Introduction

Ladies and gentlemen.

I hope that your discussions over these past two days have met your expectations and will lead to substantive connections and collaborations. I am a geneticist and molecular biologist, so for me this has been a wonderful learning experience and I now appreciate much more deeply how vital your community is in the sustainable use of our planet's precious resources, be it in agriculture, natural resource and watershed management, health care, urbanization, or the conservation of biodiversity. As well, of course, the information you provide is essential in the timely response to natural disasters, famine and conflict.

This is a small conference, but it assembled a good group of experts in a this wonderful setting -- provided by the Protea Sea Point hotel – for discussion and networking, the core objective of our Global Dialogs in Emerging Science and Technology. I have been very impressed at the level of energy in your community, your knowledge, and, above all your commitment to the value of your work, even under difficult circumstances.

The Geospatial Landscape in Africa

The history of the geospatial science community in Africa is relatively brief. Geospatial sciences entered a new phase with the advent of satellite imagery and geographic information systems, beginning in the early 1980's. These developments were initially led by the US, and more recently, by European donors and agencies. The United Nations—chiefly UNEP and FAO, and the World Bank have sponsored programs in the application of geospatial science on a regional level. Other countries, including Japan, India and China, have also begun to be major players. China announced at the 2007 Global Earth Observation Summit that imagery from the joint China/Brazil satellite (CBERS) will be shared with African partners. Over the past three decades, the United States, among other countries, has engaged with African scientists and practitioners in introducing and fostering GIS approaches in Africa.

GDEST and Geospatial Collaboration

It is not a time to rest on past achievements. Despite budget constraints and limited resources that impede collaboration in this essential field, it is crucial to maintain the momentum and continue to increase the reach and utility of the human networks that have already been established. This is what motivated my colleagues to propose this GDEST conference – and spurred their hard work in organizing it. And, of course, we are all deeply grateful to NGA, the sponsoring organization.

The three conference themes have helped frame future opportunities, as Paul Bartel said this morning.

- (1) ***Observing Africa*** examined trends and opportunities in monitoring the environment to address sustainability issues
- (2) ***The regional challenge*** theme addressed the ways that decisions and policies have been influenced by modeling, analysis, and visualization

- (3) ***The African data stream*** theme considered constraints and explored ways to get valid data in a useful format in a timely and affordable manner, as well as ways of sharing the data among collaborators.

It is clear that there is considerable momentum in the African geospatial community.

- Active networks of scientists and practitioners are engaged in shaping and directing the progress of geospatial science applications;
- There is increasing dialogue on infrastructure and data access policies.
- National policies are being developed that acknowledge the importance of science and technology and innovation, as well as the vital role of information and communication technologies in powering education, research, and business development.

- In some countries, geospatial sciences are explicitly identified in the national strategies.

Yesterday, Lee Schwartz noted the high level of attention given to science and technology at the "Science in Africa" conference co-hosted by the ECA and the African Union on March 3-7.

- Geospatial science curricula are actively being developed in universities;
- Private-sector geospatial enterprises are emerging to meet the region's analytical and mapping needs; and
- There is an active effort to establish a regional space program that benefits from the initiatives taken by South Africa and Nigeria.

However, many of the constraints identified in the 1990s and the first years of the new century remain. My colleagues heard them repeatedly in the course of their visits and we have heard them here during the conference:

- There is often a lack of awareness and commitment on the part of national governments to supporting geospatial applications, data infrastructure, and capacity;
- Academic training programs often lack strength and rigor;
- Geospatial data are still not generally used as the point of departure in governmental decision-making and there is intense debate over standards, control and access;
- Analytical models and approaches remains imitative, rather than innovative, in part because of inadequate means of sharing expertise and limited training opportunities;
- Efforts to establish regional and national institutions often depend upon outside funding, lack adequate internal budgetary support, and commonly depend on the initiative of a single individual.

Going forward from this conference, perhaps the important general guiding principles are the following:

- Collaborations must be just that, engaging Africans and experts from the US and other countries as equal partners in the conceptualization, design and implementation of geospatial science projects and programs.

- Collaborations should seek to reinforce existing networks rather than inventing new ones to avoid diluting what has already been accomplished. As well, they should contribute to building existing regional expertise to strengthen training and education.

- Funding, when available, must be equitably shared between African and foreign partners.

- Effort should be invested in creating linkages between academic institutions and both governmental and non-governmental organizations

- Collaborators should establish milestones to track progress and make use of planned events to maximize information sharing efforts. In particular, the upcoming AARSE conference in Accra (October 2008), the IGRSS conference in Cape Town (July 2009), and the Africa GIS conference in Kampala (late 2010) offer opportunities to link to a large constituency and leverage attendance to foster strategic networking for the future.

Summary Panels

Panel members cited good examples to illustrate traditions and obstacles that often complicate the decision-making process, as well success stories and opportunities for collaboration. I will emphasize some of the key observations:

Panel - Decision-Making

It has been acknowledged here repeatedly that there remain national leaders who are unaware of the importance of Geospatial Data Infrastructure and the power of geospatial data and modeling in crafting sustainable approaches to economic, social and natural resource development. Unavoidably, it fall on you, the members of the GIS community, to find ways to interact with and better inform your leaders about the importance of your science in their development strategies and in the writing of their strategic plans. You will need to find – and nurture – champions in the sectors that influence the implementation of the policies you help develop.

We scientists need to be better communicators to see the implementation of we believe most important. This is not an easy task, as panel members acknowledged. As a molecular biologist and a long-time champion of recombinant DNA technologies, this is a task familiar to me. It is a different arena of communication and persuasion than that familiar to us as scientists.
And still, the task is not done when the information is delivered. Those who develop the science must also think about its applications, then seek and satisfy their customers.

Panel - Opportunities for Collaboration

Let us turn now briefly to the opportunities articulated in the course of this GDEST conference. I will parse these into short-, medium- and long-term opportunities.

In the short term, it is important to develop and deliver information to upgrade the skills and knowledge of young scientists, engineers and practitioners during international conferences. Important resources to engage are our professional societies such as the American Association of Geographers,

the American Geographical Society, the American Society of Photogrammetry and Remote Sensing, the American Geophysical Union, the American Meteorological Society and the IEEE.

In the medium term, it is important to develop better and more extensive relationships among universities to upgrade curriculum, increase the use information technologies and distance learning, provide more collaborative research opportunities, and increase the exchanges of both faculty and students.

In the long term, it is essential to develop research opportunities to collect, share, validate – and most importantly -- use geospatial data in addressing critical issues that face both citizens and governments. The outcomes of such research can contribute to better decision-making by society in responding to the challenges of food security and health, urbanization, environmental management, climate change and, of course, disaster response. These are not issues just for Africa, they're issues that confront all of us on this planet.

In summary, there are exciting opportunities for growth in African geospatial sciences. It is my earnest hope that the people that this conference has brought together and the collaborative efforts they undertake will make a substantive contribution to the further growth and development of geospatial sciences, applications and education on the African continent.

Science Diplomacy

Speaking a bit more generally in my role as Science and Technology Adviser to both the US Secretary of State and the Administrator of USAID, it is hard for me to exaggerate the importance of science – of our common knowledge base – in relationships among nations. We are inhabitants of a perilously populous planet. Our future depends entirely on our wits – our ability to use and build on our knowledge of physics, chemistry, and biology to understand and guide the fate of an almost incomprehensibly complex global biogeophysical system.

Both the complexity and the interconnectedness of our individual disciplines are beginning to dawn on us as we struggle with our growing impact on the planet's climate. We seize on biofuels as the way forward: might we be able to power our civilization with each year's photosynthetic energy capture? We are spending the photosynthetic yield of many millions of years – our huge energy bank account – at a stupefying rate. But even as we launch into ambitious biofuels programs around the world, it is becoming evident almost immediately that a single year's energy income is too small to sustain our extravagant life style.

The amount of arable land on the planet has not changed significantly in more than half a century. Pulling down more tropical forests has an unacceptable cost in biodiversity – and will inevitably impact climate. As corn and sugarcane to power cars push aside crops for food and feed, we are seeing the prices of staple grains – corn, soybeans and wheat – skyrocket worldwide. The consequences fall most heavily on the poorest among us – and will inevitably bring political instability. There is little alternative but to put our best science and engineering to work on devising more efficient approaches not just to powering our civilization, but also to becoming much more efficient in capturing the sun's energy through plants' remarkable photosynthetic engines. And of course, your discipline plays a very central role in both planning and an in tracking the progress of such efforts.

Close and Thanks

It has been an honor to host this conference. I particularly thank our co-host, Julian Smit and the University of Cape Town. Special thanks go to our US team as well. Paul Bartel and Lee Schwartz of the US State Department's Office of the Geographer, together with Andy Reynolds and AAAS fellow Lawrence Lin of my office, and Rachel Warner in the Office of External Research have all been central to its success. Most of all, I thank our African colleagues for making the effort to join us in this dialogue. I will be reporting our findings to Secretary Rice and USAID Administrator Henrietta Fore.

Our American team looks forward to continuing the dialogue. There is much to do in achieving a measure of sustainability, not only in Africa, but in the United States and the rest of the world. We have much to learn from each other, so may the dialogue continue.