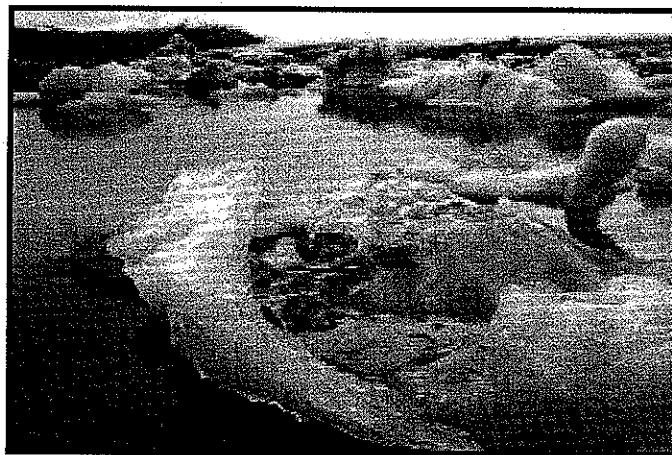


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Resilience as Emergent Behavior

*Peter Hayes**

In this article, I briefly review the diversion of the climate policy world into a single-minded fixation with mitigation. I assert that it is increasingly clear that the main game is now adaptation which renders mitigation no less urgent, but shifts the political equation in dramatic ways that cannot be ignored any longer. I suggest that global state and market-based solutions will fall far short of an adequate response. The responsibility will devolve to cities and local communities to pick up the pieces. I review some of the swarming and network strategies that may enable these communities to supplement or supplant state-based adaptation frameworks over the coming generation.

Mitigation-Adaptation

The first phase (1988-2008) of climate change policy and research work focused on gaining traction with the political elites. The task entailed overcoming political, cultural, and institutional resistance to recognition of the validity and soundness of the science on the one hand, and learning from practical grappling with the technical-economic mitigation problem in the real world on the other. The political path of least resistance over these two decades was to create a global scientific consensus based on modeling and compiling data sets. These data sets were used to both inform and convince policy makers to attend to the climate issue, while also focusing on the tractable, affordable, and (in principle) global positive sum game of "mitigation." Mitigation was stressed based on the belief that an ounce of mitigation now is worth a pound of adaptation later, especially when the benefits of mitigation are global no matter where achieved and shared, whereas the benefits of adaptation are mostly local and not shared.

This political task was enshrined in the 1992 Climate Change Convention which created new institutions and related methods, particularly the Global Environment Facility (GEF) and implementing agencies. Global actors largely ignored the issue of burden sharing in the pursuit of efficient allocation of the minimal resources that were made available to build mitigation capacity in poor countries. Equitable and adequate international burden sharing of mitigation cost was mostly disregarded in the effort to

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"start the ball rolling" and to keep the climate negotiations alive, with or without the United States as a prime mover.

In this start-up phase, the international community accorded secondary importance to adaptation and subordinated to the primary task of achieving policy consensus that climate change exists and matters. The intention was to avoid distraction from mitigation, and the strategy was grounded in the belief that mitigation was and is the first order of business. The first of these goals – achieving a global consensus that climate change risk is real and pressing – was achieved, albeit belatedly. The result, however, was that science of climate was diverted away from investigating many urgent and critical adaptation issues. Instead, the Intergovernmental Panel on Climate Change (IPCC) focused scientific research on climate change to support the demands of inter-state negotiations and to defining impacts. Consequently, a conceptual and institutional framework for global adaptation is almost absent.

What Is at Stake?

In 1972, Jun Ui published his basic theory of *kogai*, which he derived from his experience of working with the victims of mercury poisoning at Minamata in 1958 and in their court case from 1968-71, then articulating the "principles of pollution" in his KOGAI Newsletter from Polluted Japan, published by his organization Jishu Koza in the nineteen seventies.¹ Ui was the first modern theorist to explain the displacement in space and time of biological and physical costs via ecological systems from one class of beneficiaries to other classes of victims, thereby generalizing the experience of the Minamata episode. In many respects, this dynamic is similar to the problem of land mines that are strewn for short-term military advantage, but remain *in situ* for years, even decades, until they explode and maim or kill civilians who had no relationship to the original conflict. One can think of the imposition of the array of biological, physical, and social-cultural climate costs in a similar manner to hurling hand grenades randomly into the future without knowledge or concern as to when or where they fall to the ground, and who would be hurt or killed when the grenade exploded. In short, climate risk has global, spatial, and temporal dimensions. The costs of climate change relative to conceivable worlds without massive anthropogenic climate loading are vast, although they are still not known with any precision. It is already well understood that these costs will fall disproportionately on those least able to bear them. Incremental adaptation costs are likely to eventually exceed the marginal costs of mitigation and justified global burden sharing (roughly \$30 billion per year

1. Jun Ui, *Industrial Pollution in Japan* 103-31 (Jun Ui ed., United Nations University Press 1992).

in 1994 dollars)² by at least an order of magnitude, possibly much more.³ Displacing the costs of climate change due to the activities of this generation's wealthy and powerful societies onto future poor and vulnerable populations on Earth will be by far the biggest fleecing in history; all that remains is to see how devastating this impact will be.

Therefore, adaptation is now the main game, not mitigation. Moreover, far from being the enemy of mitigation, it is at least conceivable that the constituencies mobilized by climate impacts may finally muster the political will to achieve the requisite levels of mitigation hitherto missing; that is, adaptation will be the friend, not the enemy of mitigation.

Global Frameworks

In most treatments of climate change politics and economics, the key protagonists are states and corporations, and the key institutions are treaties and markets. Sometimes scientists and social movements are recognized as playing epistemic or bridging roles in order to overcome yawning institutional or market failures, but their roles are usually epiphenomenal.

Without going into detail, the emerging global framework for building adaptive capacity is, put mildly, weak and inadequate.⁴ If mitigation-related incremental funding is running at about one percent of a justified level based on capacity-to-pay and historic-responsibility-to-pay, incremental adaptation funding will likely run at perhaps 0.1 percent (less money, far greater incremental needs for adaptation than in mitigation) of a justified level. While in general the emerging global framework for building adaptive capacity is deficient, some organizations such as the GEF, United Nations Development Programme (UNDP), and multilateral and bilateral adaptation projects in developing countries are exploring the new adaptation terrain. This is excellent, exciting, and worth both investment and support. As they explore this terrain, they are revisiting old lessons from decades of misplaced, abused, and failed development assistance and discovering new challenges and potential routes to reducing social vulnerability and to increasing social resilience.

2. Peter Hayes, *North South Transfer*, in *GLOBAL GREENHOUSE REGIME: WHO PAYS?* 144, 153-54 (P. Hayes & K. Smith, eds. UN University Press/Earthscan Press, Tokyo & London 1993), available at <http://www.unu.edu/unupress/unupbooks/80836e/80836E00.htm>

3. *Id.*

4. See, PETER HAYES, *MULTIPLE JEOPARDIES: EMERGING GLOBAL RULES FOR CLIMATE CHANGE ADAPTATION*, available at <http://www.nautilus.org/~rmit/forum-reports/0619a-hayes.html>. Videotape: *China-U.S. Climate Change Forum: What's at Risk?*, available at <http://youtube.com/watch?v=u5j87MteMXk>.

State-based international assistance, however, is almost certainly far too little and arriving far too late to rely on as a route to successful adaptation in most of the world. Given the level of increasing and enduring global poverty, the ability of markets to create adaptive capacities in most rural areas and slums is highly constrained. Also, like states, markets are unlikely to create or deliver the capacities needed for either mitigation or adaptation. Without these capacities, massive and potentially catastrophic climate change cannot be avoided.

These shortcomings require a search for radical new solutions based on linked communities at a global level. If states and markets fail as badly as seems likely, then legitimate leadership that responds to the global climate adaptation challenge will emerge primarily at the sub-national state, city, and local community levels, supplemented by global civil society (roughly 25,000 intergovernmental and non-governmental international organizations).

Fortunately, this set of diverse global-local players is already inclined to communicate, coordinate, and collaborate in the search for shared solutions via trans-governmental processes, inter-city linkages, and vibrant diasporic and "glocal" networks between local communities. The cost of long distance communication and coordination is falling rapidly; the number of pro-active players at this level is increasing exponentially. Already, approximately 200 major cities, perhaps 20,000 medium and small cities and towns, and perhaps 200,000 local communities are wired and participating in networks that are active in attempting to solve one or more of the dozens of interrelated global problems and solutions linked directly or indirectly with climate change, as well as directly tackling climate change adaptation.⁵

At this local level, cooperative outcomes are sought out of necessity and based upon the identification of joint interest and cooperative benefits realized directly by communication and coordination. Such joint interests or organic reasons to cooperate include: direct ecological interdependence (downwind); trade; shared cultural heritage; historical origins (metropole-colonial cities); common climate circumstances; shared threats (terrorism); etc. This process will be facilitated (and blocked as well) by some of the innovative inter-state and market-based approaches discussed at this conference, many of which provide clues about the future that are fresh and provocative. Yet none of these solutions are likely to be as powerful as the combination of necessity and solidarity that will drive city and community-

5. This is an estimate based on the assumption that roughly each of the 200 global cities (real number) has about 10 (less-global) major cities = 2,000, and each of these has about 10 satellite small towns (approximated at 22,500 global cities, cities, and towns); and each of these has at least 10 localities in them, hence the estimated 200,000 localities.

level cooperation and collaborative problem solving, orchestrated by transnational networks.

Part of the challenge with collaborative problem-solving is to make the stocks of existing knowledge and research capacity available to knowledge users in response to rapidly emerging climate "issue clusters" that cross bureaucratic-disciplinary-sector boundaries in unexpected and unconventional ways. Another is to explore the true complexity of the interrelated problems that drive climate change and block mitigation and adaptation, using new research methods such as agent-based rather than system-based modeling.⁶

In this view, the most urgent task is not to focus on inter-state negotiations, important as these may be. Rather, the task is to establish principles and practices of direct cooperation between cities and local communities of all kinds;⁷ identify practical and testable tools and practices that can be developed in one locale and shared and replicated with dozens or hundreds of others on a tailored-to-need basis;⁸ and establish mechanisms for transmission and sharing of the tools and practices that work.⁹ The right metaphor for this process is not institutional architecture, but think-nets, small worlds-network theory, immunological "swarming" behavior, and other learning strategies that rely on viral replication for scale and success.

6. E.g., Peter Hayes, Agent-Based Modelling and Climate Change Adaptation, Global Cities Institute Climate Change Adaptation Program (2008), available at <http://gc.nautilus.org/gci/agent-based-modelling/RMIT%20overview%20rev%20Jan31-08.pdf/> view; Anthony Patt & B. Bernd Siebenhüner, Agent Based Modeling and Adaptation to Climate Change, 74(2), Vierteljahrshefte zur Wirtschaftsforschung (Quarterly Journal of Economic Research), 310, 310-20 (2005) (discussing an early application of agent based modeling and climate change application), available at http://www.vulnerabilitynet.org/OPMS/getfile.php?bn=seiproject_hotel&key=1140130223&att_id=953; Scott Moss, Claudia Pahl-Wostl & Thomas Downing, Agent-based integrated assessment modeling: the example of climate change, 2, Integrated Assessment, 17, 17-30, (2001) (discussing the benefit of employing social simulation models, rather than economic models, in addressing complex environmental problems); Brian J. L. Berry, L. Douglas Kiel, & Euel Elliott, Adaptive Agents, Intelligence, and Emergent Human Organization: Capturing Complexity through Agent-Based Modeling, 99, Suppl. 3, Proceedings of the National Academy of the Sciences (2002) (an overview of the agent-based modeling field), available at http://www.pnas.org/content/vol99/suppl_3/.

7. See, Five climate principles adopted by the SF Business Council on Climate Change at: <https://www.bc3sfbay.org/principles>.

8. See, Power tools: for policy influence in natural resource management, <http://www.policy-powertools.org/> (last visited Oct. 13, 2008).

9. See, Climate Change Adaptation at the Global Collaborative, at <http://gc.nautilus.org/gci> (last visited Oct. 13, 2008).

Fortunately, there are many, many examples to choose from in this early learning phase of bottom-up, "emergent" adaptation. The International Council of Local Environmental Initiatives, the Clinton Foundation's C40 Large Cities Climate Leadership Group and Climate Initiative, and bilateral projects related to Ho Chi Minh City, Melbourne, Jakarta, Beijing, Seoul, and Pyongyang are various examples. The San Francisco Bay Area is a global dynamo in this dimension with participation from individuals, groups, government, and business. Indeed, Google Foundation may be the single most powerful and creative force on the planet, particularly if it can align with partners such as the Aga Kahn Foundation.

Conclusion

That these social capacities will collide with state and market-based frameworks in critical respects is more or less inevitable. Whether they will also be nurtured and provide critically needed support and extension of these frameworks is less obvious. Optimism, however, remains important as ever! Arguably, over the next, cities and corporations will merge, and vibrant city-states will become more powerful relative to nation-states. The membership of the United Nations may increase by tenfold or more, and as a result, by 2050 the climate change dye will have been cast for the coming millennia. This shift in power ratios, the rise of many sources of innovation and interconnection, and above all, high levels of work-related migration, will transform the global landscape. Of particular importance is not what happens in the United States or Europe, but in China and India, because these two societies and economies represent the most salient development models for most communities on the planet. Further, Indonesia may play a crucial role in climate development models because its 40 million Muslims may generate an Islamic renaissance that represents a new source of global leadership.

Whether cities and local communities will rise to the occasion and pick up the pieces dropped by states and markets in the past remains unknown. However, with virtual certainty, the main adaptive action will occur at local levels. As John Holdren has long argued, we *will* adapt; the only question remaining is the ratio between the various types of adaptation – mitigation, pro-active and anticipatory adaptation, or just plain suffering.¹⁰

10. John P. Holdren, Science and Technology for Sustainable Well-Being, 319 Science, 424, 425-34 (2008), available at <http://www.sciencemag.org/cgi/reprint/319/5862/424.pdf>.