

Can Asia Change the Climate?

Risks, Responses, and Leadership for Climate Action

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Introduction

Good evening! Tuesdays are particularly difficult. The enthusiasm of a Monday has dissipated by now, the hump of the midweek has not even been reached, and Friday is a distant galaxy. For so many of you to have come out on a Tuesday evening can have one of three explanations. One, you have a personal connection to the organisers, or to me, so I am extremely thankful to you for your support. Two, you believe that the challenges of climate change cannot possibly be worse than the Tuesday workday you have just had. Sadly, I will have to disappoint you but I hope the lecture will be bearable. Three, you are intrigued by the topic and are curious whether Asia can truly change the climate. You are the true knowledge seekers. But I must warn that I don't have very robust answers.

I am very grateful to the Society for Policy Studies and the India Habitat Centre for inviting me to deliver this lecture. When Commodore Uday Bhaskar first requested me, the United States was still debating whether to stay in or leave the Paris Agreement, OPEC was still confident that its production cuts deal would hold, and solar tariffs in India were 30% higher. What a difference three months make! So, while I thank him deeply for nudging me to think about this topic, my own ideas are still evolving. Asia is changing, as is the climate. I venture into this minefield with an armour of caveats.



My lecture will be premised on six propositions:

1. Climate risks for Asia are real... and now
2. Climate responses in Asia are aggressive... but inadequate
3. Climate leadership is diffuse... and misunderstood

And therefore,

4. Climate politics needs a reimagining of institutions
5. Climate economics needs to defeat persisting mercantilism
6. Climate ethics needs more voices in ungoverned terrains

The flooded airfield

But let us start by painting some mental vignettes. When you hear the words “severe rainfall causes widespread destruction”, the images that usually come to mind are of flooded streets, perhaps people clambering on to rooftops, maybe even some amused faces wading through knee-deep water. In May 2014 particularly heavy rains fell on China’s industrial heartland: the cities of Guangzhou, Dongguan, Shenzhen and surrounding areas. Guangzhou had to spend \$100 million on repairs. It was lucky. The rising South China Sea and the criss-crossing network of tributaries in the Pearl River delta lie just a metre below the site of the world’s most dynamic urban transformation with trillions of dollars of assets. Damages could have been worse.¹

In November 2015, just a few weeks before the historic Paris climate change conference, Chennai suffered a once-in-a-century flood. Despite the terrible human and material impact, an iconic image was of private aircraft stranded in a flooded Chennai airport.

Were these natural disasters a consequence of climate change? Perhaps; perhaps not. What matters is that the likelihood of severe coastal flooding will increase exponentially with a warming climate. And while poor people, poor regions and poor countries will face the brunt of climate change, the impacts will be felt by the rich too, as their movable and immovable assets come under growing threat. Asia – with the most number of poor people and being the most economically dynamic region in the world – will encounter climate change like no other region.

Climate risks are real... and now

When we think about the risks to a business’s viability, or the threats to a nation’s security, we normally ask, ‘What is the worst that could happen?’ Having identified the greatest risks, we can then decide how much effort to spend on reducing or avoiding them. Climate change, surely, should be no different.

We all know that as the world becomes warmer, heat waves will become more extreme. Does Asia have it particularly bad? If the world warms by four degrees, in northern India there is a 30% probability that temperatures will be so high that moderate/heavy outdoor work cannot be carried out in the hottest month. Researchers at CEEW, IIT Gandhinagar and IIM Ahmedabad have found

that under a worst-case scenario, Delhi, Ahmedabad, Bangalore, Mumbai and Kolkata are projected to experience the highest absolute increases in heat-related mortality this century.² At six degrees, the probability of not being able to work outdoors increases to 70% in southeastern China. If the global warming range were higher, there is a 50% probability that conditions would become intolerable for survival in southeastern China, even in the shade and at rest.

Another example: drought and heat stress on crops. At its maximum, drought could affect around 7% of South Asia’s total cropland in 2050. Climate change will result in significant economic losses for Indian agriculture: production losses in rice, wheat and maize alone could reach US\$208 billion in 2050 (in 2010 US\$ prices) and US\$366 billion in 2100.³

At another extreme, on a high emissions pathway, over the course of this century, what is now a ‘30-year flood’ could become three times more frequent in China’s Yellow River basin and in the Indus basin. And six times more frequent in the Ganga basin. In the worst case for those three river basins, such a flood could be in the region of ten times more frequent by the end of the century. And like Chennai, with one metre of sea level rise, what used to be a once-in-one-hundred-years flood, becomes roughly a once-in-two-years flood in Shanghai, a twice-a-year flood in New York, and a ten-times-a-year flood in Kolkata.⁴

Cities are going to be the locus of economic activity for fast growing Asian economies. What seems low-risk today, in terms of threats to people or infrastructure, would rise manifold when hundreds of millions of people shift to cities and trillions of dollars of hard assets get built. In 2005 40 million people and \$3 trillion worth of assets were exposed to a once-in-a-century coastal flooding event across 136 port cities. But the maximum exposure for assets was for the United States, Japan and the Netherlands. By the 2070s, the story will change with Asia leading in asset vulnerability (14 of the top 20 cities), even as it also continues to host the largest number of people (16 of the top 20 cities) exposed to extreme events.⁵

For India, this is particularly problematic, since much of the urban and coastal infrastructure is yet to be built. Take Amravati, the upcoming new capital city for Andhra Pradesh. My CEEW colleagues have estimated that over and above the ₹51,500 crore (\$8 billion) needed for energy infrastructure, power demand will likely increase

by 3%-5% for every 1°C increase in temperature. A 13% increase in average rainfall by end century will likely damage energy and road infrastructure, disrupt inland waterways, and add to flood risks.⁶

As my co-authors and I have argued in *Climate Change: A Risk Assessment*,⁷ risk is a function of time, impacts and probability. Our collective shortsightedness often means that we ignore high impact events and outcomes. They might have low probabilities today but their likelihood could increase in non-linear ways over the medium term.

Sometimes in the climate change debate, analysis such as this is met with accusations of ‘alarmism’. We need to recognise how unusual this is. A country’s national security adviser would rarely be criticised for considering the worst case military, intelligence or terrorist threats to the national interest. Similarly, an insurance firm would not be faulted for assessing the worst-case risks to its ability to continue as a going concern – on the contrary, it is obliged by regulation to do exactly that. Then, why should it be different for climate change?

For Asia, the crisis is real and now. In our neighbourhood, eight countries share the combined water resources of the Hindu Kush Himalayan region. This area – also known as the Third Pole – has nearly 55000 glaciers, feeding ten major river systems. Water stress, exacerbated by a changing climate, would impact millions of farmers, impact plans for hydropower generation, and add to mutual suspicion and security concerns.

We must treat climate change as a threat to our national (regional and global) security. We would betray dangerous complacency by merely preferring an alternative outcome when the evidence points elsewhere. We have to plan for the worst, not merely hope for the best.

Climate responses are aggressive... but inadequate

In 2008 India introduced its National Action Plan on Climate Change. The plan included eight missions, covering solar power to energy efficiency to water and strategic knowledge on climate change. By then India was already participating as a preferred country for projects under the Clean Development Mechanism (CDM), which was established by the Kyoto Protocol.

Neither then, nor now, is India obliged to be acting on climate change based on historical responsibility. But the

developed world insisted that India and China (and other fast growing developing countries) would contribute a large and growing share of emissions during the course of this century. Therefore, so the argument went, they had an obligation to step up and do their bit.

The bit that was being asked was actually quite a lot. India’s per capita emissions were about two tonnes of CO₂e, one-tenth that of an average American. In fact, at the G8 summit in Heiligendamm, in 2007, Prime Minister Manmohan Singh had committed that India’s per capita emissions would never exceed the average of developed countries. As India’s 2015 submission to the UN Framework Convention on Climate Change (UNFCCC) stated, “No country in the world has been able to achieve a Human Development Index of 0.9 or more without an annual energy availability of at least 4 toe per capita. With a HDI of 0.586, India has a lot to do to provide a dignified life to its population and meet their rightful aspirations.”⁸

Moreover, the developed world’s argument was based on the *flow* of emissions. Climate change is affected by the *stock* of greenhouse gases in the atmosphere. And the stock is still dominated by and will continue to be dominated by developed countries. India would, of course, add to that stock in this century, but it would not absolve the historical polluters of their responsibility.

Yet, there has been a shift in India’s approach and its actions in the intervening decade. India has ramped up its ambitions for climate mitigation (more on them later). It has also become more cognisant of climate impacts, especially in terms of water stress, agricultural output and impacts on public health. And it has sought to demonstrate *visibly* that it seeks a robust climate agreement and an effective global climate regime.

China’s story is a little more complicated. Although still clubbed together with developing countries, its footprint on the global climate is of a different magnitude. By 2007 it had overtaken the United States as the largest emitter of carbon dioxide.⁹ As the world’s manufacturing powerhouse, it could – and did – argue that its emissions were really the consequence of the demand for products in the developed world. But China had also built its energy infrastructure aggressively, relying primarily on coal – vast amounts of it. For a long period of time it was adding two large coal power plants every week. As of January 2017 China had more than 921,000 megawatts (MW) of coal power capacity¹⁰, with some estimates suggesting that the overcapacity alone (thanks to a slowdown in

economic growth) is 300,000 MW¹¹ (that's the entire Indian power sector!).

Yet, the same China has become the world's renewable energy capital, with more capacity and more invested than in any other country in the world. It has also rapidly – and often by following uncompetitive practices – built up a massive manufacturing base for clean energy. One positive outcome has been the drop in prices of wind turbines and solar panels, from which India has also greatly benefited, thus far.

Japan has had a different experience. As a developed country, it was a major contributor to greenhouse gases. But its electricity system had a large share of nuclear power: 30% of generation when the 2011 Great East Japan earthquake and tsunami struck. The accident at Fukushima triggered a shutdown of all 54 reactors and a rethink of energy policy. In 2014, Japan issued its 4th Strategic Energy Plan, emphasising energy efficiency, environmental sustainability and a doubling of zero-emission power generation.

Other fast growing economies in Southeast Asia are further behind the curve. Indonesia is the world's largest coal exporter. Thailand plans to install 6000 MW of solar and increase the share of renewable energy from 12% to 30% only by 2036. Philippines introduced a feed-in tariff for renewables in 2012. Cambodia's first solar plant (10 MW) is expected to be commissioned next month. But overall, there remain challenges of large upfront costs, lack of institutional capital, and expensive finance.

Despite these measures, big and small, the response to climate change for the world as a whole is inadequate. For a long time the target was of limiting average surface temperature rise to 2°C, above pre-industrial levels. This target creates a carbon budget for the planet: 1000 Gt-CO₂ (from 2011 to 2100 for a 66% probability of staying within 2°C). With their commitments to the UNFCCC, between 2011 and 2030, China, the E.U. and the U.S. would have together cornered at least 38% of the world's total permissible emissions up to 2100.

Now, the Paris Agreement actually aims for “well below” 2°C with some clamouring for 1.5°C. If the world indeed set itself such a target, then the carbon budget would shrink to just 400 Gt-CO₂. And by 2030 these three regions would consume 95% of the entire world's nearly century-long carbon budget.¹²

Climate leadership is diffuse... and misunderstood

These were the cards we were dealt. But there was hope, grounded on a foundation of trust. Trust that countries would do as they say today, and would say that they would do more tomorrow.

After more than two decades of climate negotiations, the Paris Agreement on climate change offered a deal that ensured that all countries would contribute to the effort to mitigate climate change. This breakthrough was made possible by allowing each country to determine its own action plan, also known as the Nationally Determined Contributions. Climate leadership became diffuse and distributed.

This so-called “bottom up” architecture was politically salient but climatically inadequate. It was a capstone for years of negotiations, but a mere stepping-stone towards (what was expected) would be more aggressive action in the coming years.

That scenario was upended with President Trump's announcement that the United States would withdraw from the Agreement. The inadequacy of the Paris commitments is now compounded by the inaction of the American promise. Now that the U.S. plans to exit, the politics of climate change takes on a different dimension.

Who is a climate leader? It is a simple question but has no easy answers. Immediately after President Trump's Rose Garden speech on 1 June, commentators across the world jumped to pass the leadership mantle on to China. They might have wanted to convey the message to many other countries that all was not lost. They might have wanted to reassure affected communities and thousands of climate activists that there was a Plan B in China. Or they might have simply wanted to win over the air waves in a toxic media battle for climate hearts and minds.

There are three problems with this approach. First, its underlying premise is flawed. It presumes that the United States (until 31 May) was indeed the world's climate leader. As I have argued today, it was central to the problem and is needed for a practical solution. But the United States has been, primarily, a “climate squatter”.

Secondly, the argument presumes that China was both ready *and* willing to become the climate leader. Again, as argued, China's response, while aggressive in ambition

and action, is still very much a mixed story until now. The clean goes hand in hand with a lot of dirty.

Thirdly, this technocratic passing of the baton from one country to another is deeply flawed. It measures climate leadership in Presidential statements and academic charts, not from the perspective of communities impacted and people suffering. By doing so, it raises false expectations and undermines trust even further.

China and the E.U. wanted to forge an alliance in response to the U.S. decision, but failed.¹³ In fact, China proposed in January that coal consumption would *rise* to 4.1 billion tonnes in 2020. Latest evidence shows the E.U.'s emissions increased in 2015. Germany, despite driving a renewables revolution, is burning the dirtiest form of coal. None of this is unvarnished climate leadership.

It is important, then, to call a spade a spade. Climate politics will be driven by national interests; and climate action will be affected by economic interests. Climate leadership is a misunderstood concept; indeed, it is a *constructed* ideal, when the passing of one leader allows for the crown to be immediately placed on another's head. This is, unfortunately, not a case of "The Climate Leader is Dead; Long Live the Climate Leader"!

Climate politics needs a reimagining of institutions

In which direction should we look to get out of this messy morass of exponentially rising risks, inadequate responses and obscure climate leadership? Surely, we are not expecting Asian countries to fill the gap left by the U.S. decision to withdraw from the Paris Agreement. A U.S. withdrawal does not mean that all climate action has stopped there. Commentators have been at pains to emphasise that the federal government cannot overturn policies being pushed at the state level, coalitions forged by city mayors, or the direction of private investment.

So, when we ask whether Asia can change the climate, what do we really mean? I would argue that Asia's role should be to persevere for a different kind of climate politics, a reformulated climate economics, and an inclusive climate ethics.

On climate politics, there is not one but three Asias. The first is China, which stands apart in terms of its economic size and share of emissions. The second is India, along with several other South and Southeast Asian economies, which are growing rapidly, still have hundreds

of millions in poverty, need to industrialise and create jobs, and whose opportunities are getting squeezed by the shrinking carbon space. The third is West and Central Asia, with many economies heavily dependent on fossil fuels, limited diversification in their economic structure, or limited capability to develop the industries of the future. Of course, this is a generalisation and there are variations within these sub-regions and similarities across them. The point, however, is that it would be unrealistic to expect a common pattern of responses in climate politics.

This has become palpable in recent years. After the failed Copenhagen climate summit in 2009, it became clear (at least to those who would choose to see) that India was caught in a shifting world, in which China would outgrow everyone else, and capture even more carbon space than the United States and Europe in future. China would leave India by the wayside. Despite their supposed unity in climate negotiations, especially via the BASIC coalition (including Brazil and South Africa), China had no hesitation to forge parallel deals. It did so with the United States in November 2014 (a whole year before Paris).¹⁴ It did it again in March 2016 on HFC negotiations.¹⁵ And it was attempting to strike another deal with the European Union this summer. These tactics made sense from China's perspective. But they ensured that India would be increasingly viewed as the swing player in climate negotiations and would be pressed into a corner.

India did well to manoeuvre out of the corner. After the China-U.S. deal, I had argued that there were only three options when caught inside a climate *chakravayuh*: surrender, fight from within, and find allies outside the encirclement.¹⁶ India did a bit of all three in the lead up to Paris. But its true diplomatic tact and political leadership was best demonstrated when it joined hands with France to launch the International Solar Alliance (ISA) on the first day of the Paris negotiations.

ISA is designed as a platform to bring together countries with rich solar potential (along with solar innovators, developers, and financiers) to aggregate demand, creating a global buyers' market for solar energy, and thereby reduce prices, facilitate the deployment of existing solar technologies at scale, and promote collaborative R&D.¹⁷ Thirty-one countries have signed its Framework Agreement already. Among other initiatives, it is seeking common risk mitigation instruments, to hedge risks across its membership and beyond in order to leverage limited public funds and crowd in large flows of private investment.¹⁸

ISA has a long way to go before it can be called a success. But its basic premise and proposition is appealing. It is a different kind of institutional leadership compared to what has come in the past.

ISA is one example. The International Renewable Energy Agency is also headquartered in Asia (Abu Dhabi). China, Japan and South Korea have recently forged a gas alliance to collectively press for more flexible contracts.¹⁹ New financial institutions, such as the New Development Bank, have plans to invest significant capital (upwards of \$1.2 billion annually) into clean energy, even though analysts argue that it can do much more.²⁰

The institutions of the 21st century need to be nimble. They need to recognise that emerging economies increasingly demand a seat at the rule-making table; that new issues demand new types of regime design; that international regimes are more complex now, with many actors demanding a say (including the private sector, not just governments); and that networks of governance will plot the direction of travel rather than top-down diktats by Committee.²¹ Asian powers, not satisfied with the current architecture of global (and climate) governance, are seeking new avenues for articulation and action.

Climate politics will play out in many arenas, multilateral and regional. Although I believe that the greatest dynamism will be witnessed via plurilateral platforms. But only if diplomats and political leaders learned the lessons of past failures, and strived to build action-oriented institutions, not ossified international bureaucracies. If they were to do so, Asia – and India – could map a new geography for institutional leadership on climate change.

Climate economics needs to defeat persisting mercantilism

Meanwhile, the structure of the world economy has been changing. The new economy in the 21st century will be decentralised, digitalised and decarbonised. Economic activity will gradually shift towards distributed sources of production and points of consumption. These could include products (decentralised power generation, urban farming) and services (electricity consumption, wastewater treatment and reuse, transportation).²² Economies of scale will come not from geography but through networks, of people and things, even if they are not concentrated in a single location. Digital connectivity, the Internet of Things, supported by real time analytics

and artificial intelligence will add economic value by reducing the barriers of distance.

But all this will have to happen in a world with less carbon space. National security, economic prosperity and climate resilience will have to all go hand-in-hand with resource efficiency.²³

Some Asian countries spotted these opportunities early on. In Japan, green innovation was one of two high-level priority themes in its 4th Basic Science and Technology Plan (2011-15), emphasising new energy vehicles, low-carbon industry, and new energy. In 2008, South Korea announced a “low-carbon, green growth” strategy for long-term development. At least 10 out of the 27 core technologies identified were energy, material, and process efficiency improvement technologies.

Of the seven strategic emerging industries designated in China’s 12th Five Year Plan, three were associated with sustainable growth (alternative energy, clean energy vehicles, and clean energy production). The 13th Plan has continued its focus on environmental technologies.

India’s approach has been less strategic in terms of pushing new industries, but it has done well in creating the right conditions for new energy markets to develop. India has been spearheading a renewable energy revolution.²⁴ In 2010 India’s National Solar Mission commenced with a target of installing 22,000 megawatts (MW). At the time, India’s total installed capacity was 17.8 MW. The world’s leading solar countries were Germany, Spain, Japan, United States, and Italy. India was in tenth place.

In 2014, India asked itself a simple question: how big can we get on renewables? And in early 2015, it had announced that by 2022 it would install 100,000 MW of solar, 60,000 MW of wind, 10,000 MW of biomass-based electricity capacity, and 5,000 MW of small hydropower.

Is this too ambitious? After all, India is trying to do in less than a decade what took Germany more than two decades to achieve. But the targets have set a direction of travel, creating an attractive market, giving confidence to investors, and even nudging policy planners.

Whereas many European countries pushed renewable energy through consumer subsidies, India adopted a reverse auction-based competitive bidding process for solar. That has meant that the lowest tariffs have dropped from 10.95 (USD 0.17) in December 2010 to 2.44 (\$0.038) in May 2017. Competitive bidding in wind,

introduced in February 2017, resulted in bids falling to 3.46.

Can renewable energy prices fall any further? CEEW analysis shows that cost of finance, rather than cost of technology, accounts for the largest share of the tariffs²⁵ – a challenge even greater in many other developing countries. India needs \$100 billion of debt alone to achieve its solar targets.²⁶ If India could find ways to reduce investor risks, and lower the cost of finance, it would hold lessons for others on how a combination of transparent bidding and publicly funded risk guarantees could drive a clean energy transition.

Asian economies have variably demonstrated the use of directed industrial policy, leveraging public finances, and regulations to increase market competition to drive climate-friendly action. But three pitfalls are likely: trade disputes, critical minerals, and the imperative of creating jobs.

Renewable energy-related trade disputes began in 2010, accounting for 8% of new disputes at the WTO since then. This is not trivial, a signal of growing political and economic sensitivity over market access for RE. There are other signs of trade tension with several countries challenging RE policies unilaterally. During 2010-14, 45 WTO members applied countervailing duties (CVDs) against energy products (including both fossil fuels and RE); and 87 members applied antidumping (AD) measures during 2012-14.²⁷

Furthermore, with growing interest in renewable energy, electric vehicles, efficient lighting, the role of critical minerals in climate-friendly development will grow. CEEW researchers identified 12 minerals as most critical for India (high economic importance and high supply risk), including beryllium (critical for nuclear and aerospace), chromium (for stainless steel) and germanium (for semiconductors and fibre optics). India is completely import-dependent for seven of the critical minerals and nearly half of 49 minerals analysed.²⁸ China's restrictions on exports of rare earths (which are also needed for clean tech manufacturing) are an example of how vulnerability could increase.

Against 56,000 people currently employed in solar and wind in India, its 160,000 MW of solar and wind targets would create a workforce of 330,000 people over the next five years.²⁹ China has 3.6 million people employed already, Japan 313,000, and Bangladesh 162,000.³⁰ Three of the top five countries with RE jobs are in Asia.

Behind the disputes are domestic political economy pressures. The incentive is to capture a slice of the rapidly growing global RE market. Over the past decade more than \$2 trillion have been invested in RE plants. This is the basis of the new green economy on which many countries have hinged their bets for future innovation, growth and jobs.

The industries of the future³¹ – physical, biological, and digital – will be shaped by the carbon constraint and local resource constraints. But the economic opportunities presented would need a rethink of the mercantilist policies in some Asian economies, particularly China. Asian economies can tap into these opportunities if they became part of global/regional supply chains for new technologies and products, maximised resources available at home, and created trained workforces³² suited to these rapidly shifting trends.

Climate ethics needs more voices in ungoverned terrains

The third way by which Asia can change the climate game is by adding its voice on issues that have largely escaped attention or on which developed countries have dominated the discourse so far. Historically, in the climate discourse, the presumption has been that developing countries, including those in Asia, were largely interested in a limited articulation of ethics. The morality of climate negotiations rested on historical responsibility and the polluter pays principle. From that point of origin came the demands for financial support, technology transfers, capacity building, loss and damage, and so forth.

Those ethical imperatives have not disappeared, even though the developed world has tried very hard to dilute them. These are *demands*, justifiably so. But Asia also needs to *propose* moral positions. If my argument thus far has credence, then Asia's growing share in the global economy, its footprint on energy markets and global emissions, its technological and market dynamism, and its institutional leadership are sufficient justifications for it to articulate a new climate ethics. Asia needs to speak for the world, not just for itself. I propose three issues on which an Asian voice is definitely needed.

First, energy transitions. As my co-authors and I argue in *Energizing India*, by the time India becomes a 100-year-old independent country, it will go through four energy transitions: from energy deprivation to energy access; from rural to urban patterns of energy demand; from

relative autarchy to much deeper integration into global energy markets; and a shift from dirty to relatively cleaner energy.³³ Other Asian economies will encounter similar transitions, within their unique circumstances.

But the conversation around energy transitions has avoided nuance. The question often asked of Asian countries is, “When will you stop burning coal?” Or, it is suggested, “You must develop a plan for 100% renewable energy.” There is still, unfortunately, a deep lack of understanding of varying development circumstances. The well intentioned enthusiasm to ensure that developing countries avoid the dirty energy phase that advanced economies went through results in policy choices framed as binaries: coal or no coal; keep [oil] in the ground or pump it out; natural gas as a bridge fuel or not; etc.

Asian economies need to emphasise that there will be many energy transitions and due space must be yielded for countries to discover and pursue their respective paths. India, for instance, has the largest number of people in the world without access to modern energy. If we used a Benthamite approach (greatest good for greatest number), any and all energy policy *in the world* must begin with an *Indian* framing. We don’t need *an* Asian voice; we need many Asian voices to describe many energy transitions. Mere tokenism in representation will not do.

Another area with even fewer Asian voices is the governance of climate geoengineering or the deliberate large-scale intervention in Earth’s climate system, to limit adverse global warming. The suite of technologies involve removing carbon dioxide from the atmosphere or changing the amount of solar radiation reaching Earth’s surface.

These are not yet proven technologies. But they have been proposed for a while. Much of the research is concentrated in North America and the United States. The China Geoengineering Program began in 2015, to analyse impacts at a regional level. A handful of researchers work in India. Japanese scholars are assessing attitudes in the Asia-Pacific to geoengineering. CEEW has organised regular conferences (2011, 2012, 2014, 2016) to discuss the governance of geoengineering research and technologies.

The challenge is, indeed, governance. There is still limited discussion within Asia on the governance of these potentially impactful and simultaneously dangerous

technologies. There are material concerns about unilateral action in an uncertain technological field. What would happen to rainfall, to the hydrological cycle, tropical forests, the ozone layer, or the oceans? Could technology be used with less benign intentions?

There are ethical concerns too. Could geoengineering reduce incentives to take necessary action on climate mitigation? Once developed, would the temptations to deploy be too strong to resist? Should mankind hubristically interfere with nature at a planetary scale? Is it not already? Who bears responsibility for trans-border and inter-generational impacts?

We need Asia to participate much more actively and define a perspective for global governance of geoengineering technologies.³⁴ And Asian countries must help design an international research programme on geoengineering, taking account of research capacities, funding mechanisms, liability rules, and intellectual property.³⁵ This is a frontier that cannot be left ungoverned.

Lastly, Asia must look inwards, to promote greater transparency on climate change within the region and within countries. Article 13 of the Paris Agreement establishes a transparency mechanism to enhance the Parties’ trust in the UN climate regime. But many states at present lack the institutional capacity to fully carry out their obligations.

Independent institutions can plug this gap. My colleagues have developed India’s largest database on industrial emissions, drawing on data from 200,000 plants. Non-state institutions in South America (particularly Brazil and Peru) are also developing independent inventories.

Open, democratic societies must welcome transparency. Transparency is not merely a stick of the developed countries with which to beat up emerging economies. The reverse is applicable too. Asia’s leading economies should call for greater transparency. They should open the space for non-Party stakeholders, who could bridge the challenges of building national capacity, monitoring both emissions and financial flows, evaluating inter-country initiatives, and contributing to overall assessments of the effectiveness of global collective action. Such an approach could build trust and confidence and the countries with the most to gain or lose from a transparency mechanism would have set the agenda.³⁶

Conclusion

One of the reasons we do not get sufficient action on climate change is because, as humans, we are hardwired to think about immediate threats rather than long-term risks. But sometimes those risks convert to existential and imminent threats. For too long we have either dismissed climate science as the purview of a few scientists, or the tree-hugging agenda of a few activists. We have argued that it is not a problem of our creation or that it is an imposition on our freedom to develop.

If I want you to take one message back tonight, it is this: the world has changed, the climate is changing, and we must change too. As the beneficiaries of the dynamism of Asian economic transformation, and the custodians of its future sustainability, we need to recognise the direct and systemic risks climate change poses for our region. We need to celebrate the disproportionately aggressive targets we have set for climate mitigation, but also

acknowledge that our efforts will fall short of what is needed. Most of all we need to resist false pretensions of grandeur about climate leadership. It is a collective burden we carry.

Asia – and India – can, indeed, change the climate. Climate and energy-related institutions need new designs and collaborative platforms. Climate economics will deliver the greatest benefits if we forego foolhardy attempts to capture niche market shares in favour of developing supply chains for climate friendly goods and services – and create new prosperity and jobs as a result. Climate ethics requires new voices on new issues, from explaining energy transitions, to governing geoengineering, to calling for a more open, inclusive and transparent climate regime.

Asia is poised for climate leadership. Except it is not the bravado of leadership that must titillate us; rather, it is the quiet self-confidence that comes from knowing – and shaping – the future.

Thank you.



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Assessment (FCO, 2015). Arunabha's essay "Rethink India's energy strategy" in *Nature* was selected as one of 2015's ten most influential essays.

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Endnotes

1. Michael Kimmelman, and Josh Haner (2017) 'Rising Waters Threaten China's Rising Cities', *New York Times*, 7 April. Available at: https://www.nytimes.com/interactive/2017/04/07/world/asia/climate-change-china.html?ref=collection%2Fseriescollection%2Fchanging-climate-changing-cities&_r=1.
2. Hem H. Dholakia, Vimal Mishra, and Amit Garg (2015) 'Predicted Increases in Heat related Mortality under Climate Change in Urban India', CEEW, IIT Gandhinagar, IIM Ahmedabad Working Paper 2015-05-02, June
3. Vaibhav Chaturvedi (2015) 'The Costs of Climate Change Impacts for India', CEEW Working Paper 2015/11, March
4. David King, Daniel Schrag, Zhou Dadi, Qi Ye, and Arunabha Ghosh (2015) *Climate Change: A Risk Assessment*. London: UK Foreign and Commonwealth Office, July
5. Susan Hanson, Robert Nicholls, et al (2011) 'A global ranking of port cities with high exposure to climate extremes', *Climatic Change* 104, pp. 100-102.
6. Hem Dholakia et al (forthcoming) 'Amaravati: Building a Path towards Climate Resilience', *Report*, Council on Energy, Environment and Water, University of East Anglia, Mott MacDonald.
7. David King, Daniel Schrag, Zhou Dadi, Qi Ye, and Arunabha Ghosh (2015) *Climate Change: A Risk Assessment*. London: UK Foreign and Commonwealth Office, July
8. Government of India (2015) 'India's Intended Nationally Determined Contribution: Working Towards Climate Justice', *Submission to the UN Framework Convention on Climate Change*, 2 October. Available at: <http://www4.unfccc.int/submissions/INDC/Published%20Documents/India/1/INDIA%20INDC%20TO%20UNFCCC.pdf>
9. John Vidal, and David Adam (2007) 'China overtakes US as world's biggest CO2 emitter', *The Guardian*, 19 June. Available at: <https://www.theguardian.com/environment/2007/jun/19/china.usnews>
10. Ping Manongdo (2017) 'Can Asia truly go coal-free?' *Eco Business*, 17 July. Available at: http://www.eco-business.com/news/can-asia-truly-go-coal-free/?utm_medium=email&utm_campaign=July%2019%20Newsletter&utm_content=July%2019%20Newsletter+Version+A+CID_57e02e5ea4710e7365f8e8163eb77091&utm_source=Campaign%20Monitor&utm_term=Can%20Asia%20truly%20go%20coal-free
11. Ian Johnston (2016) 'China suspends building of new coal power stations as electricity demand declines', *The Independent*, 13 July. Available at: <http://www.independent.co.uk/environment/china-coal-power-stations-plants-electricity-supply-green-energy-greenpeace-a7134596.html>
12. Arunabha Ghosh and Vaibhav Chaturvedi (2015) 'For a few degrees more', *Business Standard*, 22 December. Available at: http://www.business-standard.com/article/opinion/arunabha-ghosh-vaibhav-chaturvedi-for-a-few-degrees-more-115122101121_1.html
13. Jean Chemnick (2017) 'E.U., China to make major climate announcement', *Greenwire*, 31 May. Available at: <https://www.eenews.net/greenwire/2017/05/31/stories/1060055365>
14. The White House (2014) 'U.S.-China Joint Announcement on Climate Change', 12 November. Available at: <https://obamawhitehouse.archives.gov/the-press-office/2014/11/11/us-china-joint-announcement-climate-change>
15. The White House (2016) 'U.S.-China Joint Presidential Statement on Climate Change', 31 March. Available at: <https://obamawhitehouse.archives.gov/the-press-office/2016/03/31/us-china-joint-presidential-statement-climate-change>
16. Arunabha Ghosh (2014) 'Breaking Through the Climate Chakravayuh', *Business Standard*, 25 November. Available at http://www.business-standard.com/article/opinion/arunabha-ghosh-breaking-through-the-climate-chakravayuh-114112401171_1.html
17. Arunabha Ghosh and Kanika Chawla (2016) 'Can the International Solar Alliance change the game?' *The Hindu*, 26 August. Available at: <http://www.thehindu.com/opinion/columns/Can-the-international-solar-alliance-change-the-game/article14589187.ece>
18. Press Information Bureau (2017) 'Commissioning a Study on Common Risk Mitigation Mechanism for Solar Power Generation Projects in Solar Resource Rich Countries Under Aegis of ISA', 19 May. Available at: <http://pib.nic.in/newsite/PrintRelease.aspx?relid=161974>
19. Reuters (2017) 'World's top LNG buyers form alliance to push for flexible contracts', 23 March. Available at: <http://uk.reuters.com/article/asia-lng-markets-idUKL3N1H02FJ>
20. Jai Sharda (2016) 'The New Development Bank: Its Role in Achieving BRICS Renewable Energy Targets', *Institute for Energy Economics and Financial Analysis*, October. Available at: <http://ieefa.org/wp-content/uploads/2016/10/New-Development-Bank-and-Role-in-BRICS-Renewable-Energy-Targets-October-2016.pdf>
21. Arunabha Ghosh, Arundhati Ghose et al (2011) *Understanding Complexity, Anticipating Change: From Interests to Strategy on Global Governance*, Report of the Working Group on India and Global Governance, December, New Delhi: Council on Energy, Environment and Water, pp. i-70
22. Arunabha Ghosh, and Karthik Ganesan (2015) 'Rethink India's energy strategy', *Nature* 521, 14 May, pp. 156-157. Available at: <http://www.nature.com/news/policy-rethink-india-s-energy-strategy-1.17508>
23. Arunabha Ghosh (2017) 'Climate Change and India's Development: Two Narratives' in *India: Building Future Competitiveness*, pp. 46-58. New Delhi: Confederation of Indian Industry
24. Arunabha Ghosh and Kanika Chawla (2017) 'Celebrate progress...with caution', *Business Standard*, 21 February. Available at: http://www.business-standard.com/article/opinion/arunabha-ghosh-kanika-chawla-celebrate-progress%E2%80%A6-with-caution-117022001223_1.html
25. Kanika Chawla and Manu Aggarwal (2016), 'Anatomy of a Solar Tariff: Understanding the decline in solar bids globally', *CEEW Policy Brief*, October. Also, Council on Energy, Environment and Water (2017) 'New Winds in India's Wind Power Regime', *Fact Sheet*, June; and Council on Energy, Environment and Water (2017) 'Deconstructing India's Record Low Solar Bid', *Fact Sheet*, June

26. Arunabha Ghosh, Kanika Chawla, Anjali Jaiswal, Sameer Kwatra, Meredith Connolly, Nehmat Kaur, Bhaskar Deol, Anna Mance, Douglass Sims, Sarah Dougherty, Jeff Schub, and Rob Youngs (2016) 'How Green Bonds Can Drive Clean Energy Deployment', CEEW and NRDC Issue Brief. May
27. Arunabha Ghosh (2016) 'Clean Energy Trade Conflicts: The Political Economy of a Future Energy System' in *The Palgrave Handbook of the International Political Economy of Energy*, edited by Thijs Van de Graaf, Benjamin Sovacool, Arunabha Ghosh, Florian Kern, and Michael T. Klare. London: Palgrave
28. Vaibhav Gupta, Tirtha Biswas, Karthik Ganesan (2016) *A report on 'Critical Non-Fuel Mineral Resources for India's Manufacturing Sector: A Vision for 2030*. New Delhi: Department of Science and Technology, and Council on Energy, Environment and Water
29. Neeraj Kuldeep, Kanika Chawla, Arunabha Ghosh, Anjali Jaiswal, Nehmat Kaur, Sameer Kwatra, Karan Chouksey (2017) 'Greening India's Workforce: Gearing Up for Expansion of Solar and Wind Power in India', CEEW-NRDC Report. June
30. IRENA (2017) *Renewable Energy and Jobs: Annual Review 2017*. Available at: https://www.irena.org/DocumentDownloads/Publications/IRENA_RE_Jobs_Annual_Review_2017.pdf
31. Alec Ross (2016) *The Industries of the Future*. New York, NY: Simon & Schuster
32. Arunabha Ghosh, Kanika Chawla, Neeraj Kuldeep, Anjali Jaiswal, Meredith Connolly, Nehmat Kaur, Bhaskar Deol, Sameer Kwatra (2016) 'Filling the Skill Gap in India's Clean Energy Market-Solar Energy Focus', CEEW-NRDC Policy Brief. February
33. Suman Bery, Arunabha Ghosh, Ritu Mathur et al (2016) *Energizing India: Towards a Resilient and Equitable Energy System*. New Delhi: SAGE
34. Masahiro Sugiyama, Shinichiro Asayama, Atsushi Ishii, Takanobu Kosugi, John C. Moore, Jolene Lin, Penehuro F. Lefale, Wil Burns, Masatomo Fujiwara, Arunabha Ghosh, Joshua Horton, Atsushi Kurosawa, Andy Parker, Michael Thompson, Pak-Hang Wong, Lili Xia (2017) 'The Asia-Pacific's role in the emerging solar geoengineering debate', *Climatic Change* 143(1-2), pp. 1-12. <http://doi.org/10.1007/s10584-017-1994-0>
35. Arunabha Ghosh (2014) 'Environmental Institutions, International Research Programmes, and Lessons for Geoengineering Research,' *Geoengineering Our Climate Working Paper*, February
36. Arunabha Ghosh, and Sumit S. Prasad (forthcoming) 'Shining the light on climate action: the role of non-Party institutions', *CIGI Paper*, Centre for International Governance Innovation