Research Paper

RESOURCE SECURITY AND GREEN SCIENCE & TECHNOLOGY POLICY IN ASIA

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Introduction

Contemporary scientific and technological developments in Asia provide an important context with which to understand the ongoing intellectual and policy debates defining the global security environment and the institutional and structural future of global politics. One primary node of the discourse revolves around the modern state and its ability to provide security and prosperity for its citizens in a hyper connected world burdened with growing transsovereign concerns. There is growing consensus in the literature that the state is undergoing transformation as it responds to challenges that are specifically global in scope. One such concern is resource scarcity. The combined pressures of globalization, economic growth, population increase, urbanization and climate change are driving the enormous demand for water, energy and food, but supplies of these resources are rapidly dwindling. Three conditions underpin resource scarcity as a national strategic priority. First, most of these resources are existential in nature – water, energy and food are essential to life and therefore directly impact human security. State provision of these resources to its citizenry is a core national interest. Second, resource scarcity is interwoven with environmental concerns derived from climate change, itself an emerging global security issue because of its potentially catastrophic impact on the planet. And third, existing solutions to resource scarcity (political, economic, environmental, technoscientific) do not preclude local and/or global conflicts from happening in the future.

Asia animates in full relief the landscape of scarcity. It is at the forefront of the ongoing transformations in international order of type, not degree - towards what India's former Foreign Secretary posits is a "more pluralistic, non-European, non-Western world" where its dynamic economies have "retaken control of vast resources, huge assets, big markets, are generating surplus capital, and are less dependent on imported innovation, capital inflows, development aid and technology."[1] The state is overwhelmed by the number of challenges it will need to manage. As the world's fastest growing region, demand for water for energy and industrial use is projected to rise the highest among the world's regions. The region is also the world's most populous and hyper-urbanizing, with a rapidly expanding affluent middle class that tripled in size between 1990 and 2005[2] and is still expected to grow in the decades to come: this means a shift in consumption patterns, diets and resource use of its population that will only increase

[1] Krishnan Srinivasan, "Languishing Europe and emerging Asia," *The Statesman,* Feb 10, 2012.
[2] Economist. "The ever-expanding middle-class in developing countries," (September 1, 2011).

food and energy requirements. Fulfilling these enormous demands will further aggravate pressures on the degrading ecosystem. Lastly, the region is heavy on geopolitics, rife with traditional security dilemmas and the location of the world's rising regional/global powers, India and China. The strategic picture of Asia will not be complete without taking full measure of the linkage between resources and the region's geopolitical giants.

As a core component of national security, science and technology (S&T) is an essential element of state responses to the growing challenge of resource scarcity. Among Asia's emerging and developed economies, these responses derive from two major strategies - extraction and adaptation – that Michael T. Klare discusses in his 2012 book.[3] Klare maintains that the world economy is now entering into a period of what he calls the "tough" extraction for increasingly scarce natural resources, and that this scramble for what's left will be "one of the defining political and environmental realities of the 21st century.[4] He suggests that the "race to adapt" to develop efficient, environmentally industrial processes and transportation systems presents a better alternative [5] to resource scarcity management. I build upon Klare's "adaptation" construct to explore the interface of S&T, security and the dynamics of global politics cast within the Asian setting. Alongside the increasing urgency to extract and appropriate scarce resources, countries are also pursuing the adoption of "new materials, methods, and devices" that would "free the world from its dependence on finite resource supplies."[6]

Adapting to Resource Scarcity: The Emergence of Green Policies

One major policy initiative among countries is the prioritization of green or clean-energy innovation[7] as a strategic component of national economic, environmental, and S&T development plans. Worldwide, clean-energy has only come into its own only in the last decade or so and continues to experience growth in the face of daunting challenges[8] in the form of high costs and inadequate global investment. Nevertheless, Asian countries are beginning to institutionalize their commitments to clean-energy, with China leading the effort in terms of total investment and technological development. Southeast Asia nations such as Singapore, the Philippines, Indonesia, Vietnam, Thailand and Malaysia - have started to put, if not ramped up existing, green policies in place.[9] In India, the government's annual Economic Survey 2011-

[3] Michael T. Klare, The Race for What's Left: The Global Scramble for the World's Last Resources (New York, NY: Metropolitan Books, Henry Holt and Company, LLC, 2012). Klare's book focuses primarily on extraction.
[4] Ibid. See also a transcript of a Klare interview: Diane Toomey, "Global Scarcity: Scramble for Dwindling Natural Resources," May 23, 2012, http://e360.yale.edu/feature/global_scarcity_scramble_for_dwindling_natural_resources/2531/. Another reference on resource scarcity is Fred Pearce, The Land Grabbers: The New Fight over Who Owns the Earth (Boston, MA: Beacon Press, 2012).
[5] Klare, 227.
[6] Klare, 227 – 234.
[7] I will use these terms interchangeably in this paper.
[8] International Energy Agency, "Clean Energy Progress Report," (Paris, France: OECD/IEA, June 2011): 11.
[9] Martin Abbugao, "S.E. Asia urged to exploit abundant clean energy," February 22, 2011, http://www.google.com/hostednews/afp/article/ALeqM5gMEPexBrKKotpyJIlXI3lFTnFGNw?docId=CNG.a9752ab9a9ad29f39dac145a6ef0e9bf.301. See also Alexander Lenz, "Southeast Asia embraces solar power," August 17, 2011, http://siew.sg/energy-perspectives/alternative-energies/southeast-asia-embraces-solar-power and World

2012 included, for the first time, a chapter on sustainable development and climate change that contains a proposal for lower-carbon sustainable growth as a central element of India's 12th five-year-plan.[10] Its investment in green industries is expected to increase to $70 billion in 2015 from a projected $45 billion in 2012.[11]

In 2008, South Korea's government declared green growth as a national development model and is focusing on synergizing the country's economic development and environmental protection by striving for a low-carbon green economy that promotes investments in alternative energy sources, resource savings and other environmental growth sectors. Japan's New Growth Strategy, first approved in December 2009 and revised in June 2010, is the government's guiding policy underpinning its current economic recovery plan that puts increased focus on fast-growth sectors, including renewable energy, green vehicles, farming and healthcare. The Fukushima triple catastrophe also paved the way for the Noda cabinet to endorse the 2012 white book on the environment that specifically calls for power generation in the Tohoku region through renewable energy sources using wind and solar power.

China spent $54 billion in low carbon energy technology in 2011, making it the world's largest investor, surpassing the $34 billion investment of the U.S.[12] Of its seven strategic emerging industries identified in its "12th Five-Year Development Plan for National Strategic Emerging Industries (2011-2015), three - alternative energy automotive, energy-saving/environmental protection and new energy - are in the green energy sector.[13] Its increasing investments in clean technology in recent years have started to pay off: China is now either more advanced than, or provides serious competition to, American technologies in its low-emission coal energy plants, third and fourth generation nuclear reactors, high-voltage transmission lines, alternative-energy vehicles, solar and wind energy devices.[14]

Features of Green Science and Technology

The rhetoric of adapting clean-energy draws out a distinct S&T picture. First, green innovation is not necessarily a zero-sum game. Its renewable sources and significant potentials for energy efficiency exist virtually everywhere, depending on natural resource endowments, needs and capacities; this is in contrast to scarce and finite energy resources like oil and gas,

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Wildlife Fund Report 2013 (in collaboration with the World Resources Institute), Meeting Renewable Energy Targets: Global lessons from the road to implementation. Singapore's "Green Plan" has been in place since 1992 – see "The Singapore Green Plan 2012," http://www.mewr.gov.sg/sgp2012/about.htm.

[10] Jamie Yap, "India's green IT, sustainability spend [sic] to hit $45B in 2012," October 3, 2012, http://www.zdnet.com/in/indias-green-it-sustainability-spend-to-hit-45b-in-2012-7000005150/.

[11] Ibid.

[12] "China Beats United States in Green Technology Innovation," December 11, 2011, http://usgreentechnology.com/us-green-stories/china-beats-united-states-in-green-technology-innovation/.

[13] "China adopts new plan, highlights emerging industries as drivers of economic growth," June 12, 2012, http://thecleanrevolution.org/news-and-events/news/china-adopts-new-plan-highlights-emerging-industries-as-drivers-of-economic-growth.

[14] Micah Springut, Stephen Schlaikjer, and David Chen, "China's Program for Science and Technology Modernization: Implications for American Competitiveness," Prepared for the U.S.-China Economic and Security Review Commission (Arlington, VA: Centra Technology, Inc., 2011): 129.

which are concentrated in a limited number of countries.[15] So reduced energy intensity and the geographical and technological diversification of renewable energy sources can result in greater opportunities for energy security and economic benefits to accrue to domestic/local communities.[16] The opportunities for local innovations are enormous. In Asia, for instance, South Asia's high solar insolation and dense populations make solar power an ideal option, giving India's National Solar Mission the advantage to support large-scale deployments of solar power.[17] This natural solar power advantage and falling solar panel/LED costs also makes it profitable for Mera Gao Power, an Indian company, to build and operate low-cost solar-powered microgrids that can provide clean light and charge phones to rural villagers.[18]

Second, clean-energy is socialized as a critical component of both energy security and environmental security. The 'borderless' nature of climate change concerns has introduced a transnational dimension articulated by the entry of a plethora of other non-state stakeholders (apart from global corporations) in the discourse: transnational governmental and non-governmental organizations, regional institutions and civil society groups, all promoting various border-crossing, 'green economy' agenda items including provisions for community-based programs, infrastructure development, education, research and development (R&D) and S&T assistance. Their presence has given rise to a complex network of institutions advocating for a clean, sustainable environment. These configurations have facilitated global technology transfer and diffusion and, through their sustained support of emission-reduction policies, have helped to 'induce' technological change towards clean-energy.

Third, transnational companies have emerged as co-stakeholders in green energy for many reasons: they can absorb high R&D costs, provide new investments, and generate revenue and energy supplies. For emerging and developing economies, these public-private partnerships (PPP) are also critical innovation linkages that help build the nation's technology base and enhance global competitiveness. The converse is also true: that the type/size of organization and the nature of its involvement are influenced by the technologies being deployed. For instance, for technologies with potentially large and diffuse markets (such as more efficient cook stoves or solar lighting), global corporations could support business development and supply chain management, while local businesses could be active in sales, deployment and education.[19]

[15] International Energy Agency, "Energy Technology Perspectives 2012: Pathways to a Clean Energy System, Executive Summary," (Paris, France: OECD/IEA, June 2012): 1.
[16] Ibid.
[17] Deployment will begin in 2022. See Michael Levi et al., "Globalizing the Energy Revolution," *Foreign Affairs* 86 No. 6 (November/December 2010): 113.
[18] Seema Singh, "Solar Microgrids," *Technology Review* (Cambridge, MA: MIT Press, June 2012): 39. In this issue of Technology Review, Mera Gao Power is featured to showcase solar microgrids as one of the top 10 emerging technologies.
[19] David Elzinga et al., "Advantage Energy: Emerging Economies, Developing Countries and the Private-Public Sector Interface," (Paris, France: IEA Information Paper, September 2011): 8, http://www.iea.org/publications/freepublications/publication/advantage_energy-1.pdf.

Finally, states do matter. For most of Asia, the state is the main driver for clean-energy development. It is particularly crucial in building interstate and PPP S&T cooperation and sustaining the momentum for innovation, especially because green energy products take decades before they reach the market, in contrast to other high-technology sectors where it takes years.[20] The protection of intellectual property rights (IPR) is a core element of innovation and a central role of the state. For Asia's emerging and developing economies, this is still a maturing regime. Even China, poised to become a global leader in new S&T areas such as clean-energy, is still challenged by a weak culture of IP protection, and the question remains as to whether it will be able to create an effective ecosystem for industrial innovation in the future.[21] The transnational nature of climate change warrants the global adoption, diffusion and transfer of clean-energy solutions as fast as possible. This process will be expedited by an effective IPR protection regime that must be in place in all countries for an open innovation system to work.

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Over The Horizon

This paper set out to examine the scientific and technological dimensions of state responses to the growing challenge of resource scarcity as a way to derive currents filling up the regional and global landscape. The preceding analysis that focused on adaptation strategies as major ways of enhancing national resource security among Asia's emerging and developed economies bears out the analytic point of this paper that the emergence of transnational security problems, non-state actors and S&T developments are key drivers of change in global affairs. From their dynamic linkage we derive several propositions:

- With their strategic focus on advancing green capabilities, the emerging economies of Asia will become major sources of indigenous, clean-technology innovations; in this context, the region will be a major source of game-changing developments, disruptive innovations and technological surprises;
- A strategic alliance coalescing around scarce resources is distinct from a strategic alliance based on adaptive S&T capabilities. In the long run, power and wealth will accrue not only from control over dwindling resource supplies, but from the ability to adapt utilizing existing and new S&T framed within the rubric of environmental security;
- Global and/or regional S&T leadership will critically depend not just on success with individual technologies or particular scientific fields. Current innovations highlight the trend for technological systems integration - this converges with the growth of S&T interdisciplinary fields underpinned by the continuous advancement of information technology.
- Extending the logic of adaptation to traditional security concerns, a successful interface between the defense (one of the largest consumers of energy) and green S&T private

[20] Levi et al., "Globalizing the Energy Revolution," 114.
[21] M. Springut, S. Schlaikjer, and D. Chen, "China's Program for Science and Technology Modernization," 130.

sectors will be pivotal in creating or maintaining a nation's strategic advantage, perhaps even alter the accepted ways of thinking about the nature of conflict;

- The 'vulnerability and risk' construct of a green economy is yet to be studied; green technologies for one will most likely generate dual-use concerns;
- National core interest management is increasingly dependent on the cumulative activities of multiple non-state actors, so public-private partnerships will continue to flourish. It is possible that this relationship will provide the nucleus for new forms of governance structures. While the state's power and authority are bounded by territory, the power and authority of transnational entities who operate beyond the state's control lie in their networked capacity to move people, ideas, beliefs, money, technology and other resources in and out of the state's territory;
- The nexus of energy-environment-economics suggest that a systemic approach to transnational security issues will provide more comprehensive and optimal solutions.

The views expressed in these articles are those of the author and do not reflect the official policy or position of APCSS, the U.S. Pacific Command, the U.S. Department of Defense, or the U.S. government.

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