OPPORTUNITIES IN THE GLOBAL WATER SECTOR

Paul R. Houser, *Center for Research on Environment and Water (CREW), Calverton, MD,*
http://crew.iges.org/home

Earth has been called the "Water Planet". The distribution and movement of water - the "water cycle" - determines the success or failure of life. In particular, the success or failure of human activity - biological, social, economic - the "livability" of urban areas, the reliability of agriculture, are largely dependent on our ability to understand and harness the water cycle. Water covers seventy-five percent of our planet's surfaces, and it is ceaselessly moving - cycling - on, over, and under that surface -- the atmosphere as clouds, vapor, rain and snow - on the surface and deep beneath the surface of the oceans in vast subsurface rivers and streams, and along the great continental river systems.

Knowledge and understanding of these movements provide a multitude of economic and business opportunities, large and small. For instance, understanding the water cycle can contribute to the reduction or even avoidance of the tragic effects floods and droughts, an essential requirement in the risk-management and insurance industries. Floods are a potent source of coastal and riparian erosion with the subsequent devaluation of property values as well as the disruption of human lives. Desertification ruins otherwise productive farmlands. Pollution of air and water endangers the health and lives of both humans and animals. Salinization of fresh and potable ground water reduces the areas in which men and animals can live. The field of public health was practically founded by the discovery in the late 1800s of the relation between local well-water and public latrines in a cholera epidemic. Finally, our recent concern with the global warming "greenhouse effect" is caused mainly by atmospheric water vapor - has profited from a more timely and detailed understanding of its sources.

Here are some water cycle facts and the research and business opportunities understanding it provides:

1) *The use and control of water is the third largest industry in the world - behind only electricity and oil.*
2) *The water sector is expected to grow at two to three times the global economy over the next decade.*
3) *A reliable water supply is essential for the health and wellbeing of the planet's human population as well as for almost all industrialization and manufacturing processes.*
4) *Globally there is a significant and growing imbalance between water supply and demand. Between where it is needed and where it is distributed.*
5) *Water as a commodity is still very poorly appreciated by most of the business community. It is an immensely undervalued asset.*
6) *In the U.S. alone, water infrastructure - both construction of new and the repair and maintenance of existing ones - are expected to exceed $500 billion over the next 20 years ... an average potential market of about $25 billion each year.*

All of these facts have both public (political) and private (business) implications. How can we adjust to our growing requirements to known and forecast fluctuating demands? How can we deal with a varying commodity that is absolutely essential, cannot be manufactured, yet in many areas scarce and in many others overabundant?

Understanding the mechanics and consequences of these variations, providing programs for their prediction and control, can result in programs and investments which will improve forecasts of precipitation, floods, droughts, and the locations of water availability and scarcity in general. These constitute opportunities that can be exploited for applying water cycle knowledge to water-sensitive-policy decisions in both the public and private sectors.

The possession and use of sophisticated decision tools using a variety of sources and scientific

modalities, acquires data and transforms it into usable information specific to the needs and objectives of any kind of user. The risk-management and insurance community, for instance, have urgent requirements for water cycle information to assess and help forecast flood, wind, hail, fire, transportation and even homeland security risks.

We are certain that through the accurate and timely acquisition of this knowledge by harnessing the latest available scientific research, including observational and modeling systems, our organization can not only provide superior and timely water cycle information for use in water sector investments, but also foresee complex water cycle variations that can lead to reduced long-term water-sector investment uncertainties.

The need to acquire much more knowledge about this vast water sector is real and urgent and holds tremendous opportunities for both profitable investment and societal benefit. The organizations that avail themselves of such knowledge will have an immense advantage over those which do not.

The Center for Research on Environment and Water (CREW)

CREW's vision *is to be at the forefront of water and energy cycle research, responding to needs in a diverse and ever changing world; A trusted source of water cycle information, a partner to develop solutions for emerging environmental problems, and a public and next generation educator.*

Earth is unique due to the abundance and vigorous cycling and replenishing of water. The water cycle operates on a continuum of time and space scales and exchanges large amounts of energy as water undergoes phase changes and is moved from one part of the Earth system to another. Water is essential to life and is central to society's welfare, progress, and sustainable economic growth. However, global water cycle variability which regulates flood, drought, and disease hazards is being continuously transformed by climate, erosion, pollution, salinization, and agriculture and civil engineering practices. The water cycle delivers the consequences of climate variability. In fact, the most significant manifestation of climate variation is an intensification of the global water cycle, leading to increased global precipitation, faster evaporation, and a general exacerbation of extreme hydrologic regimes, floods, and droughts. An intensified water cycle would be expected to produce more frequent or severe weather disturbances.

To make decisive progress toward better water cycle understanding, predictive skill, and decision making, the Center for Research on Environment and Water was formed in 2005. ***CREW's* mission** *is to identify, understand and predict water cycle variability, provide leadership in addressing imperative environmental issues, and to advancing the science and technology of water resources management.* **CREW's primary goal** is to *understand the mechanism of water cycle, improve global water cycle research, monitor water cycle and water related processes across planet Earth, and provide the best knowledge and solutions to solve emerging environmental problems.* ***CREW's core values*** *are dedication to excellence, and service for community. At CREW, we harness a diverse group of people with many different specialties and experiences, excelling through originality, creativity, teamwork and shared responsibility.* ***CREW's assets*** *are the provision of long-term global and regional data sets of critical water-cycle variables from satellite and surface-based observation, advanced data assimilation products, and a close collaboration with COLA* (a partner IGES center) *and multiple partner centers of excellence* (e.g. University of Maryland - Baltimore County, NASA' Goddard *Space* Flight Center. NOAA's National Centers for Environmental Prediction (NCEP), etc.).

The CREW team integrates research across traditional disciplines and government entities to develop an end-to-end program that transitions theoretical research to academic/public education and real-world application, through partnerships with universities, government, and international agencies.To focus CREW on making decisive progress toward quantifying and predicting water cycle and environmental consequences of earth system variability and change, we adopt 3 central CREW elements: (1) Observation, (2) Modeling & Prediction, and (3) Solutions, summarized as follows:

- **Observation:** Quantify long-term water cycle trends & variability; enable progression toward a coordinated water cycle observation system; extract knowledge and understanding from diverse observations to enhance prediction capability.
- **Modeling & Prediction:** Use multiple state-of-the-art "operational" earth-system models; conduct sensitivity and predictability experiments; infuse process-scale understanding to predict water cycle extremes. Enhance prediction through observational constraints; explore limits of water cycle predictability.
- **Solutions:** Enhance operational decision support tools with improved prediction; engage in public and research community education; application; link to other earth system components

As an independent non-profit, CREW is ideally suited to act as an "honest broker", to integrate water cycle research and decision maker information across government agencies, researchers, stakeholders, and international community. So we actively embrace new links and collaborations.

CREW is making progress towards the goals through its success in competitive funded NASA and NOAA grants. We are currently a small group trying to make a difference, but the needs for this work are immense, and more resources are needed to fully engage the CREW vision.

CREW
Center for Research on Environment and Water

4041 Powder Mill Road, Suite 302
Calverton, MD 20705-3106 USA
Phone:301/595-7001; Web:http://crew.iges.org
CREW is a center of the Institute of Global Environment & Society

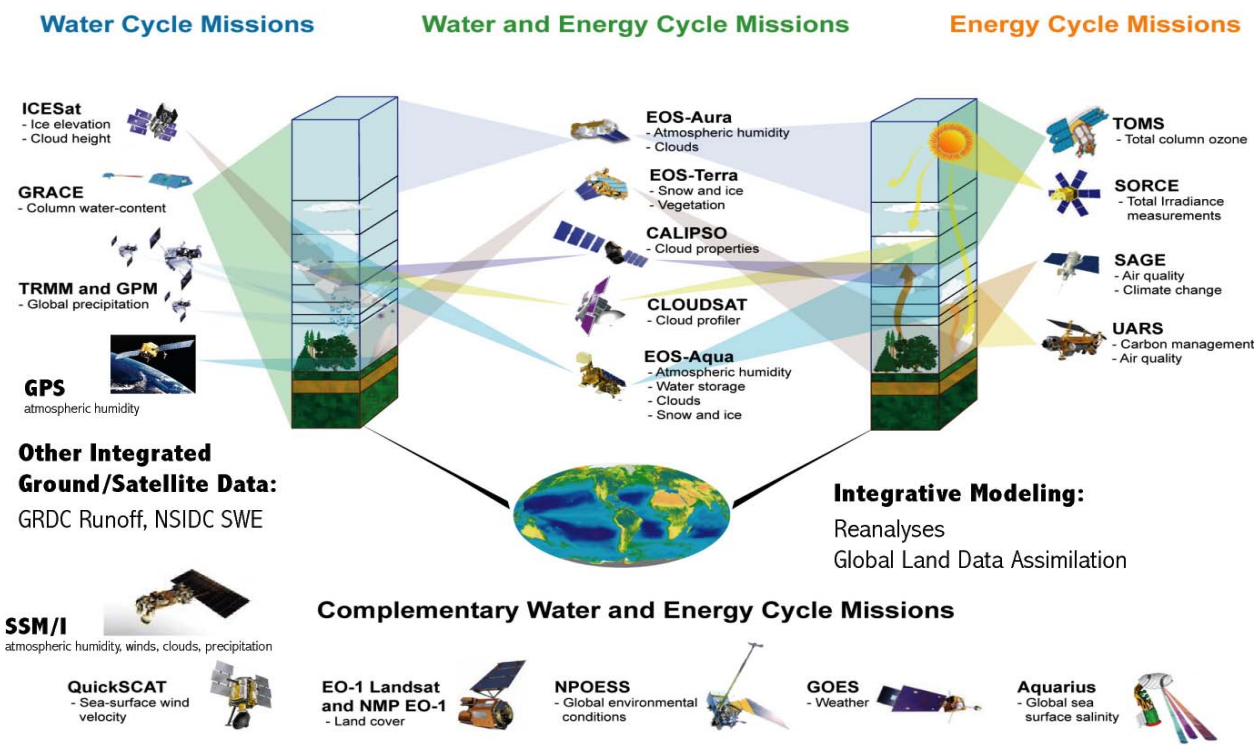

Figure 1. NASA Water and Energy Cycle Observation Capabilities

CREW
Center for Research on Environment and Water

4041 Powder Mill Road, Suite 302
Calverton, MD 20705-3106 USA
Phone:301/595-7001; Web:http://crew.iges.org
CREW is a center of the Institute of Global Environment & Society

CREW
Center for Research on Environment and Water

4041 Powder Mill Road, Suite 302
Calverton, MD 20705-3106 USA
Phone:301/595-7001; Web:http://crew.iges.org
CREW is a center of the Institute of Global Environment & Society

Water Cycle Research Making a Difference