# GREEN ENERGY: THE G20 VISION

## - T20 Energy Conference -

**HOSTED BY**

**Shanghai Institutes for International Studies (SIIS)**

**Korea Development Institute (KDI)**

**Centre for International Governance Innovation (CIGI)**

**FEBRUARY 24-25, 2017**

**Venue: SIIS, Shanghai**

# CONTENT

# GREEN ENERGY: THE G20 VISION
## - T20 Energy Conference -
**February 24-25, 2017**

## Welcome Letter

**Dear Participants,**

The Shanghai Institutes for International Studies (SIIS) takes a great pleasure in welcoming you to Shanghai. We feel highly pleased that you have agreed to attend our International Conference. As our distinguished guests, we try to make your stay as enjoyable as possible. If you encounter any problems during the stay, please do not hesitate to contact us. We provide some useful information as follows:

**1. Arrival and Departure**

For your arrival and departure, you can choose to take a taxi from the airport to the hotel venue. If you come from Shanghai Pudong International Airport, the cost for single trip taxi will be around 200RMB. If you come from Hongqiao Airport, the cost for single trip will be about 50RMB. SIIS will provide reimbursement to cover the taxi fee. **Please note our pick-up service will only be arranged at the request of participants in advance due to staff shortage.** Thanks for your understanding.

**2. Accommodation for Participants:**

Accommodation has been booked at the following hotel:

RAMADA PLAZA SHANGHAI CAOHEJING
509 Caobao Road, Shanghai, 200233
Tel: +86-21-54649999
http://www.ramadacaohejing.com/index.html

华美达新园酒店
上海徐汇区漕宝路 509 号，200233
电话：+86-21-54649999
网址：http://www.ramadacaohejing.com/index.html

**Internet:** There is free Wi-Fi at the ground floor and in all the rooms of the hotel.

**3. Venue of the Conference:**

The venue of the workshop will be at:

Shanghai Institutes for International Studies (SIIS)
Multifunctional Room, 1. Floor, SIIS Main Building
195-15 Tianlin Road, 200233 Shanghai

上海市田林路 195 弄 15 号
上海国际问题研究院主楼一层多功能会议室

**4. Bus Shuttle between Hotel and Conference Venue**

The organizers will provide a bus shuttle between the hotel and the conference venue. The bus will depart from the Hotel to the conference venue as following schedule:

**Friday, 24 February: 08:40 hrs**
**Saturday, 25 February: 08:40 hrs**

**5. Arrangements for Meals**

*Breakfast:* Your accommodation includes breakfast. Service hours for breakfast start from 06:00 hrs in All Day Dining Restaurant at the 1st floor (Chinese 2nd floor) of the Hotel.

**Thursday, 23 February**

Participants who arrive at the hotel can have dinner at the Xing Yuan Fang Restaurant, 1st Floor, Building B, Ramada Plaza. SIIS will cover up to 100RMB for the dinner in Xing Yuan Fang Restaurant.

**Friday, February 24**

**12:30-14:00 hrs: Lunch Buffet**
*Venue:* All-day-dining Restaurant, 2nd Floor, Ramada Plaza Caohejing, 509 Caobao Road

**18:00hrs: Dinner Banquet hosted by SIIS**
*Venue:* Xing Yuan Fang Restaurant, 1st Floor, Building B, Ramada Plaza Caohejing, 509 Caobao Road

**Saturday, 25 February**

**12:30 - 14:00 hrs: Lunch Buffet**
*Venue:* All-day-dining Restaurant, 2nd Floor, Ramada Plaza Caohejing, 509 Caobao Road

**6. Personal Costs**

Due to strict financial regulations, the organizers can only cover costs for accommodation and meals during the conference. Other costs such as *telephone bills, minibar, bar bills or costs, laundry and alike* are personal expenses and will have to be paid by you privately before checking-out.

Upon check-in, you may be asked by the hotel to leave a deposit (credit card assurance) for the coverage of personal costs.

**7. Staffs**

Dr. Yu Hongyuan, 13817577834
Ms. Wang Huijie, 18301703568

**8. Emergency**

Police: 110
Fire Alarm: 119
Ambulance: 120

# AGENDA

## International Conference

## GREEN ENERGY: THE G20 VISION
## - T20 Energy Conference -
## FEBRUARY 24-25, 2017

# GREEN ENERGY: THE G20 VISION

## - T20 Energy Conference -

**FEBRUARY24-25, 2017**
**Venue: SIIS, Shanghai**

Shanghai Institutes for International Studies (SIIS)
Lowy Institute for International Policy
Korea Development Institute (KDI)
Centre for International Governance Innovation (CIGI)

***PURPOSE AND GOALS***

This conference aims to improve mutual respect and understanding of pragmatic options for the G20 to enable realization of the Paris Agreement's goals. It will seek policy recommendations for 2017 G20 common actions and collaboration, with a direct policy brief and outcome paper for the T20. The German chairs of the T20 have requested a policy brief that contains recommended concrete policy actions that are implementable by the G20.

***MAJOR THEMES***

Session I: Energy-Climate Governance and the 2030 Agenda (SDGs)
Session II: The optimists' case for "muddling through"
Session III: Green Finance – G20 actions to catalyse green investments
Session IV: "Unburnable Carbon" – the case for banning the extraction of fossil fuel beyond the carbon budget (with or without compensation for stranded assets)
Session V: Sustainable Infrastructure – Smart and Quality Infrastructure for Current and Future Generations
Wrap-up Session: Policy Brief for 2017 G20: "Greening Global Energy"

***BACKGROUND***

Climate change presents the world with an array of shared economic, resource, environmental and energy challenges, which have generated a perceptible shift of the green energy development model for all G20 countries. The associated dangers, relating to water, energy and food have also emerged as top global challenges. G20 has and will continue to struggle to promote green development. Green energy is central to the G20's leading role for implementation of the Paris Agreement.

The Paris Agreement has officially launched a new phase for the mitigation of GHG emissions after 2020. Paris incorporates the developing countries in mandatory cuts in greenhouse gases with the principle of "common but differentiated responsibilities" (CBDR), establishing the framework of Intended Nationally Determined Contributions (INDCs) and international institutions to combat climate change in post 2020. The Paris Agreement covered factors including mitigation,

adaption, finance, technology, capability building, and transparency etc. Under this agreement framework, some new dynamics will impact global climate governance. A new sustainable development mechanism was created (Article 6, section 4) .

As the first step for G20 2016, to promote implementation of the Paris agreement, the G20 should enhance green energy cooperation and development, and encourage all G20 countries to embark on the path towards a Non-carbon economy. The G20 countries can work together for pragmatic and effective commitments on a global emissions vision and green energy growth associated with the "common but differentiated" and INDC principle, and should also shift global attention to cope with climate change by green technology and carbon market measures.

***CONTACT***


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|---|---|
| **YU Hongyuan**<br>Director of Institute for Comparative Politics and Public Policy Studies<br>Shanghai Institutes for International Studies<br>195-15 Tianlin Road, Shanghai 200233, China<br>T: +86 21 54614900×8507<br>M: 13817577834<br>Fax: +86 21 6485 0100<br>Email: yuhongyuan@siis.org.cn | **WANG Huijie**<br>Shanghai Institutes for International Studies<br>195-15 Tianlin Road Shanghai 200233, China<br>T: +86 21 5461 4900 ×8622<br>M: 18301703568<br>F: +86 21 6485 0100<br>Email: wanghuijie@siis.org.cn |

*MAIN SCHEDULE*

| **24 February, 2017**<br>**09:00-09:40**<br>**Opening and Remarks: Energy-Climate Governance and the 2030 Agenda (SDGs)** |
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| **Chair: YE Jiang**, Senior Fellow, Shanghai Institutes for International Studies (SIIS)<br>**Welcome Remarks: YANG Jian**, Vice-President, Shanghai Institutes for International Studies (SIIS)<br>**Remarks:**<br>**GOU Haibo,** Special Representative for Climate Change Negotiations, Ministry of Foreign Affairs, China<br>**SUN Xiansheng**, Secretary General, International Energy Forum (IEF)<br>**Amar Bhattacharya,** Senior Fellow, Global Economy and Development, Brookings Institution<br>*Time: Every Speaker 10 minutes |
| **09:40-10:00**<br>**Group Photo and Tea Break** |

| **10:00-11:00**<br>**Session I: The Case for "Muddling Through"** | |
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| Issues to be discussed | -Prospects for carbon pricing to sufficiently discourage consumption and production so that no other actions are needed.<br>-Prospects for Institutional Innovation and Information Networks Building contributing to substantial increases in efficiency.<br>-Prospects that we will be saved by technological progress.<br>-Prospects that climate engineering will relieve the pressure. |
| Moderator | **YU Hongyuan,** Professor and Director of Public Policy, SIIS |
| Panelists | **GAO Shixian,** Deputy Director, Energy Research Institute, National Development and Reform Commission (NDRC), China<br>**ZOU Ji,** Deputy Director General of National Center of Climate Change Strategy and International Cooperation<br>**Barry Carin**, Senior Fellow, CIGI<br>**Peter Saundry,** Adjunct Professor of Energy, Johns Hopkins |

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| | University<br>* Time: Every Speaker 10 minutes |
| **11:00-11:10**<br>**Tea Break** | |

| **11:10- 12:10**<br>**Session II: Green Finance** | |
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| Issues to be discussed | -G20 actions to promote innovations in the financial sector |
| Moderator | **LIM Wonhyuk,** Korea Development Institute (KDI) |
| Panelists | **Tom Heller,** Stanford & Climate Policy Initiative Board Chair and Senior Strategic Advisor<br>**R. Andreas Kraemer,** Founder of Ecologic Institute, and Senior Fellow at CIGI and IASS Potsdam<br>**CHAI Qimin,** Director, International Cooperation Department, National Center for Climate Change Strategy and International Cooperation (NCSC), National Development and Reform Commission (NDRC)<br>*Time: Every Speaker 10 minutes |

| **12:10-14:00**<br>**Lunch Break** | |
|---|---|
| **14:00-15:30**<br>**Session III: Unburnable Carbon** | |
| Issues to be Discussed | -The consequences of a hard cap on carbon emissions on stranded assets, with or without compensation.<br>-Ideas to accelerate removal of exploration subsidies and other inefficient fossil fuel subsidies.<br>-Impacts on the energy and financial sectors. |
| Moderator | **ZHAI Yongping**, Senior Advisor, Energy Sector Group, Asian Development Bank |

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| Panelists | **Thijs van den Graaf**, Assistant Professor, Ghent Institute for International Studies, Ghent University<br>**QI Ye,** Senior fellow and director of the Brookings-Tsinghua Center for Public Policy<br>**ZHU Songli,** Senior Fellow, Energy Research Institute(ERI), National Development and Reform Commission (NDRC)<br>**Daniel Garrett**, Senior Associate, The Asia Institute<br>*Time: Every Speaker 10 minutes |
| **15:30-15:40**<br>**Tea Break** | |

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| **15:40-17:10**<br>**Session IV: Sustainable Infrastructure** | |
| Issues to be discussed | -How to build smart and quality infrastructure for current and future generations.<br>-Capacity building and institution building in the construction and operation of sustainable infrastructure. |
| Moderator | **Amar Bhattacharya,** Senior Fellow, Global Economy and Development, Brookings Institution |
| Panelists | **Narendra Taneja,** Chairman, Energy Security Group, Federation of Indian Chambers of Commerce and Industry (FICCI)<br>**SHI Xunpeng,** Principal Research Fellow, Australia-China Relations Institute (ACRI), University of Technology Sydney<br>**WANG KE,** Research Fellow, National Academy of Development and Strategy, Renmin University of China<br>**Anna Pegels**, Senior Researcher, German Development Institute / Deutsches Institut für Entwicklungspolitik (DIE)<br>**Dan Guttman,** Fellow, the Centre for Advanced Governmental Study, Johns Hopkins University<br>* Time: Every Speaker 10 minutes |
| **18:00**<br>**Reception – Dinner** | |

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| **25 February, 2017**<br>**09:00-10:10**<br>**Session V: Policy Brief for 2017 G20: "Greening Global Energy"**<br>**Policy Recommendation for 2017 G20 on Improving Global Energy Governance** | |
| Issues to be discussed | -How to construct a 3000-word Policy Brief with a one sentence Teaser,100-200 words on the Challenge (summary of the problem that our recommendation is meant to address);<br>-A 1000-2500 words summary of our policy proposal options, containing recommendations and rationale on means to implement the proposals: and a list of background literature. |
| Moderator | **Barry Carin, Senior Fellow, CIGI** |
| Panelists | **Misako Takahashi**, Director, Economic Security Division, Ministry of Foreign Affairs, Government of Japan<br>**Wonhyuk Lim**, KDI, Director of Global Economy Research,<br>**XU Qinhua**, Professor and Director, International Energy Research Center, Renmin University, China.<br>* Time: Each Speaker 10 minutes |
| **10:10-10:20**<br>**Tea Break** | |
| **10:20-11:50**<br>**ROUNDTABLE** | |
| **11:50-12:10**<br>**Closing Remarks** | |
| **Chair: Barry Carin**, Senior Fellow, Centre for International Governance Innovation<br>**Remarks:**<br>**YU Hongyuan**, Professor and Director of Public Policy, SIIS<br>**Amar Bhattacharya,** Senior Fellow, Global Economy and Development, Brookings Institution<br>**Wonhyuk Lim**, Director of Global Economy Research, Korea Development Institute | |

# Participant List

## International Conference

## GREEN ENERGY: THE G20 VISION
## - T20 Energy Conference -
## FEBRUARY 24-25, 2017

* Names in alphabetical order

| Surname, Name | Affiliation |
|---|---|
| Bhattacharya, Amar | Senior Fellow, Global Economy and Development, Brookings Institution |
| Carin, Barry | Senior Fellow, Centre for International Governance Innovation |
| CHAI, Qimin | Director, International Cooperation Department, National Center for Climate Change Strategy and International Cooperation (NCSC), National Development and Reform Commission (NDRC) |
| FANG, Yuan | Deputy Directior, Department of Treaty and Law, Ministry of Foreign Affiairs, China |
| GAO, Shixian | Deputy Director, Energy Research Institute, National Development and Reform Commission (NDRC), China |
| Garrett, Daniel | Senior Associate, The Asia Institute |
| GOU, Haibo | Special Representative for Climate Change Negotiations, Ministry of Foreign Affairs, China |
| Guttman, Dan | Fellow, the Centre for Advanced Governmental Study, Johns Hopkins University |
| Heller, Tom | Stanford & Climate Policy Initiative Board Chair and Senior Strategic Advisor |
| Kraemer, R. Andreas | Founder of Ecologic Institute, and Senior Fellow at CIGI and IASS Potsdam |
| LI, Xinlei | Associate Professor & Deputy Director in the Environmental Politics Research Institute, Shandong University |
| LI, Yanfei | Energy Economist, Economic Research Institute for ASEAN and East Asia |
| Lim, Wonhyuk | Professor, KDI School of Public Policy and Management |
| Pegels, Anna | Senior Researcher, German Development Institute / Deutsches Institut für Entwicklungspolitik (DIE) |
| QI, Ye | Senior fellow and director of the Brookings-Tsinghua Center for Public Policy |
| Saundry, Peter | Senior Fellow, National Council for Science and the Environment Adjunct Professor of Energy, Johns Hopkins University |
| SHI, Xunpeng | Principal Research Fellow, Australia-China Relations Institute (ACRI), University of Technology Sydney |
| SUN, Xiansheng | Secretary General, International Energy Forum (IEF) |
| Suranovic, Steven | Associate Professor of Economics and International Affairs, The George Washington University |

| | |
|---|---|
| Takahashi, Misako | Director, Economic Security Division, Ministry of Foreign Affairs, Government of Japan |
| Taneja, Narendra | Chairman, Energy Security Group, Federation of Indian Chambers of Commerce and Industry (FICCI) |
| Van den Graaf, Thijs | Assistant Professor, Ghent Institute for International Studies, Ghent University |
| WANG, Ke | Research Fellow, National Academy of Development and Strategy, Renmin University of China |
| WANG, Lifen | Deputy Director, European and American affairs division of International Cooperation Department, China National Energy Administration |
| XU, Qinhua | Professor and Director, International Energy Research Center, Renmin University, China. |
| YANG, Jian | Vice-President, Shanghai Institutes for International Studies |
| YE, Jiang | Senior Fellow, Shanghai Institutes for International Studies |
| YU, Hongyuan | Director and Professor, the Institute for Comparative Politics and Public Policy, Shanghai Institutes for International Studies |
| ZHAI, Yongping | Senior Advisor, Energy Sector Group, Asian Development Bank |
| ZHANG, Haibing | Director of the Institute for World Economy Studies, Shanghai Institutes for International Studies (SIIS) |
| ZHANG, Yuncheng | Director of World Economic, CICIR |
| ZHU, Songli | Senior Fellow, Energy Research Institute(ERI), National Development and Reform Commission (NDRC) |
| ZHUANG, Jianzhong | Deputy Director of International Energy Research Center, Professor of the School for International and Public Affairs, Shanghai Jiao Tong University |
| ZOU, Ji | Professor, School of the Environment and Natural Resources, Renmin University of China |

## Bhattacharya, Amar

**Senior Fellow, Global Economy and Development, Brookings Institution**

**Amar Bhattacharya** is senior fellow at the Global Economy and Development Program at Brookings Institution. His focus areas are the global economy, development finance, global governance, and the links between climate and development. From April 2007 until September 2014 he was Director of the Group of 24, an intergovernmental group of developing country Finance Ministers and Central Bank Governors. In that capacity he led the work program of the Group, supported the deliberations of the Ministers, and was the principal point of interface with other organizations including the G20. He has therefore been an active participant in the global economic discussions and a key representative of the views of developing countries.

Prior to taking up his position with the G24, Mr. Bhattacharya had a long-standing career in the World Bank. His last position was as Senior Advisor and Head of the International Policy and Partnership Group. In this capacity, he was the focal point for the Bank's engagement with key international groupings and institutions such as the G7/G8, G20, IMF, OECD and the Commonwealth Secretariat. Through these different positions Mr. Bhattacharya has had a long standing engagement in research and policy discussions on the global economy and spillovers, international financial architecture, development financing and the global governance agenda including on the role and reform of the international financial institutions. He completed his undergraduate studies at the University of Delhi and Brandeis University and his graduate education at Princeton University.

## Carin, Barry

**Senior Fellow, Centre for International Governance Innovation**

**Barry Carin**, Ph.D. Economics, Brown University, has had several Canadian government positions including Treasury Board (Director of Evaluation); Assistant Deputy Minister (Strategic Planning) in the Employment Ministry; Assistant Deputy Minister, (Trade and Economic Policy) in the Foreign Ministry; G7 Foreign Affairs Sous Sherpa; and Canadian High Commissioner to Singapore. He was the Associate Director of the Centre for Global Studies at the University of Victoria. He was an editor of the journal Global Governance. He conducts research on future directions for international development, the institutions and processes of the G20, global climate change policy, governance of the Internet; and on the impacts of Western and Chinese cultures on foreign policy. In his spare time he is writing a book on humour as a management tool.

## CHAI, Qimin

**Director of International Cooperation Department, National Center for Climate Change Strategy and International Cooperation**

**Dr. Chai Qimin** now is the chief of International Cooperation Department in National Center for Climate Change Strategy and International Cooperation (NCSC), National Development and Reform Commission (NDRC), and adjunct professor of Research Center for Contemporary Management (RCCM) in Tsinghua University and Guizhou Institute of Technology. He currently serves as the delegate of Chinese Government Delegation of UN Climate Negotiations, and advisor of local governments for Low Carbon City and Emission Trading Scheme Pilots, columnist of China Daily and Caixin Finance.

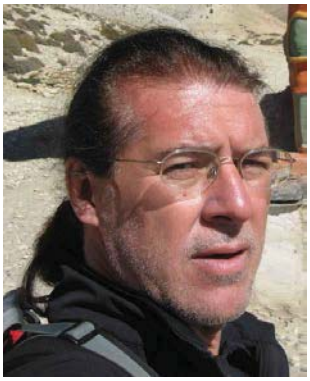
His professional activities and publications focus on green finance and investment, new energy and climate change economics, carbon factor and market theory, climate equity and security integrated assessment. He once worked in Tsinghua University since 2005, primarily in charge of the energy, environment and economy modeling development, so called Integrated Assessment Model for Global Change (IAMC). He was formerly the assistant professor of management science and engineering in Institute of Energy, Environment and Economy, the co-director of Tsinghua-MIT Program on Energy and Climate Change Modeling, and the fellow of Institute of Nuclear and New Energy Technology, China Automotive Energy Research Center and the Laboratory of Low Carbon Energy, Tsinghua University. He was also a visiting professor in the College of Engineering, Energy Modeling Forum at Stanford University, and the Joint Global Change Research Institute of Pacific Northwest National Laboratory and the University of Maryland under Department of Energy (DOE) from 2008 to 2009. He came to NCSC as deputy director of Strategy and Planning Department since it found in 2012.

## GAO, Shixian

**Deputy Director General and Research Professor of Energy Research Institute,**
**National Development and Reform Commission, China**

**Mr. GAO Shixian** is the deputy director general and research professor of Energy Research Institute, National Development and Reform Commission, P.R. China. He is a standing boarding member of China Law Energy Research Association; a boarding member of China Energy Research Society (CERS).

He has been engaged in energy research focused on energy outlook, energy security and international cooperation, as well as energy policies /strategies since 1987. He has published many articles in Peoples' Daily, Economy Daily, China's Energy, The research of Macro-economy, China's Electricity, etc.; and published many books as an author or co-author, such as "Research on Pushing Revolution of energy Production and Consumption", "Strategy of Regional Energy Cooperation in Northeast Asia", "Energy Security Strategy", "China energy consumption structure change tendency and adjustment countermeasure", " research on energy strategy in the progress of well-off society in China", "The long-term energy strategy in China", "The research on energy development strategy and policy in China", "Rethinking Energy Security in East Asia", "Integrated Assessment of Sustainable Energy Systems in China" etc.



## Garrett, Daniel

**Senior associate, the Asia Institute**

**Daniel H. Garrett** is a retired U.S. Department of State diplomat. His areas of expertise include transboundary water issues, climate change mitigation and adaptation, water security, and human rights. He is currently an independent consultant and senior associate at The Asia Institute. is personal interests include mountain climbing, music composition, and literature.

**Recent books include "The Sustenance of Words"**
https://www.amazon.com/Sustenance-Words-Selected-Essays-2009-2016-ebook/dp/B01N1ZIFK
/ref=sr_1_1?s=digital-text&ie=UTF8&qid=1487077252&sr=1-1&keywords=the+sustenance+of+words

And **"Chronicles of a New Tibet"**
https://www.amazon.com/Entanglement-Chronicles-New-Tibet-Book-ebook/dp/B01DJXQ2W4/ref=sr_1_1?s=digital-text&ie=UTF8&qid=1487077314&sr=1-1&keywords=Chronicles+of+a+New+Tibet

## GOU, Haibo

**Special Representative for Climate Change Negotiations, Ministry of Foreign Affairs, China**

**Mr.Gou Haibo** holds Bachelor of Legal Studies (1993) and Juris Master (1996) from Jilin University.Mr. Gou Haibo is an experienced diplomat and international lawyer. He joined Ministry of Foreign Affairs of China in 1996. Since then, he has worked in Commissioner's Office of MFA in Hong Kong Special Administrative Region as Second Secretary (2000-2003), Department of Treaty and Law of MFA as Deputy Director and Director (2003-2012),Embassy of China in the Netherlands as Legal Adviser and Counselor(2012-2016). He was appointed Special Representative for Climate Change Negotiations of MFA in 2016.

Mr. Gou Haibo has participated extensively in multilateral negotiation processes, especially in environmental, oceanic related fields. He was member of the Chinese delegation to the Conferences of States Parties to the Convention on Biological Diversity, Conferences of States Parties to the United Nations Convention to Combat Desertification (2004-2007), Antarctic Treaty Consultative Meetings (2004-2010), meetings of States Parties to the UNCLOS (2009-2012), meetings of the Hague Conference on Private International Law (2012-2015). He was the head of the Chinese delegation to meetings of Arctic Council (2007-2010), the United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea, UNGA meetings negotiating annual resolution on the law of the sea (2007-2011). He attended the 22$^{nd}$ Conference of Parties to UNFCCC as deputy head of Chinese delegation in 2016.

## Guttman, Dan

**Fellow, the Centre for Advanced Governmental Study, Johns Hopkins University**

**Dan Guttman** served in the Administration of President Clinton as Executive Director of the Presidential Advisory Commission on Human Radiation Experiments (report published by Oxford University Press; 1996), was appointed by President Clinton to serve as a Commissioner of the U.S. Occupational Safety and Health Review Commission, was special counsel to U.S. Senate investigations and reports on U.S. environmental and energy management, and has been UNDP adviso in the development of China environmental law.

At Johns Hopkins University he is a Fellow at the Center for Advanced Governmental Study; he teaches environmental governance as clinical Professor at New York University Shanghai, is visiting Professor at the Peking University Law School clinic, coordinates China programs for the U of California Santa Barbara Bren School of environmental science and management, and has taught China/US environmental governance at the Johns Hopkins engineering school and Nanjing University environment schools.

He was partner in a law firm (Spiegel & McDiarmid) that pioneered in application of antimonopoly law to the electric industry. He represented workers in litigation leading to Congressional enactment of the 2000 U.S. Nuclear Workers Compensation and 1986 Asbestos in Schools laws, litigation leading to court finding that the privatization of the US Enrichment Corporation was a model of how not to privatize, and litigation leading to US government moratorium on recycling of nuclear weapons waste for commercial use. He represented whistleblowers in litigations resulting in hundreds of millions of dollars of recovery by the U.S. from oil companies and military contractors.He co-authored The Shadow Government (Pantheon: 1976), recognized as a seminal study of the “contracting out” of U.S. government, many further books and articles, has testified many times before the US Congress and other public bodies, shared in journalism awards, most recently for a study of $900 billion in Pentagon contracting, is a Fellow of the U.S. National Academy of Public Administration, and was graduated from the Yale Law School.

## Heller, Tom

**Stanford & Climate Policy Initiative Board Chair and Senior Strategic Advisor**

**Thomas Heller** has served as Executive Director of a non-governmental analysis group, the Climate Policy Initiative (CPI), from September 2009. From April 1, 2016 Heller will serve as non-Executive Board Chair, Senior Strategic Advisor, and Program Director of the Advisory Finance Group.

Since 1979, Heller has been professor at Stanford University, where he has served as the Shelton Professor of International Legal Studies, Senior Fellow at the Stanford Freeman Spogli Institute for International Studies and Senior Fellow at the Woods Institute for the Environment. An expert in law, economic development and the performance of legal institutions, Thomas C. Heller has focused his research on the rule of law, international climate control, global energy use, and the interaction of government and nongovernmental organizations in establishing legal structures in the developing world.

Beginning in 1991, Heller has been increasingly engaged in research and applied policy studies in energy and climate, with a principal concern with developments in China, India, Mexico, Brazil and other leading emerging markets. He has been a contributing lead author for the IPCC on the Third and Fourth Assessment Reports, as well as a contributor to the Special Reports on Technology Transfer and Emissions Scenarios.

Beginning in 2008, Heller was a core team member directing Project Catalyst—an analysis based project in support of the Copenhagen Climate process. He has acted as advisor on climate change to the Secretary General of the United Nations and worked with the Secretary-General's High Level Commission on Climate Finance as Sherpa to George Soros. From 2010-2012, Professor Heller also acted as the Vice-Chair of the Governing Board of the Global Green Growth Institute, with headquarters in Seoul, Korea.

## Kraemer, R. Andreas

**Founder of Ecologic Institute, and Senior Fellow at CIGI and IASS Potsdam**

**R. Andreas Kraemer** is Founder & Director Emeritus of Ecologic Institute in Berlin, Germany and Founding Chairman (pro bono) of Ecologic Institute US in Washington DC. He is currently Senior Fellow at the Institute for Advanced Sustainability Studies (IASS) in Potsdam, Germany, Senior Fellow at the Centre for International Governance Innovation (CIGI) in Waterloo, Ontario, and Visiting Assistant Professor of Political Science and Adjunct Professor of German Studies at Duke University. In 2017, he became a non-executive Director of the new Fundação Oceano Azul in Lisbon, Portugal. In 2015, he was Visiting Scholar at the Massachusetts Institute of Technology (MIT), Center for Energy and Environmental Policy Research (CEEPR). His research focuses on the role and functions of science-based policy institutes or "think tanks" in theory and the practice in different political systems, the interactions among policy domains and international relations, and global governance on environment, resources, climate and energy.

## LI, Xinlei

**Associate Professor in School of Political Science and Public Administration**

**Deputy Director in the Environmental Politics Research Institute, Shandong University**

**Dr. Li Xinlei** is an Associate Professor in School of Political Science and Public Administration and Deputy Director of the Environmental Politics Research Institute, Shandong University. She received her doctoral degree in Environmental Policy Research Center& Center for Global Politics, Free University of Berlin, Germany. She specializes in studying energy and environment policy, with a particular focus on renewable energy policy, climate diplomacy and transnational municipal climate networks (TMCNs). Currently, she has extended her research interests to transnational river basin governance, water diplomacy, and environmental risk governance. She has authored one book titled *Renewable Energy Policy Change in China: Interlinking the Climate Change Regime and Domestic Pro-Renewable Energy Coalition* (2016) and translated one book *Environmental Governance in Global Perspective New Approaches to Ecological Modernization* (authored by Martin Jänicke and Klaus Jacob) in 2011. She has published a dozen of book chapters and journal papers, such as “China: From a Marginalized Follower to an Emerging Leader in Climate Politics”, in Rüdiger Wurzel, James Connelly and Duncan Liefferink (eds.) *The European Union in International Climate Change Politics:Still Taking a Lead?* (Routledge 2017);”Conflict or Cooperation? The Governance Approach and Mechanism of Transnational Rivers” in *Foreign Affairs Review* (2016) and” The Action Logic of Transnational Municipal Networks (TMNs) in the Global Climate Governance” in *International Review* (2015). Till present, she has hosted 6 national and provincial level projects, such as "Research on China Clean Energy Diplomacy Strategy "and "Strategic Research of China's Peripheral Water Diplomacy Within the Framework of ‘Belt And Road Initiatives’".

## LI, Yanfei

**Energy Economist**

**Economic Research Institute for ASEAN and East Asia**

**Dr Yanfei Li** is an Energy Economist of the Economic Research Institute for ASEAN and East Asia (ERIA). He specializes in energy markets, energy policy, and economics of technological change, serving the interests of both academic and public sectors. Dr Li's current research covers oil prices, regional natural gas trade and market integration, regional power infrastructure planning and electricity trade, economic and environmental assessment of energy technologies, and energy-economy-environment modelling. His academic research appears on top journals such as Energy Economics and Energy Policy. He also regularly contributes opinion articles to public media such as South China Morning Post and the Diplomat. He acquired PhD in Economics from Nanyang Technological University in Singapore and Bachelor's degree in Economics from Peking University in Beijing.

## Lim, Wonhyuk

**Professor, KDI School of Public Policy and Management**

**Wonhyuk Lim** is Professor at the KDI School of Public Policy and Management. Since he joined KDI in 1996, his research has focused on state-owned enterprises and family-based business groups (chaebol). He has also written extensively on development issues, in conjunction with policy consultation projects under Korea's Knowledge Sharing Program (KSP). After the 2002 Presidential Election in Korea, he worked for the Presidential Transition Committee and the Presidential Committee on Northeast Asia and helped to set policy directions for the restructuring of the electricity and gas sector and for Northeast Asian energy cooperation. Dr. Lim was at Brookings as a CNAPS Fellow for 2005-06.

After returning to KDI in 2007, he became Director of the Office of Economic Development Cooperation, precursor to the Center for International Development. He received a Presidential order from the Dominican Republic for his KSP consultation work. In 2010, Dr. Lim helped to formulate the G20 Seoul Development Consensus for Shared Growth. In 2013, he became Vice President and Director of Department of Competition Policy at KDI. In 2014-15, he served as the inaugural Executive Director of the Center for Regulatory Studies. His publications include The Korean Economy: From a Miraculous Past to a Sustainable Future (Harvard, 2015, co-authored) and Global Leadership in Transition: Making the G20 More Effective and Responsive (Brookings and KDI, 2011, co-edited). He received a B.A.S. in Physics and History and a Ph.D. in Economics from Stanford University.

## Pegels, Anna

**Senior Researcher, German Development Institute / Deutsches Institut für Entwicklungspolitik (DIE)**

**Anna Pegels** is senior researcher and research team leader at the German Development Institute / Deutsches Institut für Entwicklungspolitik (DIE), one of the leading research institutions and think tanks for global development worldwide. At DIE, she has co-built and led the DIE research cluster on the transition to clean energy systems, including several research project leads. Her profile combines strong research and teaching abilities with practical policy advice experience.

## QI, Ye

**Senior fellow and director of the Brookings-Tsinghua Center for Public Policy**

**Dr. Ye Qi** is Cheung Kong Professor of Environmental Policy at Tsinghua University School of Public Policy and Management, Senior Fellow at Brookings Institution, and Director of Brookings Tsinghua Center for Public Policy. Before he returned to China, he taught Environmental Science, Policy and Management at University of California, Berkeley from 1996 through 2003. Dr. Qi received his Ph.D. in Environmental Science in 1994 from State University of New York College of Environmental Science and Forestry and from Syracuse University, and conducted research at University of California, San Diego and Cornell University. Dr. Qi's research focuses on climate and environmental policy and governance. He publishes extensively on climate change science and environmental policy. His books include on "Environmental Governance in China", and five volumes of "Annual Review of Low Carbon Development".

## Saundry, Peter

**Senior Fellow, National Council for Science and the Environment**
**Adjunct Professor of Energy,**
**Johns Hopkins University**

**Dr. Saundry** is a Senior Fellow of the National Council for Science and the Environment and Adjunct Professor of Energy at Johns Hopkins University. Dr. Saundry received his Ph.D. in Physics from the University of Southern California (1991). An expert in energy and environmental science, technology, policy and law, Professor Saundry teaches energy law and policy at Johns Hopkins University. Dr. Saundry was the Editor of a special Food-Energy-Water Nexus issue of the Journal of Environmental Studies and Science (March, 2016) and is the Editor and coauthor of a forthcoming book on the Nexus. Dr. Saundry manages the American Chemical Society AltSep project to develop a Roadmap to advance less energy-intensive chemical separation processes. Dr. Saundry was Executive Director of the National Council for Science and the Environment (1993-2015) and a Congressional Science Fellow with the U.S. Senate Appropriations Committee (1991-1992), where he was a key advisor issues related to the National Science Foundation, NASA, and the Environmental Protection Agency. Dr. Saundry has made notable contributed to a wide range of energy and environmental topics including energy systems, climate change, coal, environment and security, environmental disasters, oceans, government investment in research and development, international cooperation, education, and the food-energy-water nexus.


## SHI, Xunpeng

**Principal Research Fellow, Australia-China Relations Institute (ACRI), University of Technology Sydney**

**Xunpeng Shi** is a Principal Research Fellow at the Australia-China Relations Institute, University of Technology Sydney and an Adjunct Senior Research Fellow at the Energy Studies Institute (ESI), National University of Singapore. He is also serving as President of the Chinese Economics Society Australia (CESA) and an Associate Editor of *Journal of Management for Modelling*. In addition, Xunpeng is also a member of ERIA Multilateral Join Workshop on LNG in East Asia, and an external consultant of Asian Development Bank (ADB) on energy policy and UN ESCAP on regional energy connectivity. Previous he has been working in Singapore, Brunei and Indonesia on energy policy with an ASEAN and East Asian focus. Prior to starting his PhD study in 2006, Xunpeng had various management and professional positions in China's leading energy institutes and central government agencies. In recent years, his researches have been published in leading international peer reviewed journals including Applied Energy, Energy Economics, Energy Policy, and Environmental and Development Economics. His areas of expertise include natural gas pricing, energy market integration and connectivity, renewable energy, energy efficiency with a regional focus of ASEAN, and Northeast Asia, and the Chinese economy. Xunpeng is active in the East Asia's energy community, and a frequent speaker on China, ASEAN and East Asia energy issues. He graduated with PHD and Master degrees from the Australian National University, a LLM degree from University of Dundee (under Chevening Scholarship), and a Bachelor degree from China University of Mining and Technology.

## SUN, Xiansheng

**Secretary General, International Energy Forum (IEF)**

Prior to his election, **Dr Sun** was the President of China National Petroleum Corporation's (CNPC) Economics and Technology Research Institute (ETRI) where he lead a team of over 370 staff members. Reporting to the Chinese leadership on energy policy decision making, including energy security strategies, "3E" (Energy, Environment, Economy) program development, low-carbon energy mix optimization, "three steps" of Chinese gas pricing reforms, and international energy cooperation. Dr Sun was deeply involved in the Chinese energy five-year planning process and many other major policies. Dr Sun also served as chief editor of ETRI's "Oil & Gas Industry Development Report" and the first "China Energy Data & Statistics" reports.

With more than 30 years of experience in the oil & gas industry, Dr Sun has accumulated practical industry experience in oil & gas production, trading and pipeline construction. In previous roles he has served as Director of the Legal & Contract Department of CNPC International Cooperation Bureau, Vice President of CNODC (China National Exploration and Development Company), Chairman of JOC and President of Greater Nile Petroleum Operating Company CNPC and also President of PetroDar company (during which the company found and developed Phalouge Oilfield, one of the largest oilfields in South Sudan). As Chairman of Saining Corporation CNPC, Dr Sun was in charge of CNPC petroleum trading in London. Dr Sun also served as Chairman of the CNPC subsidiary companies in Azerbaijan and Uzbekistan, and as Chairman and Chief Negotiator of China Kazakhstan Oil Pipeline Co. Moreover, as a representative of the Chinese government, Dr Sun participated in the dialogue with OPEC and worked as chief coordinator in setting and revising production sharing contracts both for crude oil and unconventional gas for CNPC, and participated in three bidding rounds for CNPC onshore blocks. Dr Sun holds an LLM and Ph.D from the Centre for Energy, Petroleum and Mineral Law and Policy (CEPMLP), University of Dundee, UK.

## Suranovic, Steven

**Associate Professor of Economics and International Affairs, The George Washington University**
**Institute of International Economic Policy**
**Elliott School of International Affairs Director, GW Global Bachelor's Program**

**Professor Steven Suranovic** received his BS in mathematics from the University of Illinois at Urbana/Champaign and his M.S. and PhD in economics from Cornell University. He has been a faculty member at the George Washington University since 1988. He also teaches regularly as an adjunct for Cornell University's Washington DC program. In Fall 2002, he taught at Sichuan University in Chengdu, China as a visiting Fulbright lecturer. Professor Suranovic teaches principles of microeconomics, international trade and international finance theory and policy.

His research interests include international trade policy analysis, fairness in international trade and the behavioral economics of cigarette addiction and dieting. He has spoken to business, government and academic audiences in Japan, Malaysia, the Philippines, China and Mongolia as part of the US State Department speaker's programs.

Professor Suranovic has published in numerous academic journals, including the *Journal of International Economics*, the *Canadian Journal of Economics*, *World Economy*, and the *Journal of Health Economics*. His books include:

- *A Moderate Compromise: Policy Choice in an Era of Globalization*, Palgrave-Macmillan, January 2011, which offers a critique of current methods of policy evaluation and choice and suggests a simple, principled, and moderate alternative, and
- *International Trade: Theory and Policy*, Flat World Knowledge, 2015, an international trade textbook.
- *International Finance: Theory and Policy*, Flat World Knowledge, 2015, an international finance textbook.

## Takahashi, Misako

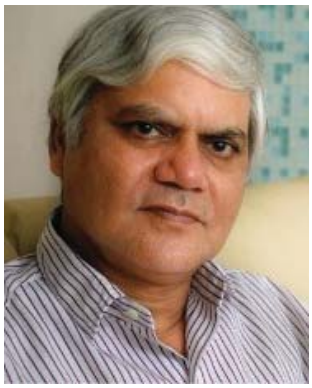
**Director, Economic Security Division of Ministry of Foreign Affairs,**
**Government of Japan**

**Ms Takahashi** leads the division in charge of economic security issues such as energy, food, minerals, among others at the Ministry of Foreign Affairs of Japan. She often represents the Government of Japan at the international meetings including G7 and G20 for energy and food security matters.

Prior to her current work at the Japanese Ministry of Foreign Affairs, Ms Takahashi was Division Head of Asia Pacific and Partnerships (formerly, Asia Pacific and Latin America Division) at the International Energy Agency (IEA) in Paris from October 2013 to July 2016. During this period, Ms Takahashi was in charge of the IEA's global engagement with emerging countries such as China, Indonesia, Thailand, Singapore, India, Brazil, Mexico and others, as well as regional partnerships such as APEC, EAS, ASEAN, UN and others.

Ms Takahashi has worked for the Japanese diplomatic service for more than 20 years. Most recently, she was a Minister-Counsellor at Japanese Embassy in Baghdad, from 2012-2013 and co-chaired the Iraq-Japan ODA monitoring committee with a Chairman of Prime Minister's advisory committee and former oil minister of Iraq. She was also a chairperson for Working Party for Domestic Regulation under WTO's Doha trade round from 2009-10 in Geneva and led the multilateral negotiation on easing the domestic barriers to services trade during the period.

Ms Takahashi studied law at Tokyo University in Japan and has M.A. from London University. She speaks and communicates in English, Arabic, Bahasa, French and Chinese, in addition to Japanese. Ms Takahashi studied law at Tokyo University in Japan and has M.A. from London University. She speaks and communicates in English, Arabic, Bahasa, French and Chinese, in addition to Japanese.



## Taneja, Narendra

**Chairman, Energy Security Group,**
**Federation of Indian Chambers of Commerce and Industry (FICCI)**

**Mr Narendra Taneja** is Chairman of the Energy Security Group of the Federation of Indian Chambers of Commerce and Industry (FICCI). He is also Founder President of the World Energy Policy Summit.

He is a Member of the World Economic Forum (WEF) Global Agenda Council on the Future of Electricity. He also represents India on energy issues on the BRICS Business Council.

He is a member of the Bharatiya Janata Party, India's ruling party.

Mr Taneja is India's leading expert, thinker and television commentator on energy.

He has for years regularly authored articles and commentaries on energy policy, business, diplomacy, geopolitics, security and energy poverty and empowerment. He has also authored two books and edited several books and publications. Mr Taneja is a well-known international speaker on energy. He is regularly invited to speak by universities, think-tanks, conferences, governments and companies from all parts of the world. He read economics, business, commerce, policy, leadership, diplomacy and international affairs in India, Norway and the United Kingdom.

## Van den Graaf, Thijs

**Assistant Professor of International Politics, Ghent Institute for International Studies, Ghent University**

**Dr. Thijs Van de Graaf** is an Assistant Professor at the Ghent Institute for International Studies, Department of Political Science, Ghent University, Belgium. His area of expertise is energy policy, international relations and global governance. In 2011, he was a visiting scholar at Princeton University. He is co-editor of *The Palgrave Handbook of the International Political Economy of Energy* (Palgrave, 2016), *Rising Powers and Multilateral Institutions* (Palgrave, 2015), author of *The Politics and Institutions of Global Energy Governance* (Palgrave, 2013) and co-author of *Global Energy Governance in a Multipolar World* (Ashgate, 2010). His research has appeared in journals such as *Global Environmental Politics*; *Energy Policy*; *British Journal of Political Science*; *International Environmental Agreements*; *Global Governance*; *Global Policy*; *Middle East Policy*; and the *Review of International Organizations*.

## WANG, Ke

**Research Fellow, National Academy of Development and Strategy, Renmin University of China**

**Dr. Ke Wang**, School of Environment and Natural Resources, Renmin University of China (RUC), He is also the executive director of Programme of Energy and Climate Economics, research fellow of National Academy of Development and Strategy, member of committee of experts of Green&Low-Carbon Development Think Tank Partnership (GDTP). He got his bachelor degrees both from Renmin University and Tsinghua University, and doctor's degree from Tsinghua University.

His research areas focus on energy-environment-economic modeling and policy simulation, economics analysis of global climate governance and multi-lateral climate negotiation process, low carbon technology innovation strategy and promotion policy, low carbon municipal planning, etc.

He provided technical support for Chinese UNFCCC delegation focusing on technology transfer issues. He also provided consultancy services to UNFCCC secretariat, UNFCCC Expert Group on Technology Transfer (EGTT), World Bank, Asian Development Bank, UNDP and Swiss Agency for Development and Cooperation (SDC) etc. He was the leader author and coordinator of "China Human Development Report 2009/10: China and a Sustainable Future Towards a Low Carbon Economy and Society" jointly published by UNDP China and Renmin University of China. As the project and branch project leader, he attended many key projects on climate change area, such as Key Program on China's low carbon macro strategy, National 973 Plan, National Key Technology Support Program, The Major Research Project on Humanities and Social Science under Ministry of Education. He is the authors of the following books: "Global governance for Climate: Shaping an international architecture to boost innovation of human development paths", "Technological Change Simulation and Its Application in Climate Change Policy Analysis Based on a CGE Model", "low carbon planning for Chinese cities: a manual for policy makers", "Guidelines for the development of cities' GHGs inventory in China", "Proposal on Innovative Mechanism for Development and Transfer of Environmentally Sound Technologies (ESTs)", etc.

## XU, Qinhua

**Professor of School of International Studies,**
**Director of Centre for International Energy and Environment Strategy Studies**

**Dr. Qinhua XU**, professor of School of International Studies, director of Centre for International Energy and Environment Strategy Studies. Her current research interests are mainly focus on energy policy in China and China's foreign energy strategy. She is active in the energy sector and is entrusted with a number of advisory posts in the China government agencies and international bodies. She is the study leader of dozens of ministerial and provincial, international energy projects. Dr Xu is the founder of China International Energy Cooperation Forum and the author of 12 books such as *China International Energy Strategy* (2014), *Energy Diplomacy* (2012), *China Energy Policy in National and International Perspectives: A Study Fore-and-Aft 18th National Congress* (2014) and *New Geopolitics: Central Asia Energy and China, The Comparative Studies on Clean Energy Development in Low Carbon Economy Era* (2013), the editor of C*hina International Energy Cooperation* R*eport* (Annual) and more than 60 papers.

## YANG, Jian

**Vice-President**
**Shanghai Institutes for International Studies (SIIS)**

**Dr. YANG Jian is** Vice-President and Senior Fellow of SIIS, his areas of specialization include: the International political economy (IPE), China's regional strategy in polar affaires and cyber governance. His previous positions include: Executive Vice-Chairman at Shanghai Institute for International Strategic Studies, Vice Chairman of Shanghai Society of Taiwan Studies, researcher at the Cross-Strait Relations Research Center, a member of the editorial board for the Arctic Yearbook, a member of the editorial board for Review of Policy Research, and deputy director of the department of IPE in the Institute of World Economy, Shanghai Academy of Social Sciences (SASS). He received his doctorate in economics from SASS, and his master's degree in history from Soochow University. YANG Jian's recent books include: New Perspectives on the Arctic Governance (Current Affairs Press, 2014), and Power and Wealth in Cyberspace (Shanghai People's Publishing House, 2012; First Prize for Outstanding Achievement in the Book Category in the 12th Shanghai Municipal Philosophy and Social Sciences Award). He was also listed as a "Shanghai Leading Talent" in 2016.

## YE, Jiang

**Senior Fellow, director of the Institute for Global Governance Studies**
**Shanghai Institutes for International Studies**

**Professor YE Jiang** is the director of the Institute for Global Governance Studies, Shanghai Institutes for International Studies (SIIS). He is also a professor, PhD supervisor at the School of International and Public Affairs, Shanghai Jiao Tong University. He was a visiting fellow at University of Copenhagen, Ramapo College of New Jersey, George Washington University, University of Cambridge, Institut d'Etudes Politiques de Paris (Sciences Po), Luxembourg Institute for European and International Studies, Ritsumeikan University, Kyoto. He is concurrently a vice-chairman of the Chinese Association of World Ethno-Nations, vice-chairman of the Shanghai Institute of European Studies and council member of the Shanghai Association of International Relations. He has so far finished two Programs of National Philosophy and Social Sciences, two Programs of Shanghai Municipal Philosophy and Social Sciences, and a Program entrusted by the Ministry of Foreign Affairs of PRC for the studies of the impact of Euro zone debt crisis on European Integration. He is the author of the books: Reading U.S. and Europe -U.S.-Europe Ties in European Integration, The Grand Change - Globalization, Cold War and Contemporary International Political Economic Relations, and Global Governance and the Transformation of China's Strategy in Dealing with Great Powers, etc., and has about 90 articles published by academic journals both at home and abroad. His two works won the 7th Shanghai Award of Excellent Achievements in Philosophy and Social Sciences (2002-2003). And his other three works won the sixth (2008), eighth (2010) and tenth (2012) Shanghai Social Sciences Association Annual Conference Excellent Papers Rewards. In early 2013 he was awarded an Award for Major Foreign Policy Research by Ministry of Foreign Affairs of China.


## YU, Hongyuan

**Professor and Director of Institute for Comparative Politics and Public Policy**
**Shanghai Institutes for International Studies (SIIS)**

**YU Hongyuan**，PH.D (Chinese University of Hong Kong), is a professor and Director of Institute for Comparative Politics and Public Policy at the Shanghai Institutes for International Studies. He is also an honorary fellow of Sustainable Developmental Research Center of China Academy for Social Science and an honorary fellow of the Centre for Asian Pacific Studies at Lingnan University in Hong Kong. He got his Ph.D. degree from Chinese University of Hong Kong, and MPhil degree from Renmin University of China .From 1998 to 2000. Yu Hongyuan is the author of numerous publications, including most recently Global Warming and China's Environmental Diplomacy in Nova Science Publishers(2008), “In the Belly of China’s Diplomacy: China and Global Warming”, Shaping China’s Energy Security,(French Asian Center)March 2008；“Environmental Change and the Asia Pacific”, published in Global Change, Peace and Security. “Knowledge and Climate Change Policy Coordination in China”， in East Asia, An International Quarterly;“International Regimes and China’s Soft Capacity Building in Climate Change”, published in World Economic and Politics [Shi Jie Jing Ji Yu Zheng Zhi], No. 8, 2008. (In Chinese); “Two Layers of Climate Change Politics”, International Review [GuoJi Guan Cha], No 5, 2008. Dr. Yu is now working on some energy and environment projects sponsored by China Ministry of Science &Technology, World Wide Fund (WWF), The Energy Foundation, and China Ministry of Environment.

## ZHAI, Yongping

**Senior Advisor, Energy Sector Group,**
**Asian Development Bank**

**Dr. Yongping Zhai** has been working on energy development in Asia and Africa for 25 years. He is currently Technical Advisor, Energy Sector Group, Asian Development Bank (ADB), in charge of overall energy policy coordination and technical support to ADB energy sector operations. He is also in charge of developing energy sector knowledge work for ADB and interacts with worldwide energy sector knowledge partners. He also serves as President of Asia Solar Energy Forum, an ADB sponsored professional organization.

Prior to his current position, Dr. Yongping Zhai was Director, South Asia Energy Division (2010-2015), ADB, covering energy sector operations in Bangladesh, Bhutan, India, Maldives, Nepal and Sri Lanka. In this capacity, he led ADB's support to renewable energy, energy efficiency and power trade in South Asia. He also served as ADB's Lead Energy Specialist (2008-2010), in charge of energy sector in Southeast Asia including Indonesia, Philippines, and the Greater Mekong Subregion (GMS).

From 1993 to 2000, Dr. Zhai was a Principal Program Coordinator/Public Utilities Economist at the African Development Bank (AfDB) in charge of energy projects in Southern African Development Community (SADC). Between 1990 and 1993, he served as an Assistant Professor at the Energy Technology Division (Energy Policy and Planning), Asian Institute of Technology (AIT) in Bangkok, Thailand.

Dr. Yongping Zhai graduated from the Thermal Energy Engineering Department, Tsinghua University, Beijing, China (1983) and received a Ph.D in Energy Economics from Institute of Energy Economics and Policy, affiliated with the University of Pierre-Mendès France in Grenoble, France (1989).

## ZHANG, Haibing

**Director of the Institute for World Economy Studies, Shanghai Institutes for International Studies (SIIS)**

**Prof. Zhang** specializes in the study of global economic governance, especially regarding international development cooperation, G20 and BRICS related issues.

Her main publications include two monographs Research On European Regional Integration ( Shanghai Academy of Social Science Press, 2005), Development Oriented Aid: The Model of China's Aid towards Africa ( Shanghai People's Publishing House,2013), and more than 50 academic papers. She was visiting scholar in Institute for Southeast Asia Studies(ISEAS) in 2016, German Development Insititute (d.i.e) in 2010, and Center for Strategic and International Studies( CSIS) in 2015.

## ZHANG, Yuncheng

**Director for the Institute of World Economics Studies, China Institutes of Contemporary International Relations（CICIR）**

**Professor Zhang Yuncheng** is the Director for the Institute of World Economics Studies, Doctoral tutor, CICIR. He joined the Institute of American Studies, CICIR, in 1994 and was transferred to the Institute of World Economics Studies, CICIR in 1997. He stayed at the Graduate School of International Studies (GSIS), University of Denver(DU), US, from 2001 to 2002 and got his Ph.D. by CICIR and GSIS's Joint-Supervision in 2002. From January 2004 to July 2013, he worked for the Center of Hong Kong and Macau Studies, CICIR. From December 2005 to January 2008, he visited the Department of Political and Economic Research at the CITIC Pacific Ltd, a well-known financial institution based in Hong Kong. From August 2012 to July 2013, he stayed at One Country Two Systems Research Institute Limited, a think tank based in Hong Kong.

Professor Zhang Yuncheng authored several dozens of internal research reports and published more than a hundred papers in both internal and external academic journals.

## ZHU, Songli

**Senior Fellow, Energy Research Institute(ERI), National Development and Reform Commission (NDRC)**

**Prof. Songli ZHU**, joining Energy Research Institute (ERI), National Development and Reform Commission in 1999, has been working on climate mitigation policy  low carbon develop strategy analysis and international climate regime to inform policy making and political dialogue for more than 15 years. As the key team member or team leader, she involved in and led key projects under "9th-five-year" plan (FYP)，10th FYP, 11th FYP and 12th FYP of Ministry of Science and Technology (MOST), and National Program on Key Basic Research Project of China (973 Programme), accumulating knowledge on comprehensive analysis on GHG mitigation policies, energy-related GHG inventory development, road transportation mitigation, comprehensive analysis on climate negotiation and global climate governance. Particularly, she led two projects closely related to climate governance during 2010-2016, namely "General planning on post-Copenhagen climate negotiation" (2010CB955101) under 973 Programme and "Research on key technologies for synthesis issues during climate negotiations" (2012BAC20B02) under 12th FYP of MOST, conducting in-depth research on Bali Roadmap negotiation and Deban Platform negotiation. Part of the research output were presented in the book, titled "from Copenhagen to Paris: the transition and development of international climate regime". She is now leading a project under Development and Reform Program of MOST to follow the post-Paris negotiation, and she is also the team leader of a project under 2016 National Air Program to figure out the roadmap for national and provincial air quality improvement.

## ZHUANG, Jianzhong

**Deputy Director of International Energy Research Center, Professor of the School for International and Public Affairs, Shanghai Jiao Tong University**

**Zhuang Jianzhong** is the Deputy Director of CEFC International Center, Deputy Director of International Energy Research Center, and Professor of the School for International and Public Affairs of Shanghai Jiao Tong University. His previous occupations include General Secretary of the Shanghai Society for Pacific Region Economic Development (SSPRED) and Standing Deputy Director of National Strategic Research Center at Shanghai Jiao Tong University. His main research areas include international politics, U.S.-China relations, Taiwan, Korea, and North East Asian Security and non-proliferation.

## ZOU, Ji

**Professor, School of the Environment and Natural Resources, Renmin University of China**

**Professor Zou Ji** was awarded a B.S. in environmental engineering (1984), a M.S. in Engineering Economics (1990) at Tsinghua University, and a Ph.D. in environmental and resources economics (1997) at Renmin University of China (RUC). He served as Deputy Dean of School of Environment and Natural & Resource at RUC. He worked for World Resources Institute (WRI) as China Country Director during 2009 and 2012. He was a lead author of Working Group III for the Fourth Assessment Report of Intergovernmental Penal on Climate Change (IPCC), and he served as a coordinating lead author (CLA) for the fifth Assessment Report of IPCC Working Group III. He has been a member of the UN Intergovernmental Committee of Experts on Sustainable Development Financing. He was nominated as a delegate of China for UN Climate Talks during 2000 - 2009 and 2012-2015, and worked as a facilitator or a co-facilitator for several issues in multilateral negotiation and dialogue. During 2012 - early 2017, he has served as the Deputy Director General of the National Center for Climate Change Strategy and International Cooperation (NCSC) under China National Development and Reform Commission.Professor Zou has worked in such areas as economic analysis of energy and climate policies with technology changes and international climate architecture as focuses, as well as sustainable urban planning. He works as team leader for such projects as "China Macro Strategy for Low Carbon Development ", study on Climate Strategy for the New Development Bank(BRICS), "Strategic Study for Durban Platform", "Technical supporting project for Intergovernmental Panel on Climate Change (IPCC) Working Group III", His major works includes "On Global Governance for Climate: Shaping an International Architecture to Boost Innovation of Human Development Paths", "China Human Development Report 2009/10 – China and Sustainable Future Towards a Low Carbon Economy and Society", "An Analysis of China's INDC", etc.

# Policy Recommendations

## International Conference

## GREEN ENERGY: THE G20 VISION
## - T20 Energy Conference -
## FEBRUARY 24-25, 2017

# From Knowledge to Action:
# G 20 Global Energy Governance Innovation

Shanghai Institutes for International Studies (SIIS)
Lowy Institute for International Policy
Korea Development Institute (KDI)
Centre for International Governance Innovation (CIGI)

1. **Promote the G20 to become a "Global Energy Affairs Chief Coordinating Platform" in cooperation with IEA , follow the consensus, inclusiveness and integration principles, respect the role of the UN, and strive for support of UN member states, especially the BRIC countries, G7 and other international organizations.**

- Set up a permanent energy network with a permanent secretariat, preferably located in Asia. All major actors in the energy interplay, including governments, corporations and markets should be invited to join such a network.
- Create forums to facilitate cooperation and dialogue on renewable energy, energy efficiency, and energy commodity and equipment trade.
- Focus on facilitating discussion among Energy Ministers that advances the G20 energy principles, building on the state of discussions at the conclusion of the Turkish G20 Presidency.
- Taking advantage of hosting the 2016 G20 summit, China should put energy governance on the list of top priorities, and negotiate a proper way to join IEA.

2. **Promote the establishment and sharing of major oil and gas reserves and energy information.**

- Build a collective energy security arrangement by ensuring market transparency, policy coordination, effective communication and institutionalized cooperation.
- Establish an energy data, analysis and facilitation center, preferably located in Asia.

3. **Address the energy insecurity featuring supply and demand separation in East Asia.**

- Propose a fund to stabilize global oil price. The fund would be accessible to oil producing companies.
- Propose upgrading the JODI and IEF/IEA/OPEC as a comprehensive information sharing mechanism on the G20 platform, and provide financial support to upgrade JODI database.
- Encourage expanding the use of natural gas as a transition fuel in preference to coal and seek a solution to help natural gas become more widely traded.

4. **Promote the construction of INDCs in energy and environment and study the merits and demerits of a G20 carbon market initiative.**

- Promote a R&D Collaborative with open-source access. The G20 could create a

new international institution, headquartered in China, focused on developing royalty-free technologies to minimize greenhouse gas emissions. The headquarters function would be to elicit pledges from G20 members to fund the research in their own countries and to promote research findings.

- Seek a forum for the G20 to propose to the WTO, a method for consideration of new Harmonized Systems codes to be added to Environmental Goods reporting as new low carbon technologies are invented and commercialized
- Seek a forum for the G20 to propose to the UN, a modification of reporting on National Accounts for Environmental Goods reporting
- Reduce exploration subsidies. Reduce inefficient fossil fuel subsidies, the place to start is the $88 billion of annual tax preferences for fossil fuel exploration.
- Establish public procurement programs to promote low-carbon technologies growth.
- Promote amend to inefficient fossil fuel subsidies within the G20 and assist non-G20 countries to identify and reform their subsidies.

**5. Formulate a G20 investment plan for global infrastructure.**

- A G20 campaign to finance "no regrets investments", for example renewable energy and building energy efficiency improvement. The G20 could invite the IPEEC Task Group to recommend incentives for financial institutions to devise and implement 'smart' programs; canvassing a range of innovative approaches including establishing state owned corporations and insurance funds, as well as reviewing best practices in tax expenditure and direct subsidy programs. The G20 could ask the OECD to undertake a new survey to quantify potential financial and emissions saving from "no regrets" investments. The G20 could ask International Capital Market Association for a report on options for Green Bonds criteria and their monitoring and enforcement.
- AIIB is expected to play a major role in infrastructure construction, including energy infrastructure in Asia. The G20 could serve as a platform to discuss and promote new ideas about financial and energy governance embodied in China's initiative on creating and governing the AIIB.
- Assess and promote the greening of the fiscal system, moving progressively to taxing 'bads' reallocation of proceeds to "no regrets investment" in the clean energy sector.

**6. Carry out urban energy and environment network construction within range of G20.**

- Establish energy Efficiency Standards for key goods, e.g. air conditioners, lighting and cars. The G20 could invite the APEC Sustainable Energy Center to promote advanced global energy efficiency standards to be phased in over appropriate periods. The G20 could agree to future border tax adjustments for non-compliant imports, perhaps with special and differential treatment for poorest countries.

**7. Deploy G20 to strengthen other energy institutions.**

- The International Energy Agency (IEA) should be enlarged to include all G20 countries. The G20 could invite the IEA to devise options to guarantee energy security of supply. Consider to set up IEA Asia Headquarter in China.
- Propose to upgrade the Clean Energy Ministerial under the G20 as the leading institution for global clean energy governance in 2016 China G20 summit. As a parallel measure, IRENA should be invited to participate in.

# Recommendations on Global Energy Governance and the G20

Thomas Heller
Climate Policy Initiative

The political economic logic that underlies the formulation and implementation of managing climate risk traces an evolution from the microeconomics of high and low carbon production—which has dominated the initial era of climate policy—to more general financial and macroeconomic issues that will increasingly define both climate and economic futures. The G-20 has largely ceded authority over climate change to more environmentally specialized public agencies given its mandated focus on economic and financial governance. However, as the central concerns of climate policy move from proving viable technology spreads at the project level to scaling more massive financial investment in low carbon systems, the interaction with macroeconomic performance and the growth (productivity) characteristics of sustainable infrastructure collapses the gap between the governance of public finance and effective carbon risk management. These issues lie at the heart of a new analytical network of high level national and multilateral public finance officials called the Advisory Finance Group (AFG), with which the G-20 may choose to develop programmatic institutional links.

Salient facts shaping this passage in the governance of climate issues that are appropriate and familiar subjects of G-20 cognizance are defined below.

1. Spreads between fossil and alternative energies have substantially declined in recent years.
2. These declines are recognized in more ambitious Paris commitments to build out low carbon energies by both advanced and emerging economies.
3. To manage climate risk at close to agreed levels (>2$^{o}$), it will be necessary to more or less double current projected levels of investment in sustainable infrastructures.
4. The major share of investments in sustainable infrastructures has come from public finance that enhances revenues or mitigates risks in new energy, mobility including transportation, and food production.
5. Prolonged low growth, constrained fiscal capacity and ineffective monetary policy have limited responses to increased demands for more

public finance to reduce income inequality, improve security, expand education and health and increase infrastructure investment.

6. Scarcity of public funds and poor delivery vehicles are more concentrated in emerging markets with growing gaps between infrastructure need and build.

Macroeconomic propositions of high G-20 relevance to be tested in the AFG include:

1. To limit the risk of climate change to $2^{o}$, new sustainable infrastructures in energy, transport, agriculture and buildings must be built out at scale and pace across advanced and emerging economies.
2. Sustainable capital-intensive infrastructure investments, especially in the energy and mobility sectors, require a substantial expansion in current levels of public funding to match their risks as regulated and illiquid public goods.
3. Public finance in a macroeconomic context of prolonged low productivity and radical uncertainty mandates increased and sustained economic growth to meet multiple political claims, including those of sustainable infrastructure.
4. Higher productivity investments that may justify coordinated and targeted public policy to lift investor expectations of future returns may most likely be tied to industrial transition in core economic sectors driven by applied digital technologies.
5. Applications of information technology may yield extraordinary resource productivity gains associated with low carbon energy infrastructure through zero marginal cost generation with efficient integration of reliability and load shifting services; shared and virtual mobility provision; building design, construction and materials; and precision farming/logistics.
6. Realizing the potential productivity gains of digital innovation demands attention to complementary systems change in policy and business models, effective delivery of public funds through national and multilateral financial institutions, and adaptive reconsideration of the impacts of network economics on taxation, pricing, industrial organization and distribution.

# Recommendations on Global Energy Governance and the G20: ASEAN Perspective

Yanfei Li
Economic Research Institute for ASEAN and East Asia

## 1. ASEAN's Challenges in Energy

ASEAN's primary demand for energy is set to grow steadily at 4.4% per year up to 2030, in the face of increased economic activity, population growth, rising electrification rates, and expansion of the transport sector. The implication is that energy demand will double by 2030, after having already expanded 2.5 times since 1990. Demand for all hydrocarbons is set to expand: oil by 50%; natural gas by 80%; and coal by 300%, as it replaces gas and oil, notably for electricity generation.

Therefore, energy self-sufficiency of ASEAN is declining and in the future it is expected to become even worse than it is now. This indicates that in developing countries in ASEAN the speed of increasing fossil fuel production cannot keep pace with the speed of increasing energy demand. Avoiding a drop in self-sufficiency is needed for reinforcing energy security in the entire EAS region. Measures to address this are much anticipated.

Moreover, ASEAN's environmental sustainability is set to decline. ASEAN energy-related greenhouse gas emissions are expected to double by 2030, after having increased by 57% during the last decade. This is due in part to the expected 8% annual increase in coal consumption for electricity generation. Moreover, ASEAN energy intensity is lagging world averages. It improved only by 12%, compared to 26% worldwide. Moreover, ASEAN industrial energy intensity has been worsening steadily in the last three decades (decreasing on average by 0.2% per year in 1980-2011). As a result, ASEAN currently consumes more than twice the amount of energy per unit of GDP than the average industrial countries (OECD). End-users appliances (e.g., incandescent light, bulbs, air conditioners; industrial motors) are highly inefficient compared to best available technologies.

ASEAN energy poverty is higher than the world average. More than one fifth of ASEAN population (some 130 million people) still lack access to electricity, and nearly half (45%) relies on traditional use of biomass for cooking (about 230 million people). Lack of access to modern energy services is a serious hindrance to economic

and social development, and must be overcome if sustainable and equitable growth is to prevail within the ASEAN Economic Community.

A major impediment to developing and implementing AEMI within the ASEAN Economic Community (AEC) is the existence of hydro carbon subsidies in several ASEAN member states. At the macroeconomic level, energy subsidies depress gross domestic product growth through a number of channels: they can discourage investment in the energy sector; diminish private sector competitiveness; and create incentives for smuggling.

At the fiscal level, energy subsidies exacerbate budget deficits; crowd out growth-enhancing public spending; and are inefficient tools to reach the poor. It has also limited the ability of state owned utilities to build sufficient infrastructure capacity, especially regarding electricity supply (shortages) and on the134 million people in ASEAN without access to electricity.

At the social and welfare levels, energy subsidies are highly inequitable because they mostly benefit upper-income groups; and they divert public resources away from pro-poor spending. At the environmental level, energy subsidies stall growth of cleaner fuels and technologies and as a result increase carbon dioxide and other greenhouse gas (GHG) emissions. It also delay development of renewable technologies and discourage adoption of energy efficient measures.

## 2. APAEC 2016-2025

Facing these challenges, the 32nd ASEAN Ministers on Energy Meeting (AMEM) held on 23rd September 2014 in Vientiane, Lao PDR, endorsed the theme of the new ASEAN Plan of Action for Energy Cooperation (APAEC) 2016-2025 as "Enhancing Energy Connectivity and Market Integration in ASEAN to Achieve Energy Security, Accessibility, Affordability and Sustainability for All". The theme also reflects the central elements of connectivity and energy security captured in the Nay Pyi Taw Declaration on the ASEAN Community's Post 2015 Vision adopted by the ASEAN Leaders at the 25th ASEAN Summit in Nay Pyi Taw, Myanmar, on 12th November 2014.

The key initiatives under this APAEC include embarking on multilateral electricity trading to accelerate the realisation of the ASEAN Power Grid (APG), enhancing gas connectivity by expanding the focus of the Trans-ASEAN Gas Pipeline

(TAGP) to include Liquefied Natural Gas (LNG) regasification terminals as well as promoting clean coal technologies. It also includes strategies to achieve higher aspirational targets to improve energy efficiency and increase the uptake of renewable energy (RE) sources, in addition to building capabilities on nuclear energy.

The APAEC 2016-2025 will be implemented in two phases. Phase I will cover the period 2016-2020 for the implementation of short to medium-term measures to enhance energy security cooperation and to take further steps towards connectivity and integration. In 2018, there will be a stocktake of the progress of Phase I, which will guide ASEAN in charting the pathways and directives for Phase II (2021-2025).

The key strategies of the seven Programme Areas of the APAEC 2016-2025 Phase I are as follows:

| | |
|---|---|
| ASEAN Power Grid | To initiate multilateral electricity trade in at least one sub-region by 2018. |
| Trans ASEAN Gas Pipeline | To enhance connectivity for energy security and accessibility via pipelines and regasification terminals. |
| Coal & Clean Coal Technology | To enhance the image of coal through promotion of clean coal technologies (CCT). |
| Energy Efficiency & Conservation | To reduce energy intensity[3] by 20% in 2020 based on 2005 level. |
| Renewable Energy | Aspirational target to increase the component of renewable energy[4] to 23% by 2025 in ASEAN Energy Mix[5]. |
| Regional Energy Policy & Planning | To better profile the energy sector internationally. |
| Civilian Nuclear Energy | To build capabilities in policy, technology and regulatory aspects of nuclear energy. |

## 3. Regional Energy Market Integration

Regional energy market integration is a key strategy adopted by ASEAN as response to its energy challenges. In this regards, the power sector and the natural gas sector have been specially highlighted for this region.

ASEAN established the electricity interconnecting arrangements within the region through the ASEAN Power Grid (APG) under the ASEAN Vision 2020 adopted in the Second ASEAN Informal Summit in Kuala Lumpur on 15 December 1997. HAPUA, as SEB, is tasked to develop the implementation plan and coordinate as well as facilitate the implementation by ASEAN member countries. The construction of the APG is first done on cross-border bilateral terms, then expanded to a sub-regional basis and finally to a total integrated regional system. It is expected to enhance electricity trade across borders which would provide benefits to meet the rising electricity demand and improve access to energy services in the region.

With support from ERIA, HAPUA is elevating its efforts to harmonise the legal and regulatory practices, technical standards and to identify possible financing models, including establishing the APG Transmission System Operator Institution (ATSO) and the APG Generation and Transmission System Planning Group Institution (AGTP) to support the realisation of multilateral trade of electricity built upon the APG. HAPUA has also opened up to feasibility studies for individual project sponsors under Infrastructure Feasibility Studies and to provide guidance to HAPUA on implementing market outreach programme to potential investors and creditors. On regulatory and legal issues, HAPUA will cooperate with the ASEAN Energy Regulatory Network (AERN) to carry out various studies, such as on Taxation and Tariff for Cross-Border Transaction, and Regulation on Public-Private Participation in APG Projects.

The Trans-ASEAN Gas Pipeline (TAGP) aims to interconnect existing and planned gas pipeline infrastructure within ASEAN, to transport gas across borders to ensure greater security of gas supply. The ASCOPE is responsible for the effective implementation of the TAGP Project through multiple physical pipeline interconnections and regasification terminals (RGT). During the 20th AMEM on 5 July 2002 in Bali, Indonesia, the Ministers signed the ASEAN MoU on the TAGP Project. The MoU sets out the cooperative framework for greater public-private partnership and collaboration in the implementation of TAGP. Under the TAGP MoU,

ASEAN countries should study the regulatory and institutional frameworks for cross-border supply, transportation, and distribution of natural gas in the region involving multilateral countries.

ASCOPE updated the TAGP Master plan in 2008, and in 2012 expanded its strategic direction to include LNG, as a means to further connect the ASEAN nations, as well as to provide strategic buffer management in the region. As of 2015, a total of 13 bilateral gas pipeline interconnection projects connecting six (6) countries bilaterally and with a total length of approximately 3,673 km have been successfully commissioned.

In this regard, ASCOPE has successfully embarked on several preliminary studies on LNG cooperation, including studies on ship-shore compatibility, gas specification and LNG destination flexibility clauses. As of 2015, the total capacity of the four (4) operational RGTs amounted to 17.8 million tonnes per annum (mtpa) or 2,492 Million standard cubic feet per day (mmscfd).

To provide the framework for AMS to cooperate towards the realisation of the TAGP Project, the TAGP MoU, which entered into force on 21 May 2004 for a period of 10 (ten) years was extended for another 10 years, i.e., from 2014- 2024. The Instrument to extend the TAGP MOU was successfully signed at the 31st AMEM in 2013 in Bali, Indonesia.

ERIA has conducted several studies on establishing a sustainable and integrated natural gas market in the broad East Asia region, including ASEAN. Such is motivated by the fact that the natural gas market in East Asia remains fragmented without a functioning benchmark price to duly reflect the dynamics of demand and supply forces in the region. A functional regional gas futures market, which is highly dependent on the presence of well-developed physical spot trading, is yet to be established.

## 4. Financing Clean Technologies

Energy supply investment in Southeast Asia amounted to more than 70 billion in 2014. These projects ranged from the extraction of fossil fuels to the construction of power stations, wind farms, solar installations, oil refineries, storage and handling facilities, pipelines, tankers and other transportation facilities. The level of investment has increased by almost 60% over the last decade in real terms, reflecting the rapid

increase in the region's energy demand, higher prices in many countries, rising costs for the production of oil and gas, and investment in new and, for now, relatively expensive, renewable technologies in power generation.

Renewable energy investment in developing countries has been increasing steadily overtime. However, growth of renewable energy in Asian developing countries except for China has been below the global average. Policies to promote renewable energy development in the region, especially policies related to the financing issues, are called for.

Amid fast-growing electricity demand in emerging Asia, coal as the most abundant and reliable energy resource, will continue to be the dominant energy source for emerging Asia. This will lead to widespread construction of coal-fired power plants, which without the employment of the best available clean-coal technologies (CCT), will result in increased greenhouse gas (GHG) and CO2 emissions. These emissions will yield profoundly negative effects on the global environment. Meanwhile, the U.S. government seems to relax on global emissions, may have the unintended effect of encouraging widespread construction of less efficient coal-fired power plants in power-hungry emerging Asian economies. Thus, policy approaches must be reviewed to assist emerging Asia to afford CCT and allow for more sustainable growth across emerging Asia.

The underpinning of less financially attractiveness is the imperative of answering the question of how to promote investment in renewable energy or clean energy technologies in the region where economic development needs massive amounts of additional energy supply, newly developed energy capacities should be as clean as possible, public financing is already very tight and private financing prioritises other high-IRR projects. To meet the massive needs of energy supply and development of cleaner energy and to overcome the low financing priority, especially in developing economies experiencing fast economic growth, apart from the well-known policy and financial tools for renewable energy adoption, a new and different strategy is needed to promote renewable energy as much as possible in the region.

ERIA has recently published a Special Issue with Energy Policy on "Financing Renewable Energy Investment in East Asian Developing Countries" and contributed to identifying the most effective policy options in this region.

# Recommendations for the G20 on Promoting Effectiveness and Efficiency of Climate Finance

Qimin Chai Yang Zhong
National Center for Climate Change Strategy and International Cooperation, NDRC

The Paris Agreement under UNFCCC that officially became effective legally on November 4, 2016 has funded a milestone for all in the process of global climate change governance. With an aim of "Making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development" (UNFCCC 2015, Article 2.1c), the issue on climate finance is always at the center of negotiations and discussions in various momentous occasions in relation to climate change. As encompassed with the world's largest developing economies and emitters coming from both developed and developing countries, G20 capacitates its working agenda and resolutions on climate finance to provide political impetus for the implementation of the Paris Agreement and also for shifting the pathway towards low greenhouse gas emissions and climate resilient development.

After 4 years of work, the Climate Finance Study Group (CFSG) under the G20 Finance Track fulfilled its task in 2016 by the ends of China's presidency, and thereafter all negotiations and view exchanges will be commenced under the Sustainability Working Group (Climate and Energy) since Germany assumes 2017 G20 Presidency. Building upon results of CFSG in 2016, we herein provide two recommendations for the G20 members from Germany's presidency onwards in order to achieve the promotion of effective and efficient climate finance.

## Fully take into account fund recipient countries' needs in the work programme

To maximize benefits of climate finance, one important win on the financial flow is the link of the resources to the real needs of the funding users. Developing countries as recipients not only bare tasks to take mitigation and adaptation actions for addressing climate change adverse impacts, but also assume onerous responsibilities for the achievement of development goals such as poverty reduction and other development priories. G20 members, encompassing both key fund providing countries and major developing economies, is right in the position to take the lead on

ensuring recipient countries' needs are fully considered in the provision and mobilization of financial resources.

It is recommended that the G20 Sustainability Working Group (Climate and Energy) with expanded mission on climate change to continue discussions on efficient and effective provision and mobilization of climate finance with one of the focuses on recipient countries' needs and development strategies. These discussions could be based on analysis results around recipient countries' national development strategies, how climate finance and help these countries achieve their Nationally Determined Contributions (NDCs) with finance, and how to ensure recipient countries' direct access and ownership of the funds in practical level.

For avoiding of inappropriate intense debates and controversies, it is also recommended to just exert the expertise of G20 fora on politics and leave all sensitive technical details be negotiated and discussed under the UNFCCC framework.

**Improve transparency on climate finance**

The transparency of climate finance is one of the paramount achievement of Paris Agreement. A transparent delivering of funds would not only increase effectiveness and efficiency of the actions in addressing climate change impacts, but also in return help scale up mutual trust of both contributing and recipient countries. To keep up the momentum after Paris, tracking of the outgoing and incoming climate finance flows and reporting the outcomes achieved are the keys for improving the transparency of climate finance.

For a better and practical fulfillment of the goal, introducing instruments could be a desirable approach to improve transparency. Of these instruments, the biennial reports submitted to the UNFCCC by developed countries in G20 members is of pivotal importance for communicating quantitative and qualitative information on financial resources. It is also recommended for G20 members to reach consensus that Monitoring, Reporting and Verification (MRV) systems, reports delivered by MDBs and other instruments for improving transparency of climate finance should be conducted under the requirement and guidelines of UNFCCC. Noted that the technical issues on accountability and the effectiveness of the statistical tools for tracking finance resources undertaken by International Organizations (IOs) e.g. Rio Makers by

OECD are not agreed by all, it is recommended that G20 members should remain these issues negotiated and solved under the UNFCCC framework.

# Suggestions for G20 on Enhancing Global Climate Governance

Zhang Yuncheng
China Institutes of Contemporary International Relations（CICIR）

First, further enhance G20's role in global climate and energy governance. The G20, committed to promoting a creative, energetic, interconnected, and inclusive global economy, should play a leadership role in addressing climate change. This is important not only because of grave impacts climate change has on global sustainable development, but also for the purpose of sharing international development fruits and assisting developing countries to achieve sustainable development goals.

The G20 needs to improve efficiency of global energy governance by deepening its cooperation with international agencies such as International Energy Agency (IEA), Organization of Petroleum Exporting Countries (OPEC), International Energy Forum (IEF), International Renewable Energy Agency (IRENA), Energy Charter Treaty (ECT), etc., and by establishing energy dialogues and encouraging adoption of measures such as phasing out ineffective fossil energy subsidies. This is critical for ensuring energy supply and investment security, boosting economic development of energy-rich countries, as well as facilitating a global low-carbon energy transition and better tackling climate change.

In the short run, the G20 Hamburg Summit should continue to put the issue of climate and energy governance on top of its agenda, and seek breakthroughs. In the medium to long run, by strengthening top design and framework reform, the G20 needs to transform itself into headquarters and coordination center in global energy and climate governance.

Second, urge developed countries to deliver their funding commitments to helping developing countries tackle the climate change challenge. The G20 Hamburg summit should press developed countries to fulfill their funding pledges made in the Paris Climate Accord and provide developing countries with financing support on time and in full. Judging from the negotiation results of the Marrakesh Climate Conference, developed countries had done little to step up their efforts to address climate change before 2020. They only pay lip's service to their funding commitments, with both timetable and route map for executing the Accord remaining nebulous. All G20 members are parties to the United Nations Framework Convention

on Climate Change (UNFCCC). Under the guidance of its principles and rules, the G20 Hamburg Summit should encourage all the countries to actively use the G20 platform to help the commitments made in the Paris Climate Accord be delivered, and to provide solutions to developing countries' funding needs in the ongoing negotiations under the framework of UNFCCC.

Third, encourage the global financial institutions to pursue a green road and allocate more resources to green industries. The G20 Hamburg summit needs to motivate global financial institutions to develop innovative financial products like green bonds, green insurance, and environment funds, enhance their financial and industrial coordination, effectively reduce financing support for energy-intensive and heavily polluting sectors and environmental law breaching enterprises, and channel resources to green and low-carbon sectors. This could help whittle down futile subsidies for fossil energy consumption while financing the battle against climate change and facilitating global energy transformation.

Fourth, consolidate China's leading and exemplary role. In the past, China played a vital leadership role in securing the Accord's final conclusion and smooth entry into effect. As for the future, on one hand, China needs to express its desire and determination to work with the international community to fight climate change, enabling the world to attain green, low-carbon and sustainable development. On the other hand, China will strictly abide by the Accord and carry out the corresponding obligations. In the implementation of the Thirteenth Five-Year Plan, China will act as a role model by actively fulfilling its commitments in climate change area, endeavoring to conserve energy, reduce emissions and eradicate air pollution, and pursuing a successful green transition.

Fifth, cement the Sino-EU cooperation on climate change. Both China and EU are active advocates and promoters for a global battle against climate change. Given Trump administration's rather negative attitude toward the issue of climate change and the Paris Climate Accord, it is critical for China and EU to boost cooperation. The two sides can deepen cooperation in the following areas: first is to make a joint effort to help developing countries bridge their funding gap by urging rich countries to honor their funding pledges. Second is to enhance their bilateral policy dialogues and practical cooperation on building a resource-intensive, green, low-carbon, and climate-adapting economy and society. Third, the EU can help China improve the carbon trading system by enhancing policy communication and sharing with China its

own experiences in developing the “Cap-and-trade” programs. Fourth, the two sides need to enhance bilateral policy coordination on clean energy equipments trade, and ward off a trade war in this area by settling trade disputes through dialogue and consultation.

# The G20 and SDGs: To Integrate Soft laws and Hard Laws Forward

YU Hongyuan

Professor and Director of Institute for Comparative Politics and Public Policy

Shanghai Institutes for International Studies (SIIS)

As announced in the Roadmap of 2016 Hangzhou G20 Summit, the G20 should play a dispensable and irreplaceable role in SDGs, and should work together to assume their responsibilities of preventing and mitigating environmental changes that include global warming, aggravation of desertification, and regional environmental pollution, so that leaving a sustainable living space for future generations. Particularly, in terms of sharing expertise, knowledge, technology, practices and financial resources as below: (1) Promoting sustainable models of production, consumption and lifestyle in an effort to achieve economic, social and environmental sustainable development;(2) Enhancing the partnership between government, enterprises and citizens in managing green development;(3.)Strengthening regional and global cooperation to share successful practice and experience in common but different responsibilities. However, the SDGs implementation is mainly on the basis of "Soft Law" mechanism, accompanied with the standards from international environmental organizations as well as institutions.

As "software system" in SDGs, resolutions, declarations, conventions and international environment law, recognized by countries' negotiation, provide legal protection for sustainable development institution. Actually, most resolutions and declarations falls within the ambit of morals or expression of political will, which generally are not legally binding and called as "soft law". Furthermore, conventions and international environment law, as the form of Multilateral Environment Agreements, have strong legal binding force. Developing rapidly, Multilateral Environment Agreements have exceeded 500 cases in the fields of natural resource and environment. MEAs have different models of operation, but they consider Conference of Parties as the top decision. In the perspective of environment, it is fairly difficult for international community to reach agreements. In order to provide effective platform for negotiation and discussion, various international conferences are held in terms of different environmental and sustainable issues. Although international forums do not have legally binding force, they play significant roles in

communication, publication and education.

As “hardware system” in SDGs, international organization and institution related to environment and sustainable development play a significant role in organizing international environment affairs. The UN is the professional institution responsible for environment and sustainable development affairs, including the United Nations Environment Programme, United Nations Commission on Sustainable Development, The Economic and Social Council, International Court of Justice, and UN General Assembly. For example, the UNEP aims to assessing global, regional and national environmental conditions and trends, developing international agreements and national environmental instruments, strengthening institutions for the wise management of the environment, and integrating economic development and environmental protection. The implementation of Sustainable development Strategy need a great deal of financial backing. Institutional framework of global sustainable development not only includes rule system of environment, but also consists of indirect rules or articles of international institution such as FAO, WHO, WTO and so forth.

The SDGs are facing challenges include increasing diversification and goals divergence, this kind of challenges are mainly stem from NGOs’ growing powers, increasing contradictions between developing and developed countries, and diversity of actors. Thus, we should bring more hard laws into the global SDGs governance, particularly in 2017 G20 discussions. In order to better implementation of SDGs, the G20 should attach more importance with nexus and balanced approached with hard and soft laws, and help advances related research from technological and academic level to diplomatic strategy level and offers new instrument for SDGs practices.

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# Conference Papers

## International Conference

## GREEN ENERGY: THE G20 VISION
## - T20 Energy Conference -
## FEBRUARY 24-25, 2017

# Strengthening the G20 Sustainable Energy Agenda

Sybille Roehrkasten
Institute for Advanced Sustainability Studies (IASS)
and
R. Andreas Kraemer
CIGI, IASS Potsdam, and Ecologic Institute

**The 2017 G20 summit takes place in the country that has won international recognition for its "*Energiewende*" – a fundamental transformation of its energy system. This provides an important window of opportunity for strengthening the G20 agenda on sustainable energy. The world's overall energy supply is still heavily dependent on fossil fuels, which undermines climate protection objectives and the resilience of financial markets. With falling costs of renewable energies and global efforts to combat climate change, investments in fossil fuels and nuclear energy bear significant risks for stranded assets and thus the long-term stability of financial markets.**

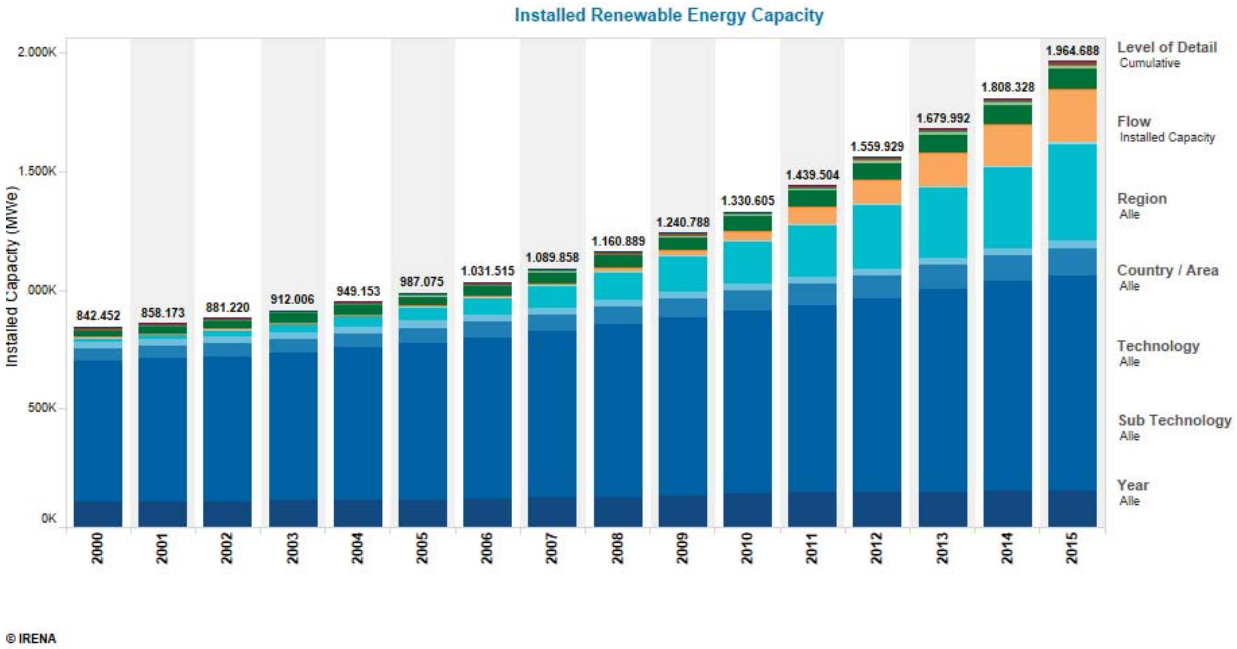
Hence, for the sake of financial resilience, Finance Ministers and Central Bank Governors need to anchor the promotion of sustainable energy in their G20 meetings. However, while limiting global warming to less than two degrees won't be possible without a fundamental transformation of the global energy system, solely appealing to climate protection benefits is not the right way to foster the required level of investment in renewable energy and energy efficiency.

## A global energy transition: is it about to happen?

The German Energiewende is an outstanding example of a national effort to transform an energy system. It has been particularly successful in expanding renewable energies in the electricity sector. Germany also has a strong track record in promoting renewable energies and energy efficiency in its international energy policy (see also The German Energy Transition in International Perspective). In a guest commentary for the German weekly newspaper *DIE ZEIT* last year, the State Secretary of the Germany Federal Ministry for Economic Affairs and Energy, Rainer Baake, made it very clear: the German government is dedicated to pursuing a global energy transition – encompassing not only the promotion of renewables and energy

efficiency, but also the phasing out of the carbon intensive energy sources coal, oil and gas.

Since the beginning of the millennium, global renewable energy capacities have experienced impressive growth. As IRENA figures reveal, global capacities more than doubled from 842,452 MWe in 2000 to 1,964,688 MWe in 2015.




The expansion has been a truly global phenomenon: capacities have been growing in all regions of the world. The report Global Trends in Renewable Energy Investments 2016 shows that global investments in renewables are more than twice the amount invested in coal and gas. And the report ReThinking Energy 2014 highlights the fact that in 2013, for the first time, renewables constituted the majority – 58% – of new power generation capacity.

However, focusing on the successful expansion of renewables blinds out an important fact: worldwide energy supply is still heavily dependent on fossil fuels. The Renewables 2016 Global Status Report and the World Energy Outlook 2016 reveal that fossil fuels such as coal, oil and gas make up 80 percent of global primary energy demand and this share has not decreased over the last 25 years. How can this be explained? Well, in most countries of the world, renewables have not yet replaced fossil fuels. Here, the expansion of renewables has been accompanied by an expansion of fossil fuels. In addition, renewables investments have been concentrated

on the electricity sector. In the heating and transport sectors, progress has been very limited.

**Time has come to anchor sustainable energy in the G20 finance track**

Since the creation of the Energy Sustainability Working Group in 2012, the G20 has addressed energy issues in a comprehensive way. The Energy Sustainability Working Group – which is part of the G20 Sherpa Track – has concentrated on four areas: phasing out subsidies for inefficient fossil fuels, improving energy efficiency, expanding renewables, and promoting energy access. All four areas are key to promoting a global transition towards sustainable energy. However, the measures taken so far are not yet sufficient to achieve that Goal.

As my colleagues and I argue in the IASS Policy Brief An ambitious energy agenda for the G20, G20 members should also push within the G20 finance track for a rapid and comprehensive transformation of global energy systems. G20 Finance Ministers and Central Bank Governors should comprehensively address the risks of stranded assets and long-term costs associated with investments in fossil fuels and nuclear energy for financial markets, national economies and government budgets. In doing so, they could provide an impetus to a global energy transition that goes far beyond Energy Ministers' influence – and they would strengthen the G20's capacity to contain financial and fiscal crises in advance.

**Protecting the climate by building on the right policy drivers**

Reaching the goals of the Paris Climate Agreement won't be possible without a rapid and fundamental transformation of the global energy system. There is an urgent need for renewable energies to replace fossil fuels and for massive improvements in energy efficiency.

While energy policies are central for reaching climate goals, it has to be recognized that climate protection is not a central goal for most energy policy-makers. Our recent IASS Study on the energy policy trend and priorities of key G20 members reveals that progress on renewable energy and energy efficiency in most of the cases is not driven by concerns about climate change. In many countries, cost-competitiveness of technologies and economic benefits of investing in an expanding industry are major drivers behind renewable energy investments. In most

emerging economies, meeting rising energy demand while diversifying the energy mix is an important motivation. And in countries such as China and India, local environmental benefits – primarily air quality, but also water security – come in.

In some cases, appealing to climate protection might even be counterproductive for gaining political support for renewables and energy efficiency – particularly in those countries that do not regard themselves as the main culprits of climate change. In order to achieve the much-needed acceleration of investments in renewables and energy efficiency, it is imperative to build on those policy drivers that are prevalent in the respective contexts.

**Common ground for the current G20 Troika China – *Germany – Argentina***

The alternating presidencies play a key role in the G20. It is up to them to steer the process and to set the agenda. To ensure some degree of continuity, each G20 presidency works with its predecessor and successor in a process known as the troika. In 2017, the troika comprises Germany, China – the host of the G20 summit 2016 – and Argentina, which will have the G20 presidency in 2018. The Chinese and German interests in the global promotion of sustainable energies are well known. Both economies are leading providers of renewable energy technologies and both governments consider energy and environment as a policy area where they can present themselves as global leaders. Argentina has only recently shifted its policies, promoting renewable energy while drastically reducing energy subsidies – these developments bode well for the G20's ongoing effort to foster a global energy transition.

# Apply 'Credit Trading Scheme' to Cut Production Capacity: Example in China's Coal Industry

Xunpeng Shi[a,b] and Yifan Shen[c]

a. Australia-China Relations Institute, University of Technology Sydney, 15 Broadway Ultimo, NSW 2007, Australia. Email: xunpeng.shi@uts.edu.au

b. Energy Studies Institute, National University of Singapore, 29 Heng Mui Keng Terrace, #10-01, Blk A, Singapore 119620, Singapore.

c. Department of Economics National University of Singapore, Singapore 117570

**Abstract:** This paper innovatively proposes a 'Credit Trading Scheme (CTS)' to minimize compliance cost of cut production capacity that is implemented in China and is applicable in other countries. The CTS is analogic to the well-known emission trading system and individual tradable quota both of which are well-known in the literature. A theoretical model is developed and the results show that in addition to minimize cost, CTS also incentivize firms and local government to cut capacity and reduce their incentive to cheat in the capacity cut policy. Such a cheat behavior undermine policy initiatives in China due to centralized and hierarchy governance institution. Using China's coal industry as an example, the papers illustrates how the CTS scheme can be applied in the reality.

## 1. Overcapacity in China's industries

The Chinese coal industry is one of the few Chinese industries that suffer from overcapacity issues and the only industry that has experienced back and forth policy interventions. Overcapacity in China's coal industry appeared in 1998 for the first time. Since 1998, China's coal sector has already experienced a period of cutting the overcapacity. The capacity cut policy disappeared soon after 2003 when China faced high demand for coal, although the discrimination and thus elimination of small coal mines are continued (Shi, 2013).

Although the coal industry has a chance to use market mechanisms to cut capacity, it is not well established. This coal industry overcapacity policy makes it possible to trade capacity credit in the coal industry. However, the government still follow the current practice by delegated the issues to lower levels, which could be further delegated down along the hierarchy. In its August 2016 notice (NDRC et al.,

2016a), the government agencies encourage local governments to set trade platforms for the capacity quotas trading, but so far no specific progress has been made.

However, the current platform, such as that in Shanxi (Shanxi Provincial Economy an Information Commission, 2015), only supports the private treaty, auction and share investor, and does not support exchange trade. The chaos of capacity cut policy in the coal industry indicates that the policy and its implementation need to be improved.

Following the practice of Individual Transfer Quotas (ITQs) in fishing and emission trading scheme, we propose to implement a 'Credit Trading Scheme (CTS)' for the coal industry to control the total capacity while minimizing costs and resistance. The CTS trade allows firms to purchase the right to increase their production capacity from firms that reduce production capacity for any reasons.

## 2. Comparison between command and control and CTSs in China's context

The existing cap and control system has three major weaknesses. First, the huge fluctuations of coal price highlight the challenges and consequences of imposing the production cap. The determination of the total production capacity is difficult since there is no information on supply and demand curves. Inaccurate determination of the total production capacity leads to the considerable fluctuations of products price. Since the products under control are also intermediate goods for other industry, the instability of the products price may result in the uncertainty in other sectors. The capacity cut target could also be infeasible technically since capacity is not a continuous variable and cannot be scaled down in a certain percentage that is enforced by the government.

The difficulty to balance between capacity cut and price stability is demonstrated in 2016. In 2016, the Chinese coal industry has experienced a U-turn on its capacity cut policy. In the first eight months, the policy set by the State Council is to achieve the target and limit the working days to 276 a year (State Council, 2016). However, in September, NRDC started to soften its capacity cut standpoint gradually amid soaring coal prices and potentially increasing demand in winter. NDRC suspended the 276 working days limit in designated coal companies at the end of September, and in all coal companies at the end of October. In December, Guizhou provincial government even goes further by subsidizing local coal output and imports from other provinces (sxcoal.com, 2016).

Second, this method unfairly imposes the production cap on each firm, regardless of the market microstructure. Without the process of market selection, there is a huge loss of economic welfare. The government set a cap for capacity, and the limit is broken down along the hierarchy of government. Regions and companies will often comply with resources under their jurisdictions and thus limit the opportunities to reduce its compliance costs. The capacity replacement is mainly, and conveniently, implemented within a company, there are few cases that developer of the new capacity can purchase capacity quotas from other companies.

Third, the command and control method fosters the cheating behavior. Given the high cost of the overcapacity cut, firms have the great incentive to violate the production control policy. In addition, cutting the overcapacity is usually associated with a surge of products price, which motivates the market players to violate the policy even with a risk to incur the significant punishment costs. This is particularly the case in China due to the multiple levels of governments and thus diverse interests, weak enforcement capacity and non-dependent legal system. The decentralized implementation means that the outcomes could be unfair for those who implement the policy more strictly, which may undercut their own local economies. The higher coal prices increase the profit margin for the coal production, encouraging the cheating and misreport behaviors, especially those coalmines with lower cheating costs, like the small companies. The volatile policy, and the strong demand at some regions, cause the frequent cheating from firms, which is often support silently by the local government (Andrews-Speed et al., 2002; Shi, 2013). The cheating behavior directly triggers the collapse of the capacity cutting policy in the past.

In comparison, the CTS program has a few notable advantages compared with the current practice of cutting overcapacity in the Chinese coal industry. First, the CTS program makes those large firms with advanced technology profitable and thus helps to achieve the industrial structure updating targets of the government. Under the traditional command and control policy, those firms will not be able to build new capabilities, despite their existing capacities are new, advanced or efficient and thus are not economically to be cut. Given the CTS program, they will not be bounded by the limited capacity quotas, and thus could develop beyond the limit in any local regions or province. On the other hand, those firms that will leave the markets can also get the maximum possible economic benefits from the trading and could encourage those firms do not have comparative to close down.

The CTS program can also safeguard the interest of local governments who might otherwise not interest in cutting their local capacity, or prefer to keep the capacity quotas for local use and thus prevent maximization of social warfare. The overcapacity in China coal industry started in later 1990s and is often argued to be a result of policy intervention at local levels (Andrews-Speed et al., 2003; Shen et al., 2012; Shi, 2013). In order to achieve better economic performance and thus more promotion opportunities, local government has a very strong incentive to invest in industries. The complexity and incoherence of government regulations on investment are believed to be a factor that has contributed to coal overcapacity (Andrews-Speed et al., 2003). Shi (2013) argued that utilizing the traditional command and control method to shut down small mines is impractical and ineffective to solve overcapacity issue. With the CTS program, local governments will get the economic return for closing down mines and thus would have less incentive to put a barrier or even encourage cheating under the capacity cutting policy.

Even assume the capacity quota announced in the policy (NDRC et al., 2016b) is implemented, such an institutionalize CTS program will generate a few additional benefits. First, it allows trade to be conducted in flexible amount. The currently proposed trading of quotas, if happens at all, will often be between two firms. A perfect match of quotas between the buyer and seller is difficult and costly to find. However, in the CTS program, both buyer and seller can trade with more than one counterpart. Thus, there is no need to find the perfect match of a buyer and a seller. Second, the standardization of quotas and centralization of information will save search and match costs between buyers and sellers. Once the trading is put on an exchange, the liquidity market will generate efficiency and transparent prices that will provide a reference for both buyers and sellers and the policy makers. Third, the national-wide trade will minimize the compliance cost of the capacity cut program since the firm with the highest economic performance will buy the next unit available Individual Tradable Credit (ITC).

## 3. Application of CTS program to cut coal production capacity in China

The cap in the coal industry is permanent, which is more like a cap on the stock, and is different from the cap in fishing and emission trading which is often set annually and is a flow variable. The proposal of the permanent cap is consistent with the central government' direction on capping new coal production capacity and

trading of capacity quotas to facilitate capacity replacement and exchange (NDRC et al., 2016a, b)

The CTS for production capacity could be set in the follow steps: The regulator, namely NDRC, with a consultation of NEA and other agencies, sets a total allowable production capacity (TAPC). Considering coal mine capacity is often not less than 100,000 tones, the ITC can be denominated at 1000 tones. The ITCs can be generated through closing down of existing coal mines, or reducing the capacity of operating mines. Over time, the central government can reduce the TAPC by enforcing a discount on capacity reduction. For example, each one unit reduced capacity will only get less than 1 unit of ITCs. However, the government may intervene in the short run if the price volatility of products is out of the tolerance level set by the government.

The provincial government will be tasked to measure and verify the ITCs. The ITCs then can be registered in a central government-appointed organization ('Register'), which, however, will not be operating the trade platforms. The ITCs, once certificated, will no longer be bundled in the quantity that when they were generated, but can be traded as small as one unit (1000 tons/ year in this case). The sellers can publish the information of available ITCs it has on any platform and can sell any units to a buyer. The versa is true that one buyer can purchase from many sellers to meet its project need.

The trading platforms can be in anywhere and in virtual forms. Buyers and sellers are free to trade ITCs in any forms, including bilateral negotiations (over the counter, OTC) and exchange-based trading. However, the prices must be reported to the Register within certain period saying two working days, after the settlement.

Ultimately, the trading platform could be institutionalized as an Exchange, which could be virtual, whether trades are conducted publicly and anonymously. The trade could also be conducted through current environmental Exchange. This will minimize the search costs for both buyers and sellers. Third part players, such as financial players and professional traders, may also be allowed to participate in the ITC markets to increase the liquidity of the markets.

# How the G20 can nudge activity in constructive directions

Barry Carin
Senior Fellow, CIGI Chinese Academy of Social Sciences

## Introduction

The UNFCCC top-down process is unlikely to succeed. Prospects for success suffer from uncertainties, the capacity for denial and self-delusion, selfish interests and free riders, and the elusiveness of burden sharing agreements. This paper explores ways of "muddling through", succeeding in spite of a lack of organization.

Bottom-up approaches are reviewed – sub-national and private corporate action, border carbon adjustments, targeted research, adaptation, geoengineering, and "doing-good-by-stealth". Suggestions are provided for the G20 to nudge activity in constructive directions.

## 1. The Prospects of the UNFCCC Process are Dim

The UNFCCC goal of limiting temperature increase to $1.5^0$ appears unattainable. Even the $2^0$ goal is unrealistic. The $2^0$ goal is simplistically presented as consistent with atmospheric concentration of about 450 ppm CO2equivalent by 2050. This simplification hides an inconvenient fact. Depending on the emission pathway, 450 ppm may provide only a 50% probability of limiting temperature increase to $2^0$C.

While the exact probabilities are uncertain, 80% confidence of not exceeding the $2^0$ limit requires limiting cumulative atmospheric concentration to around to under the current level of 400 ppm.

Translating the limit for atmospheric concentration of CO2 provides probability distributions of "an emissions budget" for the years 2015 to 2049. For 50% probability, the $2^0$C budget is about 1000 Gt CO2. For 66% probability to limit increases to $2^0$C, the 35 year budget is about 800 Gt CO2. A more than 80% probability of success reduces the global cumulative budget to a range of 666-775 GtCO2 from now to 2050. Some have argued that an 80% probability unreasonable, "….somewhat worse odds than playing Russian roulette with a six-shooter".

The momentum for action is weakened by uncertainty. Uncertainties include population forecasts; future per capita demand for energy resources; availability and costs of energy; technology used to produce power; costs of alternative technologies;

emissions of various technologies; carbon uptake from the oceans and forests; climate sensitivity to increased atmospheric concentration; impacts of temperature increase on ecosystem productivity, sea level, and extreme weather events; impact on future economic activity of carbon taxes or cap and trade systems; and the opportunity costs of both inaction or adaptation. The uncertainty with respect to these key variables and parameters undermine arguments for any specific costly course of action.

Voltaire's observed: "The human brain is a complex organ with the wonderful power of enabling man to find reasons for continuing to believe whatever it is that he wants to believe." An example of denial is the COP22 Marrakech communique which suggests we can limit temperature increase to $1.5^0$ if emissions peak by 2020. This is wishful thinking, given continued population growth, the impetus for development (more than one billion people without access to electricity), and the determination of the fossil fuel industries to continue exploration and to avoid assets being stranded. In a similar vein, Upton Sinclair: "It is difficult to get a man to understand something, when his salary depends upon his not understanding it!" And "expecting people to be convinced by the facts flies in the face of, you know, the facts….We apply fight-or-flight reflexes not only to predators, but to data itself".

The "intractability of the burden sharing problem", and "vagaries of human nature compromise top down efforts to agree to global collective action to decrease GHG emissions."

> "People of privilege will always risk their complete destruction rather than surrender any material part of their advantage. Intellectual myopia, often called stupidity, is no doubt a reason. But the privileged also feel that their privileges, however egregious they may seem to others, are a solemn, basic, God-given right. The sensitivity of the poor to injustice is a trivial thing compared with that of the rich." John Galbraith

What is "fair" in the context of allocating the global emissions budget across countries? What criteria should be included in determining an allocation formula? Ability to pay or polluter pay? The debate to determine relative contributions to any global effort is likely to be highly divisive.

## 2. The Bottom up Approach - Six Building Blocks

"If we are serious about it, we can still get there". A bottom up approach can increase chances of success. A bottom up approach "decomposes climate change into discrete problem-solving efforts, engaging ground-level actors". Building blocks could include: (i) Broadening and deepening private sector initiatives; (ii) Widespread adoption of border carbon adjustments; (iii) Intensification of research efforts on carbon-free energy; (iv) Identification of optimal adaptation initiatives; (v) Research on governance of geoengineering; and (vi) A suite of "doing-good-by-stealth" initiatives.

**(i) Sub-national and Private Corporate Action**

Sub-national actors can establish accelerators, tech incubators, and "green banks"; promote performance standards; and institute sub-national carbon tax or cap and trade programs. Product standards can ensure designs with extended lifetimes, make resources recoverable for other uses, product take-back, and remanufacturing. Authorities can promote sharing and service models that focus on increasing the utilisation of products, particularly for items, such as cars, which have high externalities but very low levels of utilisation (<95%) and exploit digital platforms replacing resource-based services with digital services. A reporting program on climate actions and achievements could standardize global data and showcase opportunities for climate impacts.

Clean-tech companies will become a powerful force for climate-friendly actions. Industry groups can set rigorous energy efficiency standards in their self-interest, without waiting for government. Business and labour can lobby for tax reform that replaces inefficient fossil fuel subsidies and payroll taxes (taxes on employment) with pollution taxes.

**(ii) Legitimize Border Carbon Adjustments (BCAs)**

Border tax adjustments – border carbon adjustments in the climate context – can be both fair and potentially effective. BCAs ensure a level playing field in international trade while internalizing the costs of climate damage into prices of goods and services. Domestic firms would be protected. Carbon-careless competition from imports from countries that don't tax carbon emissions or have cap-and-trade systems is unfair. WTO Article XX (Section VI) provides a justification for BCAs on environmental grounds. It centers on whether a carbon-based duty applied on a variable scale takes account of local conditions in foreign countries, including their own efforts to fight global warming and the level of economic development in

developing countries. Properly designed BCAs would be effective in changing behaviour, creating incentives for non-carbon taxing countries to adopt carbon taxes or establish cap-and-trade systems.

**(iii) Stimulate Targeted Research**

A recent CIGI Policy Brief noted that a both a "CGIAR for green technology" and the application of Advanced Market Commitments (AMCs) mechanism to incentivise targeted research could have a very beneficial impact on reducing CO2 emissions. CGIAR is a network of 15 research centres, spread across the world, focused on the science and policy of agriculture, aquaculture and nutrition. The CGIAR system is funded by dozens of national governments, and private and public organizations. Patents are held in the public interest and advances in technology and technique are disseminated freely across countries. An AMC is a publically created fund to guarantee a profitable market for a technical advance that is pre-specified and unlikely to be produced without such an incentive. One AMC stimulated the invention of a pneumococcal vaccine.

**(iv) Pipeline of Priority Adaptation Projects**

The Brisbane G20 announced a Global Infrastructure Initiative with "a consolidated database of infrastructure projects, connected to national and relevant multilateral development bank databases, to help match potential investors with projects". But the Brisbane announcement did not mention adaptation to climate change. The webpage of the Global Infrastructure Hub does not mention adaptation. The Warsaw International Mechanism for Loss and Damage associated with Climate Change Impacts does not explicitly mention establishing a pipeline of priority adaptation projects. The UNISDR Plan of Action mentions adaptation to climate risks and infrastructure, but without any sense of "action". At the Paris COP, the UNSG launched the "Initiative on Climate Resilience", known as A2R (Anticipate, Absorb, Reshape):

> "The A2R initiative will help countries secure expertise and financial resources for strengthening climate resilience. Today's launch of the Leadership Group establishes A2R's place within the UN system."

However, A2R does not commit to creation of a pipeline of priority infrastructure projects to optimize investment in adaptation to climate change.

**(v) Insurance: Research on Geoengineering**

The World Bank "Turn down the Heat" report concluded we are on a path to heat up by 4 degrees at the end of the century. Investing in an insurance policy is in order as a fallback. Even if all the "Intended Nationally Determined Contributions" pledged in Paris COP 21 are fully implemented, warming will likely exceed 2°C.

Early research suggests geoengineering interventions could offset much of the global-average heating projected this century, rapidly and at relatively low direct cost. But geoengineering interventions carry substantial new risks. Investment in research is required to determine the nature and extent of these risks.

**(vi) Doing Good by Stealth**

In its just released report to the FSB, the Task Force on Climate-related Financial Disclosures, chaired by Michael Bloomberg, noted that "what gets measured better gets managed better". Among its recommendations, it proposes that companies disclose climate-related risks in all major financial filings. Incentives matter; disclosure can be a powerful incentive.

The Internet and the digital economy have great potential to lower carbon intensity while increasing growth and productivity. Innovation in data and digital tech can transform outdated energy systems as well as the manufacturing, transportation and financial sectors. But the potential is threatened by weaknesses in the digital infrastructure, the instability of the international protocol coordination and innovation processes is reinforced and inadequate international coordination on crime and security to establish norms to deal with cyber-attacks. To ensure the necessary trust in the Internet, international cooperation is required. The place to start is to protect the financial sector, the foundation of the economy.

Policies that make sense in other sectors reduce emissions. Possibilities include changes in building standards, transport and forestry practices and policies. "No regrets" initiatives include ambitious standards to increase vehicle fuel efficiency (for example, the Global Fuel Economy Initiative) and to open the transportation fuel markets to competition (for example, the Open Fuel Standard). Health officials and city mayors could lead the charge on short-lived air pollutants (black carbon, methane and tropospheric ozone), which have damaging impacts on human health and agriculture.

Smart tax policies can have co-benefits that reduce emissions. Tax and education policies can increase female completion rates in secondary schools (which lowers fertility rates and hence future population and energy demand). Public health

campaigns to reduce obesity will relieve the pressure on health care costs (and the incremental energy demand for food and transportation). Synergies from successful public heath campaigns to reduce obesity could perhaps save an estimated 30 gigatonnes of carbon dioxide worldwide over the next 35 years. Apparently unconnected policies can make a significant contribution to reducing emissions. An example in the agricultural sector is that changing the diet of livestock can help reduce methane emissions gas produced in the rumen of cattle.

## 2. Suggestions for G20 action

### (i) Private Corporate Action

The G20 could welcome the December report of the Task Force on Climate-related Financial Disclosures and the UN's Private Sector Initiative's online database of case studies of good practices. The G20 could ask the Task Force and the FSB to follow up by developing model legislation on financial disclosure.

### (ii) Border Carbon Adjustments

The G20 could invite a report from the WTO on the legality of BCAs, to reinforce the argument that both the letter and spirit of existing rules permit countries with carbon taxes or cap-and-trade systems to adopt "non-discriminatory harmonizing tariffs". It could request exploration of provisions to deal with the unfairness argument – that the tax shouldn't apply to imports from poor countries with low per-capita carbon emissions. It could request the WTO to strengthen its relatively weak environmental provisions to support BCA's based on production processes.

### (iii) Stimulate targeted research

The G20 could follow up its "Mission Innovation" and the "Breakthrough Initiative" by asking G20 Energy Ministers to translate the CGIAR model from agriculture into the green energy field and to report on how AMCs might be applied to clean energy.

### (iv) A Pipeline for Adaptation Projects

Standardization of processes and forms is common for bidding documents in the field of procurement. Standardized contracts for complex public-private partnership (PPP) transactions are less common. The World Bank (WB) has begun to fill the gap providing examples of standardized PPP agreements, PPP contract clauses, bidding documents and guidance manuals that were developed on the national and

international level. For large adaptation infrastructure projects, the G20 could invite the MDBs to develop standardized approaches to calls for tenders and methods for both certifying and rating project proposals for adaption infrastructure.

**(v) Geoengineering**

Some believe climate engineering may be required to offset the potential consequences and future costs of global warming. However, the prevailing current view appears to be that geoengineering is a "cure worse than the disease." Given that an insurance policy may be prudent, the G20 could request that processes be devised to govern future research experiments in climate engineering and potential large scale deployment. Issues include consideration of realistic forecasts of the scale and impact of mitigation efforts, how to constitute the body to assess research proposals and out comes; the criteria for decision-making; and transparency and accountability provisions. Other questions include:

- In the long term, if research results are promising, what is the process to determine if we are facing a "climate emergency" requiring deployment?
- What threshold for agreement?
- Who controls the thermostat?

The G20 could request a report from China and the US on options for protocols and governance arrangements for research experiments, to inform well-founded decisions on whether or not to ultimately deploy climate engineering initiatives.

**(vi) Doing Good by Stealth**

Many policy proposals in fields other than energy will have impacts on future energy use and hence on future emissions. The G20 could contribute by inviting the FSB to prepare recommendations to provide trust in applications in the financial sector, the foundation of the economy. It would also be informative and useful to collect existing work estimating positive spillovers that reduce carbon emissions, as in the agriculture, education, public health and tax policy examples above. The G20 could invite a report from the OECD and the World Bank to consolidate existing research on policies in non-energy sectors that could contribute to both economic growth and the reduction of emissions. Produced with an auditor's frame of mind, the product would point the way for governments to indirectly contribute to emission reduction goals.

## 3. Conclusion

The G20 can effectively support the UNFCCC and the Paris agreement by imparting momentum to a suite of bottom up initiatives that can be characterized as "no regrets" or "win-win". The G20 can invite reports from:

- The International Energy Agency and the World Bank on the impacts of sub-national initiatives;
- The WTO on the legality of Border Carbon Adjustments;
- G20 Energy Ministers on adapting CGIAR and AMC models for green energy;
- MDBs on developing standardized approaches to tender calls, and certifying and rating proposals, to enable preparation for a pipeline for adaption infrastructure projects;
- China and the US, jointly, on options for protocols and governance arrangements for geo-engineering research experiments;
- The OECD and the World Bank to consolidate existing research on policies in non-energy sectors that contribute to both economic growth and the reduction of emissions (e.g. Internet security);
- The Financial Stability Board (FSB) to develop model legislation on financial disclosure.
- The FSB to recommend initiatives to maintain trust in financial sector digital applications.

# G20 Agenda for Sustainable Infrastructure

Wonhyuk Lim
KDI School of Public Policy

Infrastructure has been a major G20 agenda item since 2010, when it was selected as one of the nine pillars of the G20 Seoul Development Consensus. However, many G20 member countries have been reluctant to make resource commitments to facilitate infrastructure investment and instead tended to focus on the role of private investors through public-private partnership (PPP) and pension funds. This approach has proved to be of limited utility. It is not too difficult to understand why. Given the private sector's focus on the short term and concern about expropriation and other political and regulatory risks (and hence their demand for a high risk premium), and developing countries' reluctance to rely on high-cost short-term financing for infrastructure, it does not seem to make much sense to emphasize PPP. While pension funds could make longer-term commitments than ordinary private investors, their concern about political and regulatory risks may be no less significant, especially with regard to infrastructure that is socially desirable but not commercially viable. Much of infrastructure designed to respond to environmental challenges belongs to this category.

Under this circumstance, it may be useful to strengthen the financial and technical role of the multilateral development banks (MDBs), for they could not only raise capital more cheaply but also negotiate more effectively with country governments than would private investors. This would lower perceived risks and infrastructure financing costs. More specifically, MDBs could make two important contributions: (1) establishing infrastructure as an asset class to facilitate the use of different financing instruments based on the risk profile of infrastructure investment; and (2) formulating energy efficiency and environmental standards for infrastructure as part of their loan conditions to encourage their adoption by borrowing countries.

**Infrastructure Investment Risk Profile by Phase**

| PHASE | Initiation | Construction | Growth | Maturity |
|---|---|---|---|---|
| RISKS | Non-feasibility; No financing | Design Construction (change orders, bankruptcy) | Operations; Political/natural | Political/natural |
| RISK PREMIUM | 8 – 10% | 6 – 8% | 3-6% | 2 – 3% |
| FINANCING | Equity | Senior bank debt | Bonds suitable | Bonds suitable |

Source: C.H. Paik, Macquarie Korea