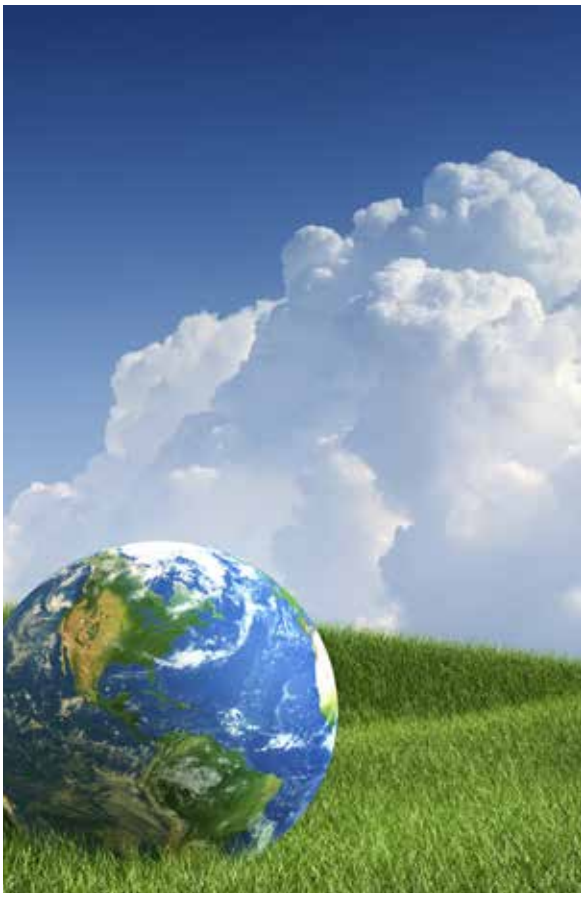
Centre for International Governance Innovation

POLICY BRIEF
Fixing Climate Governance Series
No. 8 • August 2017

STARTING THE DIALOGUE ON CLIMATE ENGINEERING GOVERNANCE
A WORLD COMMISSION

Edward A. Parson



Key Points

- Climate engineering — also called geoengineering or climate intervention or remediation — can, if appropriately governed, reduce climate change risks beyond what mitigation and adaptation can do alone, and may be essential to achieve the Paris Agreement temperature targets.
- Geoengineering, however — in particular, solar geoengineering — poses not only significant risks but also major governance challenges.
- Accordingly, international dialogue on climate engineering governance, with broad participation, is urgently needed, but existing institutions are not well equipped to support it.
- A promising first step in such a dialogue would be to establish a world commission on climate engineering or similar high-level consultative body.

Climate Engineering: Its Contributions and Risks

It is possible to actively modify global environmental processes to offset some of the harm caused by elevated greenhouse gases. Such intentional global modification takes two forms: modifying the global carbon cycle, by removing carbon dioxide (CO_2) from the atmosphere, and altering the earth's radiation balance, mainly by reflecting away a little incoming sunlight (Royal Society 2009; National Academy of Sciences 2015). If properly used, each method offers the prospect of reducing climate change risks in ways that the main climate responses, mitigation and adaptation, cannot do alone. Indeed, it is increasingly likely that the targets set at the 2015 UN Climate Change Conference in Paris — holding global heating well below 2°C and aiming for 1.5°C — will require large-scale use of one or both types of climate engineering (Keith 2017).

The two types of climate engineering differ substantially in their effects and risks, as well as their governance needs, with solar methods posing the greater challenges. Carbon removal can slow — or, if done at huge scale, reverse — the rising of atmospheric CO_2 from human emissions, and all resulting impacts, but it is costly and slow: pulling CO_2 out of the air is like draining a lake through a straw. In their distribution of costs, and in their potential risks and benefits, carbon interventions are roughly similar to mitigation, so are unlikely to fundamentally disrupt international climate politics.

By contrast, sunlight methods (also called solar geoengineering) are virtually certain to disrupt climate politics (Parson and Ernst 2013). Of several proposed solar methods, the most promising would spray a reflective mist in the upper atmosphere, to scatter roughly one percent of incoming sunlight. This could cool the Earth roughly half a degree Celsius within a year or so, at a direct cost of a few billion dollars per year to sustain the effect — remarkably fast and cheap, relative to other responses. It could thus allow intervention on short notice to slow or reduce severe impending changes; alternatively, it could be used

About the Fixing Climate Governance Project

Project Leaders: **John Odell**, CIGI Senior Fellow and **David Runnalls**, CIGI Distinguished Fellow

Climate scientists agree that human activity has been changing our planet's climate over the long term. Without serious policy changes, scientists expect devastating consequences in many regions: inundation of coastal cities; greater risks to food production and, hence, malnutrition; unprecedented heat waves; greater risk of high-intensity cyclones; many climate refugees; and irreversible loss of biodiversity. Some international relations scholars expect increased risk of violent conflicts over scarce resources due to state breakdown.

Environmentalists have been campaigning for effective policy changes for more than two decades. The world's governments have been negotiating since 1995 as parties to the United Nations Framework Convention on Climate Change (UNFCCC). Their 2015 Paris Agreement represents a historic new platform for international cooperation. It is the first UN climate agreement obliging all member states to make concrete contributions to address the problem. Yet, important details of this new regime remain to be negotiated. The members' pledges still must be implemented. And it is widely agreed that, if implemented, their 2015 pledges alone will not be sufficient to meet the need identified by science or to achieve their own agreed goal of stopping global warming well below 2°C.

The Fixing Climate Governance project is designed to contribute fresh ideas to the global debate. High-level workshops have developed a set of policy briefs and short papers written by experts from multiple countries and disciplines. Publications began in 2015. Some offer original concrete recommendations for making the UNFCCC more effective. Some propose diverse other ways to improve climate governance. The ideas in two 2015 publications were implemented in Paris. New publications, taking stock of recent conditions and research and looking forward on multiple levels, appear as they are completed.

incrementally and temporarily, in parallel with strong mitigation and carbon removal, to reduce the peak near-term heating that these responses, no matter how intensely they are pursued, act too slowly to avoid.

Solar methods, however, offer only imperfect correction to the climate effects of elevated CO_2 and only small, indirect correction to its chemical and ecological effects, notably ocean acidification. Solar geoengineering may also present serious new risks, from either direct environmental impacts or the ways it could be misused — for example, through incompetence or recklessness; in pursuit of national or regional advantage; by overreliance, so that mitigation is undermined — with resultant threats to effective climate response or broader global governance and stability (Keith, Parson and Morgan 2010).

Needed: Research, Assessment, Governance

Climate engineering thus presents a two-sided, high-stakes prospect, with large (and uncertain) potential for both benefits and risks. To better understand these methods and to support prudent climate decisions, both of the climate engineering types need expanded research and more thorough consideration in assessments. But solar methods present a unique, additional need. Because of several structural characteristics, notably their high leverage and global impacts, these methods pose grave and novel challenges to governance. These challenges have not received adequate consideration. Debate on climate engineering thus far has been mostly scientific in character and participation, and has mainly focused on the need to expand, and govern, research (Solar Radiation Management Governance Initiative 2012). Several assessments have included statements calling for deliberations on governance, but have offered no guidance on the substance of these deliberations or how to get them started (Royal Society 2009; Bipartisan Policy Center 2011; National Research Council 2015; Schäfer et al. 2015).

Debate on governance issues surrounding climate engineering, other than on near-term issues of managing research, has been thin and scattered, yielding advice that is mostly obvious and does not address key questions. For example, it is clear that governance of solar methods must be international, since their low direct costs and global impacts put unilateral action within the reach of a dozen-odd world powers, but effective control beyond the reach of any single power. It is also clear that no existing treaty or institution has the authority to control climate engineering, and that the functional governance requirements of deciding, and potentially operating, global climate interventions — and dealing with the consequences — exceed the technical and operational capacity of existing institutions. In addition, most observers regard it as premature to pursue a formal international agreement on climate engineering: in view of present uncertainties and anticipated change in knowledge and capabilities, an agreement now would risk locking in decisions that could turn out to be inadvisable.

This advice is reasonable as far as it goes, but offers little help in addressing the highest-stakes questions about how to govern climate engineering. For example, what international capacity and authority would be needed to make informed, prudent, legitimate decisions regarding proposed large-scale interventions, whether for research or operational deployment? If interventions were approved, what capacity would be needed to oversee and control them; to adequately monitor and assess their effects; to modify actions in response to advances in knowledge or capabilities; to deal with the consequences of interventions, particularly claims that they have caused harm; to coherently manage strategic interactions of climate engineering with other forms of response to climate change; and to manage associated conflicts? Alternatively, if we view these capabilities not as immediate requirements but as future goals, what feasible near-term steps could start moving international processes toward developing them? More immediately, how can discussion on these questions that engages the required knowledge and participation get started? Thus far, these questions have received scant attention — preliminary and speculative investigation mainly by academics, and none by any body of international stature.

Several justifications have been advanced for ignoring climate engineering governance. It has been widely suggested that any need to explore climate engineering is speculative and remote, particularly given the overriding near-term priority of mitigation. Some observers express hope that scientific research and international research cooperation on climate engineering will inform governance needs or build shared understanding and norms that make governance challenges easier, even without exploring them explicitly. Finally, some authors argue that using geoengineering is categorically unacceptable, at any time and under any conditions — this certainty rests, in some cases, on non-consequential objections, and in others on a prior certainty that its use will be, on balance, harmful or ungovernable — and thus that climate engineering research and investigation of its governance needs are futile or dangerous, or both (Hamilton 2013; Hulme 2014).

None of these arguments, however, persuasively rebuts the need to examine climate engineering governance. The prospect of climate engineering is neither speculative nor remote. Present technology already provides crude capabilities and the possibility of rapid advances, while increasing climate impacts will raise states' interest in considering geoengineering, especially in regions of high vulnerability. The near-term priority of mitigation may well make it inadvisable to consider climate engineering or its governance in current climate negotiations, but it does not imply these should not be discussed at all.

The prospect that governance capability may advance indirectly through research cooperation has not exactly been rebutted, since calls to expand research have thus far seen little success, but early debate does not give much hope for this happy side effect. Rather, several years have been spent in debate over governance of research, including continuing disagreement over the dilemma of which should come first, research or its governance: research is needed to inform governance needs but research itself needs governance, and early decisions on research governance may, through precedent or path-dependence, exert strong influence on development of later governance capacity. The evident resolution is that research and governance should co-evolve, so that research progress informs governance needs, while progress in understanding governance informs oversight and guidance for further research. This rather abstract insight has not yet been operationalized but has two clear implications. First, it is not premature to begin serious discussion of climate engineering governance: as with the expansion of research, this must start promptly. And, second, there must be strong mechanisms for communication and mutual adaptation between research and governance discussions.

Even the objection based on categorical opposition to climate engineering is not persuasive. Disruptive climate change impacts are already evident in many world regions, and increasingly severe impacts are likely over coming decades. Facing these, governments in vulnerable regions will find climate engineering's promise of fast harm reduction highly attractive, despite the risks. It is thus likely that disruptive geoengineering-related challenges to international order cannot be avoided — no matter how strongly one may disapprove of this approach — and states must be prepared to respond effectively.

Climate Engineering Challenges to International Order

The precise form, source or timing of governance-related challenges to climate engineering cannot be predicted, of course. They may appear as demands for operational-scale interventions; announcements of such interventions (planned, or already begun); assertions of rights to make them under international law; or charges that someone else has already made one — perhaps also blaming that party for some severe climate event. Such challenges might come from any of a dozen-odd world powers capable of making operational interventions, or from coalitions — perhaps unfamiliar groupings of diverse states and non-state actors. Given current climate change impacts and projections, such a challenge could appear within a decade or two, maybe sooner (Morton 2015).

Moreover, several recent trends in international climate policy may have inadvertently eased the way, procedurally and rhetorically, for such challenges. The shift in orientation of negotiations between 2009 in the Copenhagen meeting and 2015 in Paris, from negotiated "top-down" emission targets to open-ended nationally determined contributions, may allow nations to include activities related to climate engineering among their contributions, either as adjuncts to mitigation and adaptation or by stretching these categories to include them.

Current attention to short-lived climate pollutants highlights the fact that some short-lived species heat while others cool, and thus highlights the potential to slow climate change not just by decreasing the heaters (a form of mitigation now being pursued) but also by increasing the coolers (which would be climate engineering). Most important, the large and growing gap between ambitious temperature targets and weak mitigation performance has already brought heavy, albeit implicit, reliance on large-scale future carbon removal to close the gap. Most emissions scenarios that meet the 2°C target do so through large "net negative emissions" — carbon removal — after 2050 (Fuss et al. 2014). These removals are usually assumed to be biological, using forests or energy crops, but the huge scale and impacts of these will shift attention to lower-impact methods such as direct atmospheric removal, and also to the faster, cheaper — and likely environmentally preferred — solar methods. Tightening the target to 1.5°C strengthens every step of this argument, further increasing the likelihood of proposals, demands or other challenges related to solar geoengineering.

The claim herein is not that climate engineering will necessarily be beneficial: early signs are surprisingly favourable, but further research may identify important limits or risks. Rather, the claim is more limited and less normative — that the likelihood of an international challenge related to climate engineering occurring someday is enough to warrant serious early consultation on governance to help prepare an effective response. Regardless of the overall normative stance taken toward climate engineering, the capabilities needed to reject proposed interventions and make it stick, or to detect and deter unauthorized interventions, will be similar to those needed to authorize and control interventions, and to deal with the consequences.

Building Governance Capacity: Starting the Conversation

Developing governance capacity and shared knowledge and norms to support it will take time. Even if the first concrete decisions about climate engineering are a few decades away — which cannot be counted on — international exploration of associated governance challenges, needed capabilities and ways to develop these must start promptly, in parallel with scientific research on climate engineering methods, effects and risks. What should this dialogue and investigation look like, and in what kind of body should they be conducted? Despite pervasive uncertainties, a few of the necessary characteristics are evident.

First, governance dialogue needs strong linkage with scientific research on climate engineering. Knowledge about its methods, effects and risks will strongly shape governance needs, but scientific expertise and perspectives must be valued inputs, not run the show. Questions of effective governance — in particular regarding not-yet-existing capabilities — are matters of social and political judgment, not subject to scientific standards of demonstration. Moreover, since the capabilities of and knowledge about climate engineering are moving targets, governance advice based on a snapshot of present capabilities could become irrelevant as these capabilities change. Rather, governance debate should aim to interact adaptively with advancing science and technology, seeking insights and governance responses that can be robust to changes in capabilities and concerns or that can adapt to these as they occur.

Second, initial governance dialogue should not aim to recommend specific decisions. Discussions should be open-ended and exploratory, considering alternative scenarios of potential challenges, investigating governance issues raised by structural properties of geoengineering technologies or suggested by relevant analogies, and identifying promising directions to take or potential pitfalls to avoid.

Third, initial discussions must engage high-level expertise — both scholarly and practical — in international politics and institutions, but should not aim to be, or to simulate, an actual political negotiation. Having an informed and practical discussion requires participants who bring insight into the perspectives of key national and institutional actors. At the same time, nurturing the required informal, exploratory discussion requires that participants be able to step back from these perspectives, so they must not have briefs to advance during the discussion. Discussions should thus engage former high-office holders in governments or international institutions, and other experts of similar stature, but not current office holders or their proxies. The debate must also engage broad international participation, for legitimacy and for breadth of perspectives, and consult with officials, experts, civil society and other thought leaders from multiple world regions.

A World Commission on Climate Engineering

A promising model to begin such governance dialogue would be a world commission on climate engineering. A dozen-odd such commissions have been established over the past few decades, with the leading model being the World Commission on Environment and Development (1987). Commissions vary in mandate and organization, but the most successful have elements in common that meet the needs sketched above: high-level authorization, such as from the United Nations General Assembly or Secretary-General; distinguished commissioners with broad international representation; adequate staff, resources and time to address their charge thoroughly; and a broad mandate for consultation and expert input, synthesis, and recommendations to states and international bodies. Such high-level commissions can exert a strong constructive influence in characterizing new international challenges, framing key requirements and potential responses, and identifying promising paths forward (Thakur, Cooper and English 2005).

Building sufficient support for the establishment and adequate resourcing of a world commission on climate engineering will take time and care. So, too, will developing its specific terms

of reference and organization. But without pre-judging these issues, a few broad questions would be obvious priorities for such a body.

A commission could examine interactions between climate engineering and other climate responses, and how these could best support an effective overall climate strategy. For example, in what institutional setting should international decisions about development and control of climate engineering be made — could they be made within the existing structure of the United Nations Framework Convention on Climate Change or some other existing body, or is a new forum needed? How could the broad climate change decision agenda be managed so that consideration of climate engineering enhances rather than weakens other efforts, in particular mitigation (Parson 2014)? Might some large-scale adaptation activities come to be seen as climate engineering, and if so, what kind of international action or oversight might they require?

Looking further ahead, a commission could consider what participation, and what political, administrative and technical capacity, would be needed to deal with future geoengineering-related diplomatic challenges such as those discussed above. Could some degree of needed governance capacity be developed before such a challenge appeared, and if so, how? Alternatively, if governance capacity can be developed only in reaction to a concrete challenge, what advance planning or consultation might help avoid the worst risks in such a crisis?

A commission could also consider implications of climate engineering research. What scale or characteristics of field experiments or other research programs might make them matters of international concern? What forms of information sharing and consultation, or other steps, would best mitigate those concerns? What measures could forestall the risk of research programs spawning commercial or political vested interests that might tend to lock in future expansion? Are there elements of early research programs or their governance that might aid or hinder development of effective governance for large-scale interventions?

A commission need not provide concrete, specific governance recommendations: it would make a contribution simply by clarifying questions to be addressed, issues at stake, broad response options and factors militating for and against each. It is also possible that a commission might conclude that the governance challenges of solar geoengineering cannot be effectively addressed, and thus spur further intensification of mitigation, adaptation and carbon removal efforts. Given the dangerous silence that now prevails on climate engineering, even a commission that merely raised the profile of the issue and its governance challenges, and so stimulated discussion among political leaders, officials and international institutions, would make a valuable contribution.

Conclusion

Climate engineering can, if appropriately governed within a coherent overall climate change strategy, reduce risks beyond what mitigation and adaptation can achieve alone, and is probably essential to achieve the Paris Agreement temperature targets. Climate engineering also poses significant new risks, and needs expanded research and scrutiny in climate assessments.

Both types of climate engineering — carbon removal and solar geoengineering — also pose significant challenges to governance. The governance challenges of solar methods are particularly novel and severe, and urgently need international examination and consultation, both to learn how (and whether) climate engineering can deliver societal and ecosystem benefits, and to prepare for the likelihood that some states, facing mounting climate change impacts, will pursue climate engineering and the international system will have to respond.

The needed international dialogue on geoengineering governance will have broad international participation; will engage high-level expertise in international policy and institutions; will draw closely on parallel advances in scientific knowledge and technical capability, while keeping governance the central focus; and will facilitate open, exploratory investigations of governance needs and potential responses rather than pursue specific decisions, at least in initial stages. Present institutions are not well equipped to support such a dialogue.

A promising first step in such a dialogue would be to establish a world commission on climate engineering or similar high-level consultative body. Such a commission would need high-level political authorization, an appropriately broad mandate, adequate resources and broad senior participation. Suitably authorized and configured, the commission could explore governance needs, promising approaches and potential pitfalls on key questions:

- What are the functional requirements for effectively addressing future proposals to use climate engineering, and ways to develop these over time?
- How can interactions between climate engineering and other climate responses be managed for a coherent and effective overall climate response?
- Finally, what forms of international response may be required by climate engineering research programs?

Works Cited

Bipartisan Policy Center. 2011. *Report of the Task Force on Climate Remediation Research*. Washington, DC: Bipartisan Policy Center. https://bipartisanpolicy.org/library/task-force-climate-remediation-research/.

Fuss, Sabine, Josep G. Canadell, Glen P. Peters, Massimo Tavoni, Robbie M. Andrew, Philippe Ciais, Robert B. Jackson, Chris D. Jones, Florian Kraxner, Nebosja Nakicenovic, Corinne Le Quéré, Michael R. Raupach, Ayyoob Sharifi, Pete Smith and Yoshiki Yamagata. 2014. "Betting on negative emissions." *Nature Climate Change* 4: 850–53. doi:10.1038/nclimate2392.

Hamilton, Clive. 2013. *Earthmasters: The Dawn of the Age of Climate Engineering*. New Haven, CT: Yale University Press.

Hulme, Mike. 2014. *Can Science Fix Climate Change? A Case Against Geoengineering*. Cambridge, UK: Polity Press.

Keith, David W. 2017. "Toward a Responsible Solar Geoengineering Research Program." *Issues in Science and Technology* 33: 3. http://issues.org/33-3/toward-a-responsible-solar-geoengineering-research-program/.

Keith, David W., Edward Parson and M. Granger Morgan. 2010. "Research on global sun block needed now." *Nature* 463 (7280): 426–27. doi:10.1038/463426a.

Morton, Oliver. 2015. *The Planet Remade: How Geoengineering Could Change the World*. Princeton, NJ: Princeton University Press.

National Research Council. 2015. *Climate Intervention: Reflecting Sunlight to Cool Earth*. Washington, DC: National Academies Press. https://doi.org/10.17226/18988.

Parson, Edward A. 2014. "Climate Engineering in Global Climate Governance: Implications for Participation and Linkage." *Transnational Environmental Law* 3 (1): 89–110. www.cambridge.org/core/services/aop-cambridge-core/content/view/S2047102513000496.

Parson, Edward A. and Lia N. Ernst. 2013. "International Governance of Climate Engineering." *Theoretical Inquiries in Law* 14 (1): 307–37.

Royal Society. 2009. *Geoengineering the Climate: Science, Governance and Uncertainty*. RS Policy document 10/09. London, UK: Royal Society.

Schäfer, S.; M. Lawrence, H. Stelzer, W. Born, W., eds. 2015. *The European Transdisciplinary Assessment of Climate Engineering (EuTrace): Removing Greenhouse Gases from the Atmosphere and Reflecting Sunlight away from Earth*. Potsdam, Germany: Institute for Advanced Sustainability Studies Potsdam. www.iass-potsdam.de/sites/default/files/files/rz_150715_eutrace_digital.pdf.

Solar Radiation Management Governance Initiative. 2012. *Solar radiation management: the governance of research*. www.srmgi.org/files/2016/02/SRMGI.pdf.

Thakur, Ramesh, Andrew F. Cooper and John English, eds. 2005. *International Commissions and the Power of Ideas*. Tokyo, Japan: United Nations University Press.

World Commission on Environment and Development. 1987. *Our Common Future*. Oxford, UK: Oxford University Press.

About the Author

Edward A. (Ted) Parson is Dan and Rae Emmett Professor of Environmental Law and co-director of the Emmett Institute on Climate and the Environment at the University of California, Los Angeles, where he studies international environmental law and policy, the role of science and technology in policy making, and the political economy of regulation. His articles have appeared in a wide range of journals, including *Science*, *Nature*, *Climatic Change*, *Issues in Science and Technology*, the *Journal of Economic Literature* and the *Annual Review of Energy and the Environment*. His books include *The Science and Politics of Global Climate Change* (with Andrew Dessler; Cambridge University Press) and *Protecting the Ozone Layer: Science and Strategy* (Oxford University Press), winner of the Sprout Award of the International Studies Association and widely recognized as the authoritative account of the development of international cooperation to protect the ozone layer. Ted has led and served on multiple advisory bodies, including National Academy of Sciences committees, the US Global Change Research Program and the Intergovernmental Panel on Climate Change, and has worked for the White House Office of Science and Technology Policy, the US Congress Office of Technology Assessment, the Privy Council Office of Canada, the UN Environment Program and the International Institute for Applied Systems Analysis. He holds degrees in physics from the University of Toronto and in management science from the University of British Columbia and a Ph.D. in public policy from Harvard University.

About CIGI

We are the Centre for International Governance Innovation: an independent, non-partisan think tank with an objective and uniquely global perspective. Our research, opinions and public voice make a difference in today's world by bringing clarity and innovative thinking to global policy making. By working across disciplines and in partnership with the best peers and experts, we are the benchmark for influential research and trusted analysis.

Our research programs focus on governance of the global economy, global security and politics, and international law in collaboration with a range of strategic partners and support from the Government of Canada, the Government of Ontario, as well as founder Jim Balsillie.

À propos du CIGI

Au Centre pour l'innovation dans la gouvernance internationale (CIGI), nous formons un groupe de réflexion indépendant et non partisan qui formule des points de vue objectifs dont la portée est notamment mondiale. Nos recherches, nos avis et l'opinion publique ont des effets réels sur le monde d'aujourd'hui en apportant autant de la clarté qu'une réflexion novatrice dans l'élaboration des politiques à l'échelle internationale. En raison des travaux accomplis en collaboration et en partenariat avec des pairs et des spécialistes interdisciplinaires des plus compétents, nous sommes devenus une référence grâce à l'influence de nos recherches et à la fiabilité de nos analyses.

Nos programmes de recherche ont trait à la gouvernance dans les domaines suivants : l'économie mondiale, la sécurité et les politiques mondiales, et le droit international, et nous les exécutons avec la collaboration de nombreux partenaires stratégiques et le soutien des gouvernements du Canada et de l'Ontario ainsi que du fondateur du CIGI, Jim Balsillie.

For more information, please visit www.cigionline.org.

CIGI Masthead

Centre for International Governance Innovation

67 Erb Street West
Waterloo, Ontario N2L 6C2, Canada
tel +1 519 885 2444 fax +1 519 885 5450
www.cigionline.org