connect the complex interdependencies that can make a nonsense of isolated laws and regulations. For NGOs and other representatives of civil society, collaborations provide an opportunity to have more impact, as well as to help partners in business and government to rebuild trust with the people they serve, and to look more readily to the long term. And everyone involved can benefit by opening themselves up to those great ideas that enter from unexpected places.

Success in collaboration also demands a new type of leader, for whom boundaries between companies, industries, sectors or countries are irrelevant. These are the women and men who look farther and more widely than traditional leaders, to identify new risks and opportunities and create unconventional partnerships. Just as the challenges we now face are



By Gabrielle Walker Chief Scientist, Xyntéo

cross-cutting and interdependent, so the developing solutions to those issues demonstrate the need for collaborations and connections across traditional silos.

Although there are many factors that hinder such collaborations, we are currently identifying powerful factors that can support them. Often it is crucial to have individual champions who stand out in the different sectors by their persistence, passion, collaboration, humility and vision, and can forge the bonds of trust that these collaborations need. Neutral ground can also be vital, as well as shared accountability and ownership of the outcomes.

The power of collaboration is what motivated my organisation, Xyntéo, to found the GLTE partnership, of which Statkraft is a valued member. By pooling the insight, competence, experience and resources represented in businesses from a wide range of geographies and sectors, we believe GLTE partners can make an important contribution to moving the world to a new growth model, while readying their businesses to compete in a new economic landscape.

Meanwhile, we will continue to focus our efforts on better ways to connect innovative policymakers, representatives of civil society and business leaders, and how to spread and scale their most effective collective actions. And although it will take time to build the trust, relationships and connections that all of this this implies, we are convinced that extraordinary outcomes are possible if we join our considerable forces for the sake of all our common goals. After all, the best way to prepare for change is to create it.

Just as the challenges we are now facing are cross-cutting and interdependent, so the developing solutions to those issues demonstrate the need for collaborations and connections across traditional silos. **J

Gabrielle Walker









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