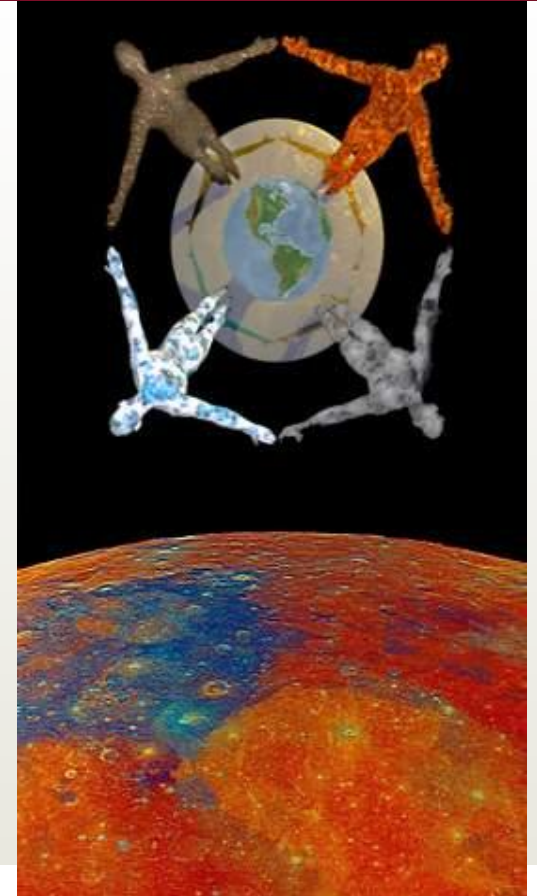


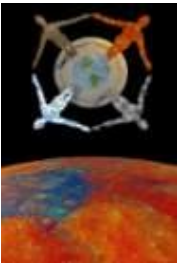
***Watershed: At the
Precipice or Over the
Falls - Facing Up to Our
Water Scarce Future***

Jack Smith,

Director CACOR, Adjunct

Professor Telfer School of Management

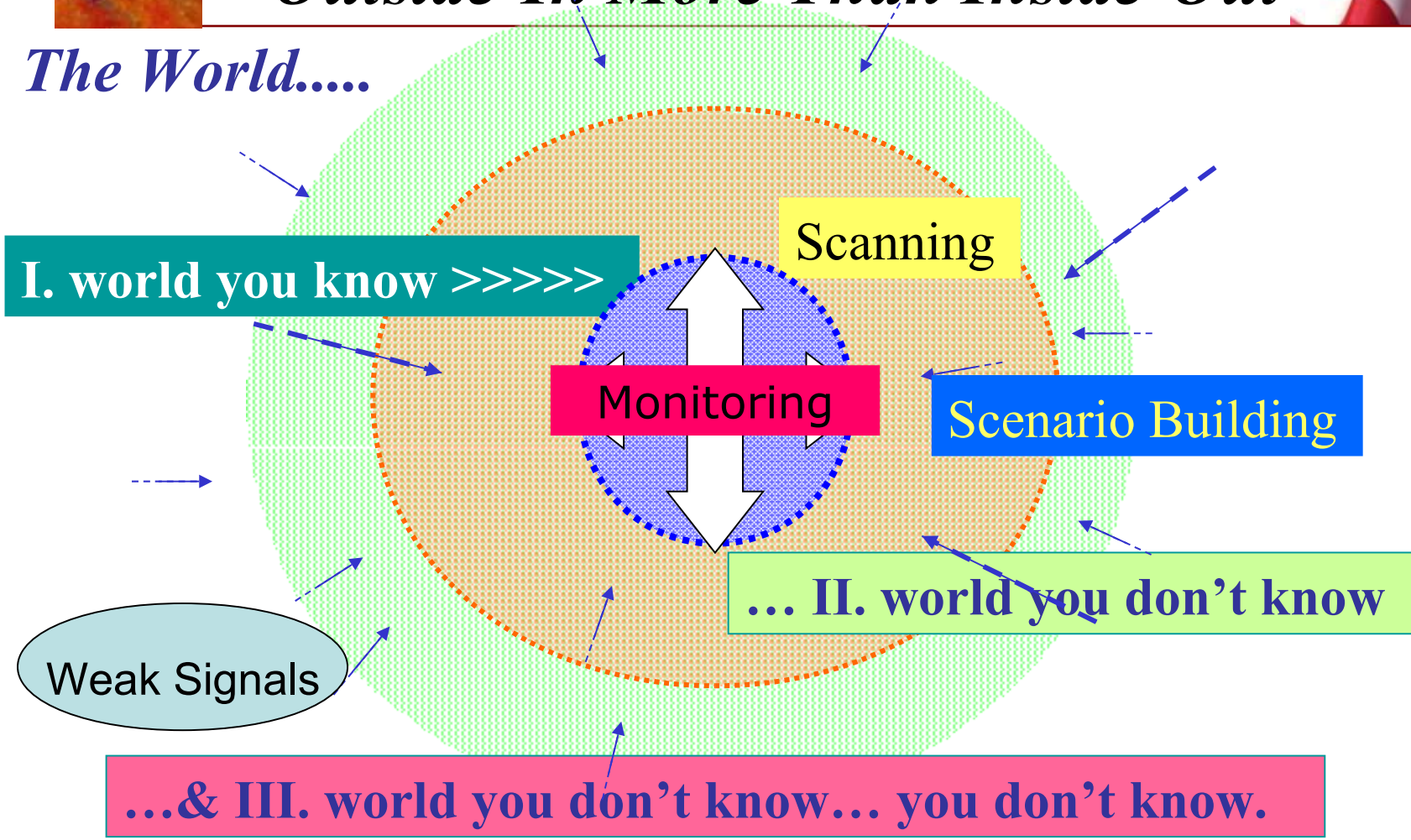


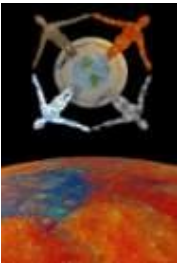


Being Open to Surprise Involves Outside-In More Than Inside-Out



The World.....



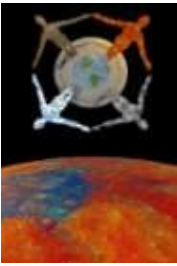


Resilience & Foresight



- Resilience involves accepting that there are unknown, unknowns – *real surprises* – that require empathy, agility and imaginative-analytical, anticipatory strategies and tools: i.e. foresight;
- Institutions can add resilience when they engage in collaborative learning , *what if* simulations and scenarios, and challenge the accepted wisdoms;
- Foresight involves creating circumstances under which resilience can be increased through exploration of *diverse pathways*, and how organizations approach the restoration of order following shocks.

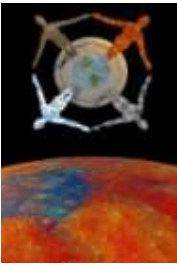




Sources of Disruption



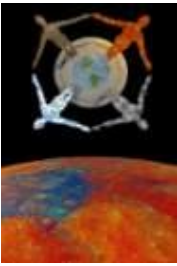
- **Mind Set:** Institutional *Linearity-Rigidity* in assumptions, structures and preparedness strategies; (Maginot Line, Blitzkreig; Vietnam;)
- **New Models:** e.g. new societal capacities - digital education, *disaggregation of services; social networks*
- **Technology Shift:** Succession – Breakthrough, and *Transformative Technologies*; (Hiroshima; Singularity- quantum- nano-self assembly; synthetic biology, drones-robotics)
- **Arrogance-Comfort:** Self *Delusive* Narratives; (9-11; Global Finance 2008, Iran nuclear)
- **Power of Nature:** “*Gaia*” *planetary techtonics*-Evolutionary – naturally occurring - recurring earthquakes, tsunamis, volcanoes, typhoons, hurricanes etc.
- **Doomsday “Unthinkables”** - horrific; pervasive and complex; comprehensive and costly beyond our capabilities for restoration; (asteroid hit; gulf stream shift, rapid polar melt, nuclear winter, solar flare heat thrust, “ grey goo”)



Water Themes



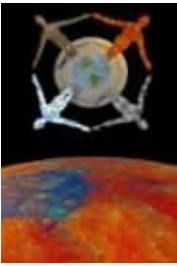
- **Water & energy seem to be the two key sustainability challenges facing us all; water is a growing concern;**
- **The composition of our shared atmosphere has significantly changed from that of our ancestors – water cycles are central to this;**
- **There are fossil energy substitutes – but not for water;**
- **However there may be technologies to improve water purification and potability – e.g. Nanofiltration + we are only now learning conservation**
- **Canada (and others), blessed by water presence, persist in the myth of super abundance of good quality water – leads to water waste and reluctance to value;**
- **Some key economic producers and important sectors are constrained by water scarcity- e.g. Alberta oil sands, agriculture, mining**
- **Our major water sheds are showing strain; erosion; flash floods, Great lakes levels, Prairies droughts, Glacial retreat, Arctic ponds, peat lands (12% of surface cover) and ice cover, and declining average flows of rivers in populated zones: window for action is beginning to close**



I. The Changing Climate and Canada's Water by Dr. James P. Bruce



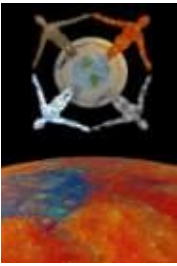
- Our citizens continue to believe we are plentiful in high quality water, so attitudes toward water preservation are difficult to adjust;
- International Geosphere-Biosphere Program has measured composite change since 1980: measuring sea levels, global mean temperatures, Arctic sea ice and CO₂ concentrations in atmosphere (key driver of other three) – all are rising;
- Until 1960s natural forces led the cycle but since then human interventions have dominated – CO₂ now rising from 340 ppm in 1980 to 387 ppm in 2009
- Canada is especially affected given climatic diversity, Arctic impacts, 3 seas;
- Water quality and quantity is showing affects in; increased frequency of heavy rains creating toxic runoff- eutrophication and erosion; flash floods and drought cycles in Prairies; lower average river flows;
- Rockies, Arctic glaciers and winter ice covers are showing clear declines of 20% and more since 1960s
- There are substitutes for fossil fuels but none for water



II. Carrying Capacity and Water Limits by Dr Ted Manning



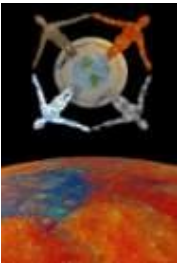
- Water is now the most common limit to sustainability – e.g. in resorts, farming, energy production;
- Limits are easier to understand when they are most visible- e.g. Maldives, Cozumel; China has plentiful water but clean water is lacking;
- Clean water has a visible price in time, effort or cost;
- Canada is only starting to meter and charge for water – about \$ 100 per month for an average family in Ottawa;
- Water availability now affecting investment decisions- e.g. cruise ships port choices;
- When towns were small water was a convenient way of waste disposal- this has changed for most communities;
- Where water costs are real and significant, changes in behaviour follow ;
- Tourism is a leading innovator- grey water for golf; rainwater capture and aquifer protection, desalinization with solar systems, end use efficiency devices;
- May become a zero sum game and may take a crisis to prompt change



III. Final Ecological Threshold in High Arctic Ponds by John Smol and Marianne Douglas



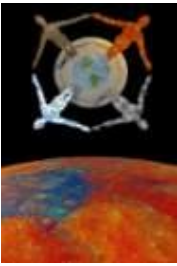
- Ponds are drying up faster than expected in the Arctic ecosystem;
- Climate change is the most likely reason;
- Data is observational over a 24 year period
- A Key Ecological tipping point has now been passed- Arctic ponds that were permanent for millenia are now ephemeral;
- The consequences are likely more severe than just is the water cycle as these ponds provided food, breeding beds etc. – now need more complex modeling to understand



IV. A Modern Dynamic Water Treaty by Dr. David Brooks



- Water treaties are important allocators for life support;
- Quantitative sharing is deficient: securitization and rigidity;
- Fixed allocations today may be impossible to sustain over time;
- Unlike land water is mobile and many times usage is possible;
- Most treaties focus on equitable and reasonable use – no longer adequate ;
- Dr. Brooks advocates 5 additional principles : 1) define rights; 2) equality in rights and responsibilities; 3) priority to demand management ; 4) acceptance of historic local forms of management; 5) continuous quality monitoring and mediation of conflicts
- New institutional structures may be required- bilateral commission

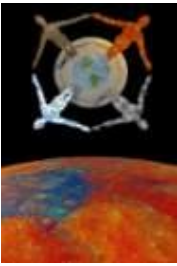


5. Sustainable Development and Water Policy

By Ralph Pentland



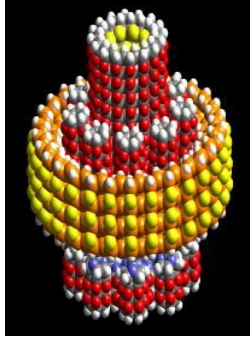
- **In 20th century energy consumption rose by 12.5 and water by 9 fold;**
- **The world cannot sustain water usage at developed country rates without major technology changes to enable reuse;**
- **New approaches can offer synergies – e.g. - saving water saves energy;**
- **If ecological carrying capacity is exceeded, economic activity will experience a jolt- downward;**
- **We are heading toward a precipice- because hundreds of millions depend upon food grown with water from diminishing ground water;**
- **Regulatory trends are not helping us- away from precaution, under valued economies of water value and assumptions of endless supply**
- **E.G.> US-Can border issues loop holes on prospects for future water transfer (subsequent news item re Canadian Water Issues Council treaty concerns**



6. A Watershed Moment for Democracy By Matt Retallack



- **Water stress is already present in Canada;**
- **Canada has five (macro, geo-political, cross regional) watersheds each with different dynamics, stakeholders : 1) Atlantic – includes Great Lakes; 2) Hudson Bay- Continental divide to Quebec; 3) Arctic Ocean ;4) Pacific – from Rockies and divide west; 5) Gulf of Mexico – small arc of southern Prairies**
- **All are shared with US which constrains Canadian scope for action (CWI Council) ;**
- **Stress is apparent in Great Lakes, Prairies and Hudson Bay domains of the five watersheds**
- **Serious investment has yet to start on systemic conservation, e.g. Widespread metering and charging value;**
- **Multi-jurisdictional complexity is holding back sensible policies, innovation;**



Strategic Policy Implications



- ❖ It is time for more aggressive public , community and institutional engagement on water strategies
- ❖ Canada can be an exemplary model for future practices – as long as the real costs of water can be integrated into municipal economies;
- ❖ Smart regulatory measures aligned with conservation strategies and sensible US-Canada interests will be critical;
- ❖ Technology innovations in water metering, management, minimal usage and filtration must be supported in new targeted R&D;
- ❖ Water treaties are an essential part of future democratic governance and should be better funded to reflect this critical role

