



Eco-Engineering: Building Sustainable Cities

October 6, 2011

The third in a series of annual forums sponsored by Hitachi, and featuring panels organized by the American Association for the Advancement of Science (AAAS) and The Brookings Institution

AGENDA

Welcome

Master of Ceremonies

Dr. Albert Teich
Senior Policy Advisor
American Association for the Advancement of Science

Opening Remarks

Strobe Talbott
President, The Brookings Institution

Takashi Hatchoji
Group Chairman for the Americas
Chairman of the Board, Hitachi America, Ltd.

Dr. Alan Leshner
Chief Executive Officer and Executive
Publisher, Science
American Association for the Advancement of Science

Keynote Presentation

The Honorable Stephen Chu
U.S. Secretary of Energy

Panel Discussion

Eco-Engineering: Building Sustainable Cities

Moderator

Dr. Vaughan Turekian
Chief International Officer
American Association for the Advancement of Science

Panelists

Dr. Matthew Fraser
Associate Professor, School of Sustainability
Arizona State University

James Hunt
Chief of Environment and Energy
City of Boston, MA

Michinaga Kohno
Senior Chief Engineer, Smart City Business Management
Hitachi, Ltd.

Robert Puentes
Senior Fellow, Metropolitan Policy Program
The Brookings Institution

Tom Shircliff
Steering Committee Chairman,
Envision: Charlotte
Managing Director/Co-Founder, IntelligentBuildings

Conversation with Mayors: Sustainable Redevelopment

Moderator

Amy Liu
Co-Director and Senior Fellow
Metropolitan Policy Program, The Brookings Institution

Mayors

The Honorable Roy Buol
Mayor of Dubuque, IA

The Honorable Dwight C. Jones
Mayor of Richmond, VA

Closing Remarks

Takashi Kawamura
Chairman of the Board, Hitachi, Ltd.



On October 6, 2011, Hitachi, Ltd., with the Brookings Institution and the American Association for the Advancement of Science (AAAS), presented the third in a series of annual forums focusing on *Eco-Engineering: Building Sustainable Cities*. The forum was held at AAAS headquarters in Washington, DC and featured a keynote presentation from Secretary of Energy Stephen Chu and two sessions, one with experts and practitioners on urban sustainability efforts from several cities and the other with the mayors of Dubuque, Iowa and Richmond, Virginia.



The “Urban Century” is a challenge for all of us—the private sector, scientists, public policy research organizations, and government—and it will take a combined effort to meet it.

...this conference is a testament to Hitachi’s commitment to total solutions for sustainable urban development.

...urbanization presents an opportunity to improve our quality of life.

Opening Remarks

Strobe Talbott, President, The Brookings Institution

Building sustainable cities is extraordinarily important for the future, making this conference very timely and important. It is fitting that there are so many mayors here: with the majority of the world’s population living in urban areas for the first time in history, how we manage the urbanization process has profound implications for the environment, energy security and economic productivity. The “Urban Century” is a challenge for all of us—the private sector, scientists, public policy research organizations, and government—and it will take a combined effort to meet it.

Takashi Hatchoji, Group Chairman for the Americas and Chairman of the Board, Hitachi America, Ltd.

This forum is an important platform for sharing knowledge among experts and practitioners, and to really drill down more deeply into the key challenges that go with increasing urbanization across the world. In the aftermath of the Great East Japan Earthquake, Japan has significant rebuilding to do, with major construction projects underway to replace damaged buildings. Hitachi’s corporate focus is on social innovation—how to use cutting-edge technologies to solve social problems and contribute to environmental preservation—and hosting this conference is a testament to Hitachi’s commitment to total solutions for sustainable urban development.

Dr. Alan Leshner, Chief Executive Officer and Executive Publisher, Science, American Association for the Advancement of Science (AAAS)

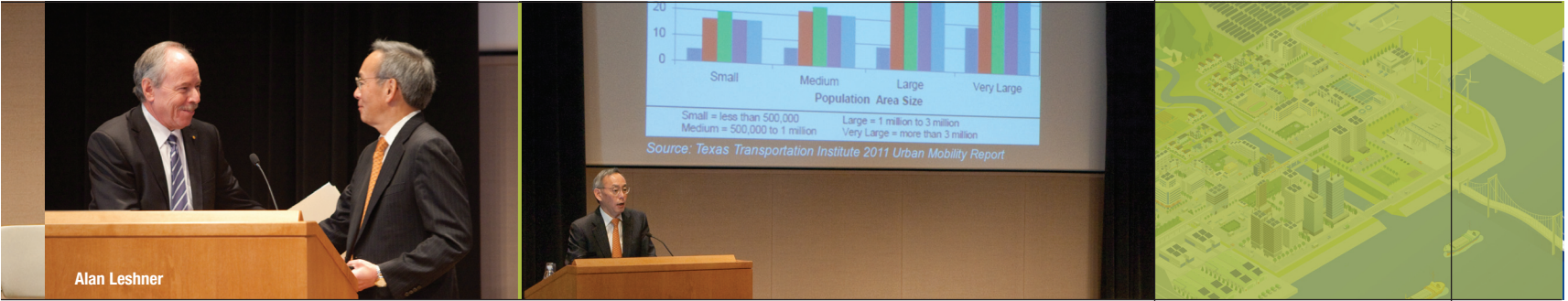
One need not be an expert to recognize that urbanization is taking place at a phenomenal rate and that this development will put tremendous pressure on all aspects of life. Dealing with the impact of these changes is one of the fundamental challenges of our time. It is especially appropriate to hold a conference to examine these challenges and how cities are responding at AAAS headquarters, which was the first Gold LEED-certified building in Washington, DC. It is also appropriate that Secretary Chu is here today, since as head of the Department of Energy he has a mandate to invest in renewable energy, reduce dependence on foreign oil, address the climate crisis and create jobs in the process.

Keynote Address

Stephen Chu, United States Secretary of Energy

The global shift to urbanization presents an opportunity to improve our quality of life. In the developed world, the vast majority of people already live in cities and urban populations are continuing to grow. In developing countries, that shift is also taking place and, for example, India and China together will add approximately 600 million people to their urban populations in the next 20 years. In some senses, developing countries actually have an advantage since so many of their cities will have to be built from scratch, sustainability principles can be incorporated from the start instead of having to be introduced into existing built environments and legacy infrastructure.

To accommodate this population growth, it will be necessary to rethink how cities are organized so that people can live, work, shop and recreate all in the same place rather than have to travel between each of these sets of activities. The old model of a central city where



Alan Leshner

people work surrounded by outer areas where they live is being replaced by a new model where there aren't separate shopping districts, business districts, and residential districts but rather all living functions, including green space, are available within walking distance of each other. Under the current model, people are compelled to allocate additional time for travel and change their behavior to accommodate delays and uncertainty. All of this has costs.

Sustainable cities also need sustainable energy, and there are some innovative financing mechanisms out there that can make renewables more broadly accessible. This is important because of the sometimes considerable up-front costs required for installing new equipment. In Phoenix, Arizona, for example, it is possible to lease solar panels that provide electricity that is at least 10% cheaper than current rates from standard sources. The company will install and maintain the panels and underwrite the cost of any additional power that the consumer has to purchase from the conventional grid to supplement what the panels provide. Banks are willing to underwrite the costs of the panels for people with good credit. There is no public funding involved, but the city has agreed not to erect any obstacles like installation fees that might inhibit widespread adoption. The result of this program has been a 10-fold increase in residential solar installations and now businesses are starting to take advantage of the offer. A facility like a warehouse that has a large expanse of roof space can provide its own power and sell the excess back to the grid on a wholesale basis. Business models that can make widespread use of solar power generation work do exist, and will become even more viable as more people and businesses adopt this technology and costs drop.

The approach that cities take to urban renewal can make a big difference in improving sustainability. Milwaukee, Wisconsin, for example, undertook a major project to revitalize the old Pabst Blue Ribbon brewery and its surrounding area. Unlike some urban renewal projects that aim to attract tourists and visitors, Milwaukee focused on creating a place that where people can live, work, and play within a fairly compact, walkable area.

Innovations in mass transit are an important contributor to greater sustainability. In many places, including in the developing world, there is a status effect associated with owning a personal car that reinforces unsustainable behavior and increases traffic. To overcome this, the advantages in speed, economics, and convenience of mass transit have to be obvious. Improvements such as dedicated lanes, timed stoplights, and improved loading and unloading procedures, as well as route networks that cover more of the metropolitan area (Curitiba, Brazil's network, for example, covers 90% of the city) combine to help make mass transit more appealing.

A fully integrated approach to sustainable cities requires looking carefully at power consumption, water usage, and waste output. Steps such as putting in efficient lighting (like LEDs) and better HVAC systems during the building process can have a remarkable impact on overall efficiency.

The Obama Administration is working on this agenda, creating jobs, improving the quality of life, and promoting a more efficient society and economy, all of which make the United States more competitive. Challenges remain in developing an effective financing mechanism, but programs like the one in Phoenix for leasing solar panels show that there are ways to make it competitive. Nonetheless, the price for solar needs to fall further to really compete with fossil fuels and the Department of Energy is doing research to make it fall faster.

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Stephen Chu

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The legacy of suburbs built in an era of cheap energy is that residents must drive several miles for any shopping opportunities as well as many miles to the city center for work. The new model is to distribute shopping so that there are more stores that are within walking distance of homes. Areas that are designed this way are increasing in value at a much faster rate than the traditional auto-dependent suburbs. As suburbs are redeveloped and new ones are constructed, the new model can be replicated.

PANEL ONE:

Eco-Engineering: Building Sustainable Cities

Moderator: Dr. Vaughn Turekian, Chief International Officer, AAAS

Panelists: Dr. Matthew Fraser, Associate Professor, School of Sustainability, Arizona State University
James Hunt, Chief of Environment and Energy, City of Boston, Massachusetts
Michinaga Kohno, Senior Chief Engineer, Smart City Business Management, Hitachi, Ltd.
Robert Puentes, Senior Fellow, Metropolitan Policy Program, The Brookings Institution
Tom Shircliff, Steering Committee Chairman, Envision: Charlotte and
Managing Director/Co-Founder, IntelligentBuildings

...there are three levels of sustainability that have to be taken into consideration: residents (sustainable population growth), city functions (urban management), and natural environments (zoning to cohabit with nature).

This panel focused on the steps that several cities—Tempe, Arizona; Charlotte, North Carolina; Boston, Massachusetts; Tianjing and Guangzhou, China—are taking to increase their sustainability while promoting economic growth. One important step toward sustainability can be found in making cities “smarter,” which means designing infrastructure systems for water, communications, mobility, and energy that work in concert to be low carbon and resistant to natural disaster. Sustainability goes beyond just the generation and consumption of power and other resources; there are three levels of sustainability that have to be taken into consideration: residents (sustainable population growth), city functions (urban management), and natural environments (zoning to cohabit with nature).

Likewise, there are three primary sets of stakeholders for achieving sustainable cities: residents, city administrators, and the global consensus on preventing global warming and preserving natural resources and biodiversity. “Smartness” of cities can be defined as a way of resolving conflicts among the three sets of stakeholders by using technology that allows each to pursue their interests.

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In Boston, the Mayor recognized that sustainability is about more than just the environment; it’s also about quality of life and economic growth. There, the sustainability effort is being led from the top and the city is working to leverage community-based groups to implement new programs and projects.

As cities compete for young talent and to retain college graduates, their relative “greenness” or sustainability becomes an important factor in where people decide to live and start businesses. In Boston, a third of residents are under 30 and they are asking about companies’ energy profile and sustainability in evaluating career options. The city talked to business leaders as it developed a green building zone and introduced more stringent building codes; the developer community sees benefits in policies like these that attract new tenants to their properties. Furthermore, implementing new sustainability measures has a huge upside in creating jobs and promoting economic growth. The clean tech sector in Boston is one of the fastest growing in the city and so a major focus has been on keeping companies in town while they grow.



Boston established a goal of reducing its carbon emissions by 25% and is undertaking a series of measures to achieve it. The smart grid offers many potential avenues for increasing efficiency, but efforts can't leave behind older, "dumb" buildings (which Boston has a lot of). So the city is deploying existing technologies to retrofit older buildings to conserve water and energy and is thinking hard about how to rate older buildings. Boston is also taking steps to change consumer behavior through programs like changing utility bills to reflect savings from various sustainability efforts and instituting a regional cap and trade program.

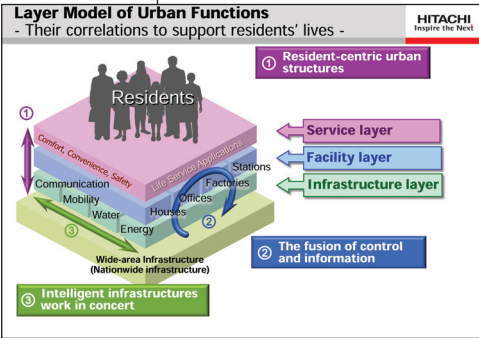
In Charlotte, sustainability has been closely tied to economic development; energy consumption, air quality and waste management are dealt with cohesively to maximize efficiency. To help the city better understand what is working and what isn't, Charlotte has made measurement a key pillar of its sustainability efforts. Keeping close track of energy usage helps improve management of resources.

Leaders in Charlotte have focused sharply on geography and land-use type, taking the view that the metropolitan area is really a patchwork of submarkets that are stitched together and any sustainability effort has to take their differences into account to succeed. An important effort by Charlotte has been to incorporate the culture within buildings into decisions about how to retrofit them so that new initiatives are congruent with the users' needs. In fact, Charlotte has placed a real emphasis on asking the corporate community to work with the city to improve sustainability.

The difficult fiscal situation in so many cities and states means that the challenge of increasing sustainability can't be met by simply throwing money at the problem. Instead, the emphasis has been on efforts to change behavior in ways that improve efficiency and lower consumption. One example of this approach is developing new lease structures that more closely align the interests of the building owners, who are responsible for making the investments that improve efficiency and reduce consumption, and the tenants, who are responsible for paying the utility bills.

For Phoenix, efficiency is only part of meeting the challenge, and so the city's strategy also incorporates a scientific approach to innovation and a humanistic approach to creating a vibrant city. The sustainability of water usage is a key priority for the city, since that is the resource that is in the shortest supply in its desert environment. In fact, it has doubled its population without increasing demand for water by encouraging behavior changes that recognize that "insatiable isn't sustainable." Technology plays an important part too, of course, and innovations such as providing real-time feedback to consumers on energy and water usage and pricing have proved very effective in reducing consumption.

Phoenix has also emphasized getting all parts of the community involved in its sustainability effort—businesses, property owners, and residents of all income levels. Like in Charlotte, the challenge of getting renters (especially in low income communities) to participate has been approached by trying to figure out ways that landlords can recoup their investments in improved efficiency. The city is also expecting that as businesses adopt more sustainable practices in their workplaces, employees will want to bring home new efficiency-improving ideas and practices.





Amy Liu, Roy Buol, Dwight C. Jones



The intertwined systems of urban life—transportation, housing, energy, air quality—set the framework for sustainability.

The discussion of these three cities and their experiences trying to improve the efficiency and sustainability of their government operations, utility provisions, and built environments illustrates the importance of tackling problems on a metropolitan scale, where local actions have a major impact on how businesses are run and people make their residential decisions. Accordingly, civic leaders have to tailor solutions to meet the specific needs of their communities and the socio-economic and demographic changes that are taking place.

The intertwined systems of urban life—transportation, housing, energy, air quality—set the framework for sustainability. It is therefore imperative to approach them in an integrated way to make meaningful progress. The smart grid and smart transportation technologies that can make a difference already exist and are “imminently deployable.” The focus on data collection to better understand how people are using energy and making housing and transportation decisions has great potential for improving efficiency and developing policies that promote the growth of a low carbon economy. The U.S. needs to pay attention to best practices in cities around the world for ideas that can be replicated domestically.

PANEL TWO:

A Conversation with Mayors: Sustainable Redevelopment

Moderator: Amy Liu, Senior Fellow and Co-Director, Metropolitan Policy Program, The Brookings Institution

The Honorable Roy Buol, Mayor, Dubuque, Iowa

The Honorable Dwight C. Jones, Mayor, Richmond, Virginia

The second session gave the mayors from two quite different cities—Dubuque, Iowa and Richmond, Virginia—the chance to talk about their administrations’ approaches to sustainable redevelopment. Richmond is a state capital and the heart of the nation’s 43rd largest metropolitan area and Dubuque is a small city that nonetheless draws the attention of presidential candidates every four years. Accordingly, each has different motivations for pursuing a sustainability agenda and is going about it in a different way.

In Richmond, the sustainability agenda is driven by its desire to become a top-tier city through job creation and economic growth. Mayor Jones sees sustainability through the lens of social justice, efficiency and affordability; a number of the city’s programs are aimed at low-income residents.

Dubuque’s mayor identified his grandchildren as his motivation for advancing sustainability efforts in his city. The consumption patterns—of energy, water, land and other resources—he observed were not sustainable and needed to be changed. Because of this, he thinks in terms of “generational planning” rather than sustainability.

In order to engage the community in sustainability efforts, the city involved the citizens at an early stage by reaching out to local businesses, churches, and organizations to find out what would work. The city has promoted a concept of sustainability that combines economic prosperity, environmental protection, and social equity, and those principles are used throughout the community. By his definition, a sustainable city is one where the economic, environmental, and social needs of today’s citizens are being met in a way that does not limit what future citizens are able to enjoy.

Mayor Jones sees sustainability through the lens of social justice, efficiency and affordability...



The Dubuque city government has made a concerted effort to reduce the cost of city services through efficiency. Steps such as changing vehicle fleets and the types of fuels they use and introducing new technologies like more efficient lighting have had an impact. The business community has created a consortium to develop new products and learn best practices for improved efficiency.

Like in other cities, an important emphasis for Sustainable Dubuque is providing people with information that helps them make conscious decisions about energy consumption, such as by changing billing practices or offering real time information on electricity, natural gas, and water usage through smart phones or computers. The driving force for this kind of program is showing people what's in it for them; when they can see the savings of, for example, running appliances at off-peak times, they are more inclined to take resource-saving steps. As data becomes more widely available, the issue of privacy has emerged as a concern. Nonetheless, 12,000 households have volunteered to be part of these pilot projects, including one that creates an incentive for fixing leaks, which could potentially save 68 million gallons water in Dubuque, suggesting very significant savings in bigger cities.

In Richmond, the mayor issued a green government order that included the appointment of its first-ever full-time director of sustainability. The city also introduced an anti-idling policy that contributes both to cleaner air and reduced fuel consumption. A new telework policy for city employees shares these benefits and reduces traffic congestion, as does a system of alternative work schedules that enables people to commute at different times. LEED certified stoplights are being installed in the city to reduce power demand. Garbage trucks are being converted to compressed natural gas (CNG) and CNG filling stations are being built around Richmond. The city has also made an effort to promote multimodal transportation options, with an emphasis on bicycles that includes installation of 80 miles of bike lanes and shared roads and a bike-sharing program at Virginia Commonwealth University.

Integrating initiatives and developing partnerships with companies are clearly important to the success of sustainability efforts. Dubuque has partnered with a company to develop the Smarter Sustainable Dubuque program, which integrates technological innovations into its electricity, natural gas, water, and transportation systems to provide feedback on consumption. Because Dubuque involved the community in the design of its sustainability efforts from the outset, it has achieved broad buy-in. Sustainable Dubuque was developed by citizens for citizens and the city government is a partner, not a leader, in the effort.

Ensuring that sustainability initiatives reach low-income residents is a priority for both Richmond and Dubuque. In Richmond, the city emphasizes the economic development component of its efforts, including requirements to incorporate green values in city MOU's, which have served to attract businesses that share those values. Beyond the construction of green buildings, Richmond has developed a job-training program that targets unemployed and hard-to-employ residents to provide them with higher-level skills.

Dubuque also focuses on social equity in its efforts. One example is a creek restoration project, paid for by a storm water fee, that protects 1,100 homes at high risk of being flooded. The creek now has greater capacity to handle run-off and the project created a linear park that has become an asset to the entire community.

One of the biggest issues facing redevelopment efforts is how to implement 21st century ideas with a 20th century financing structure. Partnerships between the cities and their

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state governments provide important support for sustainability efforts. Iowa provided a grant to support Sustainable Dubuque, with the idea that it will be able to share its successes and best practices with other cities in Iowa and, ultimately, other smaller cities (less than 200,000 residents) elsewhere in the country and the world. Redevelopment of existing buildings is an important contributor to sustainability because the greenest building is the one that's already built. Redevelopment is good for jobs too, because 70% of the cost of redeveloping a building is labor, while 70% of the costs of new construction is materials. Redevelopment of existing buildings also means that greenfields do not need to be developed, which helps preserve the environment.

The Commonwealth of Virginia still has a way to go to build a sustainable pathway. Because the state will run out of highway funds in five years, the time is now to rethink its approach to transportation. Building roads that can't be maintained is not a viable plan and so projects like high-speed rail and dedicated bike lanes offer more promise. One helpful program that the state could implement would be a way to incentivize LEED-certified redevelopment of existing buildings.

The federal government has an important role to play in local sustainability efforts, including offering cities more flexibility in applying for support and streamlining operations so that it is easier to work across agencies and access different silos of funding. A more integrated approach by the federal government would help 21st century ideas come to fruition and improve economic competitiveness. Dubuque is showing how government efforts can change consumer behavior. These steps do not include asking for more money, but rather integrating funds that are already available. Richmond would benefit most from high-speed rail to connect the city with the Washington, DC megalopolis and further integrate the east coast by rail. Competition within Congress to prioritize investments in transportation projects has led to a logjam that is hindering progress.

Aside from federal leadership, mayors have a real opportunity to advance the national discussion. Mayors hear local concerns and ideas and can help move their cities forward by bringing people together for things that help the planet.

Closing Remarks

Takashi Kawamura, Chairman, Hitachi, Ltd.



The Eco-Engineering Forum provided significant information to help increase understanding of what is possible in creating a sustainable world. After the earthquake, tsunami and ensuing nuclear meltdown, Japan has significant opportunities to rebuild its cities while applying principles of efficiency and sustainability to the new construction. Japan is grateful for the support and encouragement that the rest of the world has provided, and hopes that its experiences and the discussions at the Forum can enhance the strength of U.S. cities.

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