



Group 1 Water Technologies

Introduction

- ◆ a. **Dr. Oki provided an introduction**
- ◆ b. **Discussion of Project Areas**
 - Go back and look at the Middle
- ◆ c. **Canada NSERC Strategic Grant needs to provide results back to industry / receiving body**



Social demands

- ◆ **Small community water supply <= Population distribution**
- ◆ **Dam removal/control <= Aging infrastructures**
- ◆ **Urban area, CSO/power <= Increasing number of heavy rain**
- ◆ **Eutrophication /non-point source <= Remaining pollution**
- ◆ **Trace contaminants/radionuclides <= Chemicals/emergency**
- ◆ **Communication on value of water <= Public concern**
- ◆ **Climate change adaptation <= Global climate change**
- ◆ **Impacts of new energy development <= New energy needs**
- ◆ **Land use forestry – floods <= Change in use**
- ◆ **Microbiological contamination in water supplies, Assimilable organic carbon, regrowth, ... <= Growing concern**
- ◆ **Distribution network control <= Difficulties in control, needs energy**
- ◆ **Energy saving <= Urgent energy saving is required**



Rationale -Timely, Efficient, and Worthy-

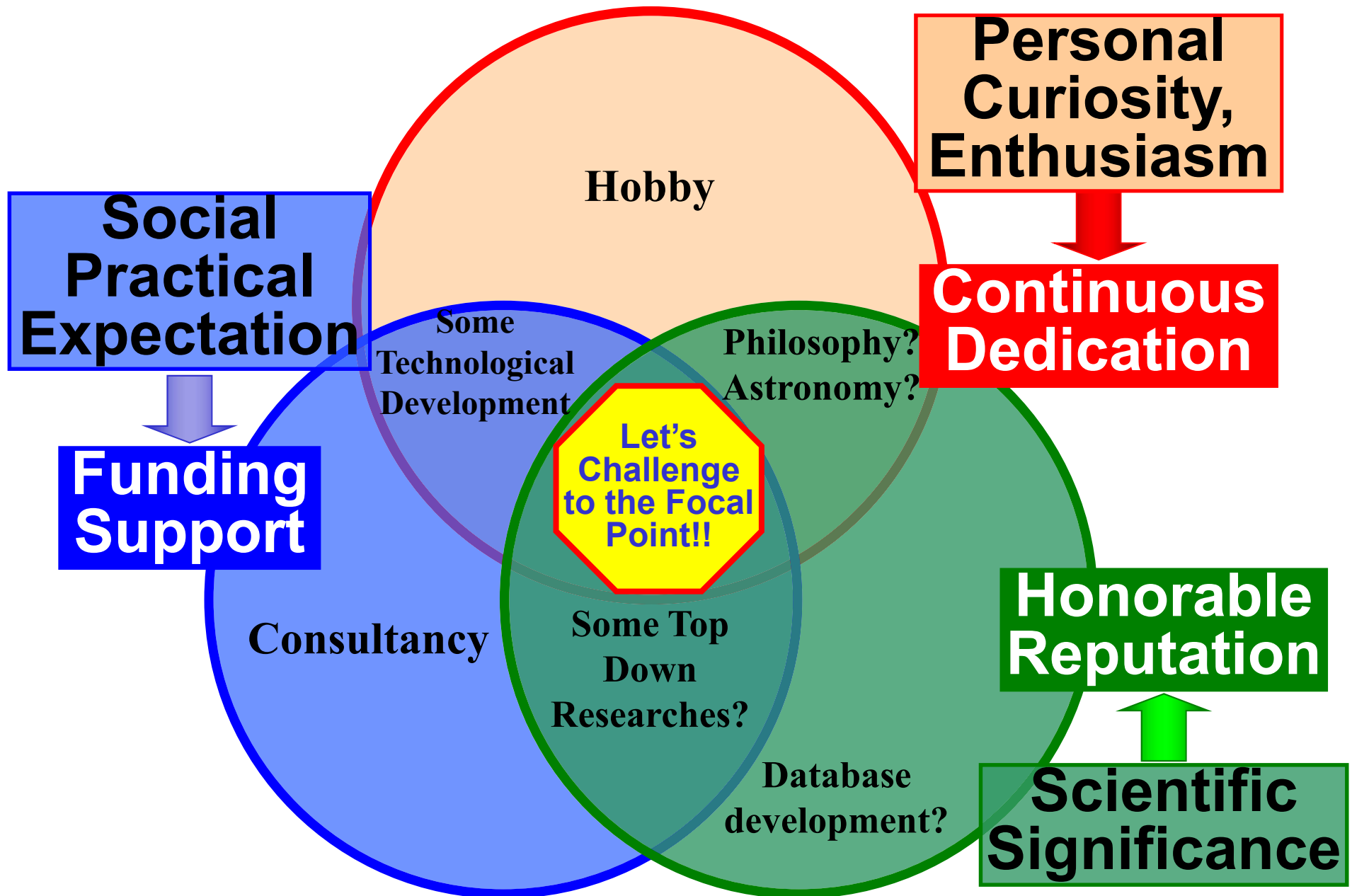
- ******Small community water supply**
 - ❄ Vulnerable and a lot of incidents are reported.
- ****Dam removal/control**
 - ❄ Is it only about B/C? Repair and maintenance or removal?
- ****Microbiological contamination in water supplies, AOC (Assimilable organic carbon), regrowth, ...**
 - ❄ Many cases are reported.
- **Emergency responses securing sustainable water use**
- ***Climate change adaptation in urban areas**
 - ❄ increasing frequency of “guerrilla” rainfall: how can we handle it?
- ***Energy saving in water sectors**
 - ❄ Electric energy is consumed in water sector by 5 % in Canada, 3% in Japan.



Scientific questions

- ◆ **How can we realize sustainable water use in small communities?**
 - ❄ Water safety plan, checklist, ICT, UV, MBR, ...
- ◆ **How can we predict the possibility of outbreaks by microbiological contamination in water supplies?**
 - ❄ Water safety plan, PCR, ICT, ...
- ◆ **What are proper emergency responses in order to secure sustainable water use?**
 - ❄ Water safety plan, checklist, ICT, ...
- ◆ **What are the merit, demerit, and side effects of dam removals?**
- ◆ **How can we achieve proper adaptation in water management in urban area to climate change?**
 - ❄ ICT, remote/online sensing, modeling, ...
- ◆ **How can we reduce the energy consumption (and GHG emissions) related to water management?**
 - ❄ ICT, prediction (numerical modeling, ANN etc.), ...

Technological
Seeds





Technological Seeds

- ◆ **ICT**
- ◆ **UV (robust, reliable system)**
- ◆ **Online sensing**
- ◆ **Checklist**
- ◆ **Numerical modeling**
- ◆ **Remote sensing**
- ◆ **Source tracking technology/ stable isotope**
- ◆ **PCR**
- ◆ **MBR**



Timely, Efficient, and Worthy

- ◆ ******Small community water supply**
 - ❄ ****Distribution network control**
 - ❄ ***Energy saving in water sectors**
- ◆ ****Dam removal/control**
- ◆ ****Microbiological contamination in water supplies, AOC (Assimilable organic carbon), regrowth, ...**
- ◆ ***Climate change adaptation in urban areas**
- ◆ **Urban area, CSO/power**
- ◆ **Eutrophication /non-point source**
- ◆ **Trace contaminants/radionuclides**
- ◆ **Communication on value of water**
- ◆ **Impacts of new energy development**
- ◆ **Land use forestry – floods**



Opportunities?

- 💧 **Alleviate CSO (Combined Sewage Outflow) in urban areas**
- 💧 **Aquatic toxicology: quality + temperature, sediments, ...**
- 💧 **Comparative study how to secure safe drinking water supplies**
 - ❄️ Risk management strategy, high-tech counter measures, ...
- 💧 **Multiple anthropogenic stressors on aquatic eco-systems/water**
 - ❄️ LULC Changes, social and climate changes, ...
- 💧 **Impacts of multiple stressors on:**
 - ❄️ Sustainable water supply, water (+food & energy) security, ...
 - ❄️ Restoration and conservation of river environment, ...
 - ❄️ Wild fish, recreational fishing
- 💧 **Communicating water environment/“healthy river” with public**
 - ❄️ Refurbish or remove dams – environmental flows/controlled flooding, ...
- 💧 **Transferring technology and wisdom on water to developing world.**



International Collaborations

- ◆ **Exchange ideas, views, scholars...**
- ◆ **Sharing common targets, motivations, tools, datasets, observational sites, numerical models, knowledge, ...**
- ◆ **For example,**
 - ❄ **Joint case study in Canadian/Japanese lakes/watersheds?**
 - ❄ **Comparative study on watershed managements?**
 - ❄ **Joint summer school on water security?**
- ◆ **Needs social scientists (?) ← Belmont Forum**



Discussions (1)

- ◆ Joint efforts by ecologists and engineers
- ◆ **Solution oriented approach**
 - ❄ Scale issues: temporal, spatial
- ◆ **Specific versus general approaches**
 - ❄ Best practices in watershed management
- ◆ **Threshold study of silt and sediment on fish**
 - ❄ Turbidity, pH, temperature, oxygen, shading, feeding, ...
- ◆ **Dams/reservoirs**
 - ❄ Flow management, removal, ...
- ◆ **Water source protection/conservation. Regulation issues.**



Discussions (2)

- ◆ **Water quality at the outlet from waste water plant should be monitored and criteria should be examined/revised.**
- ◆ **Urban water management**
- ◆ **Practical use of developed technology.**
 - ❄ **Solution technologies can be developed for sharp issues**
- ◆ **Comparative study**
 - ❄ **Lake Biwa and Canadian Lake cases. ← gigantic engineering**
 - ❄ **Governance issues and/or management systems as well.**
 - ❄ **Understanding the water use/management in paddy fields.**
 - ❄ **Different states have different ways of management in Canada.**



Discussions (3)

- ◆ **Impacts of Geo-engineering (as mitigation of climate change) on water.**
 - ❄ **Impacts of producing oil sand & biofuel crops on water.**
- ◆ **Communication design among stakeholders.**
- ◆ **Ecology side and engineering side 2.5 hour on the 2nd day to develop possible collaborations.**
 - ❄ **Identify the “Big Picture” (good questions and ideas) first, then think about the comparative advantages.**



Discussions (4)

- ◆ Need to identify a few to several topics with higher priorities in the “sustainable water use” research.
- ◆ Requires integration and synergy among possible future projects under the joint call.
- ◆ Other tools/issues
 - ❄ Stable isotopes
 - ❄ Point source *v.s.* non point source
 - ❄ Empirical numerical models ⇔ physically based models
 - Enable to develop more universally applicable prediction tool.