Economics and Water Resources

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Economics?

- The study of what people do when there isn't enough to go around.
- Decision making in the face of scarcity.
  - Not enough time in the day
  - Not enough skilled labour
  - Not enough health care providers
  - Not enough water

Decisions

- Having a choice means there are options.
- Choosing one option means other options are gone.
- The cost of choosing one option is the best alternative not chosen.
  - More irrigation is less water for fish.
  - etc.

Valuation and Incentives

- Can roughly divide economics into two areas
- Valuation
  - Tools to compare options
  - Better to use water for consumption or in stream.
  - Assortment of methods – CV, TCM, ...
- Incentives
  - Tools for encouraging behaviors
  - Water rate structure, development charges, etc.

Types of Values

- Use value
  - Input into agriculture, drinking
- Option value
  - Water in reservoir
- Non-use value
  - Non-consumptive – boating on lake
  - Existence – wetlands, habitat, etc.

Instream Flow

- Willingness to pay for protecting or increasing flow in streams (per person or per acre-foot)
  - New Mexico (CV), $29 - $90 to protect minimum flow
  - Montana (CV), $3 - $23 to protect minimum flow
  - California (TCM), $300 - $350 per acre-foot in San Joaquin River, $70 per acre-foot for recreation.
  - Western US (lit review), $40 - $80 to protect / enhance instream flow
  - California (TCM), $73 per cubic foot second
- People do value water 'in the wild'

Lake Level

- Value of more water in a lake
  - Nevada (TCM and CB), $240 - $360 for 20 ft (50k af)
  - California (CV), $154 - $350 to protect from decline.
  - Tennessee (CV), $33 to increase fall reservoir level
  - New Mexico (TCM), $133 per acre foot in lakes
  - New Mexico (TCM), $1 - $11 per af in reservoirs
  - Texas (HPV), $110 - $136 per af, homes on lake
- Maintaining lake level has value.

Surface Water Quality

- Water quality affects value of recreational experience.
  - Montana (TCM), $64 to protect quality, Flathead
  - Minnesota (HPV), $206 extra foot clarity per house
  - Maine (HPV), $6300 - $8900 bad to good per house
  - Wisconsin (HPV), $5000 extra foot clarity per house
  - Iowa (CV), $12 boat to swim, $73 swim to drink
  - New Hampshire (HPV), 1-6% loss for meter clarity
- Protecting lake water quality has value.

Ground / Drinking Water Quality

- People willing to pay to protect / improve quality of water entering house.
- Many studies
  - > 60 referenced in Shaw (2003)
  - Range $4 - $5,000
  - Varies with type of contaminant (hardness to bacterial contamination).
- Value of safe and palatable water is high!

So What?

- Water provides a range of services.
- Services have measurable economic value
  - People will pay money to protect or enhance these services.
- Market for these services often missing
  - Nowhere to buy higher water level for just your house.
- Policy needed to help market maximize value of services provided by water.

Policy Themes

- Benefit / Cost Analysis
  - Relies on government with authority over project.
- Incentive based policies
  - Influence decision of individuals
  - Impacting on many small decisions

Benefit / Cost Analysis

- Identify options
- Project impacts of options
- Calculate costs and benefits for each option
- Choose project with greatest surplus of benefit over cost.
- Measurement may be hard, but if done right, picks 'best' choice.
  - Doing it right includes measurement of effects not observed in market.

Chlorination of SEKID Water

- As example, treat all water or leave as is.
  - (guess) 2,500 households.
  - Paying $500 per year to improve water
  - Value of improvement ~ $1.25 Million per year.
    - A lower bound, as treatment not perfect.
- Aggregate benefit **NOT** same as revenue for SEKID.
  - Aggregate benefit not about cash flow.
  - If Benefit > Cost, worth finding way to finance.

Installing Piped Sewers

- Another example, replacing septic systems near lake with sewer and/or only allowing construction with sewer.
  - Foot extra water clarity, $1000 per house
  - (guess) 10000 affected houses (near or on lake), $10 M benefit
  - Lower bound, also some benefit to resident and non-resident tourists.
- Compare to cost of sewerage program.
  - Conventional property tax **DOES NOT** **capture.**
  - **Implicit subsidy, poor to rich.**

Household Water Conservation

- Example, benefit of 20% reduction in household water use.
  - Population growth, 3% per year.
  - 6.2 years 'extra' capacity from water saving
  - $20M expansion delayed, 5% interest, saves $740,000.
- How to get individual households to conserve?
  - Gov't cannot directly control household choices.
  - Role for incentives.

Incentive Based Policies

- Make desired behaviors beneficial to people making choices.
- Key issue, rights need to be clear and understood.
  - Need to know consequences of choices.
  - Need to know that this relationship won't arbitrarily change.

Water Rights

- Western North America, mostly prior appropriation.
- Licences have seniority
  - More senior entitled to receive licence quantity first, remaining available for more junior.
  - First in time, first in right.
- Beneficial use
  - Use it or loose it.
- Environment historically not beneficial use.
- Don't get greatest value out of water.

Low Flow Shower Heads

- Shower (somewhat) less pleasant.
- Installation requires time and effort
- Must pay for device
  - Unless metered and pay by volume, little uptake.
  - Where not metered, or price low, can give shower heads away, many don't install.
- Metering, pay by volume, and reasonably high price create incentive to conserve.

Low Volume Toilets

- Can save considerable water.
- Device expensive, installation expensive.
  - Little uptake unless water expensive.
- Easy way, legislate for new buildings.
- Retrofit subsidies
  - Expensive for city
  - Can justify if conservation delays expensive expansion.

Efficient Irrigation Technologies

- Low pressure nozzles, drip, etc. save water.
  - Why install, if water not metered?
  - Improved management as reason?
- San Diego, Central Valley (California)
  - City paid for water conservation investments, in exchange for receiving saved water.

Groundwater

- Groundwater often unregulated
  - More difficult to monitor and manage pumping.
- Pumping 'race'
  - Pumping from common aquifer.
  - Pumpers ignore impact on others
- Connection to surface
  - Lowering water table can increase infiltration or reduce seepage.
  - Pumpers can 'steal' water that 'belongs' to surface users.

Water Pricing

- Information campaigns short term only.
  - People 'forget' and revert to old habits.
- Pricing results in permanent changes.
  - Education for need of conservation
  - Education to help people adapt.
- Justice issues
  - Water essential, can poor afford?
  - Increasing block rate, basic needs block cheap.

Trading Water

- Beneficial use rule makes water trading difficult
  - If you can sell it, didn't need it, so can loose right.
- Need enabling legislation that protects rights of owner, before trades will occur.

Chile, Australia

- Trade in permanent and temporary (rental) water rights.
- Buyers producing higher value crops than sellers
  - Transfers increase total value of production
- Some transfer to industry / residential
- Relatively little trade in permanent rights.
  - Owners (mostly farmers) value protection from future shortages.

Water Banking

- US, suspicious of permanent trades
  - Use it or loose it rule
- Establish right to stored water in reservoir
  - Store water till next season, not loosing it
  - Rent it out this season.
- Important in California drought of 90's
- Some adverse impact on small towns dependent on agriculture.
  - Later incarnation prevented fallowing.

Water for Environment

- Food or Fish?
  - Serious when drought or over allocated
- Regulatory decrees may fail
  - Klamath Basin
- Secure water rights, sell for environment
  - Gov't and/or NGOs can buy water for environment
  - http://www.cbwtp.org/jsp/cbwtp/index.jsp

Water Options

- Buy or sell right to water, given drought or other trigger.
  - Get payment now, may not need to forego water.
  - If drought occurs, get extra payment
- Security of supply for buyer
- Security of income for seller

Conclusion

- Water is a precious and scarce resource.
  - Need to manage its use to generate greatest benefit to society.
- Economics can help
  - Establish true value of water in different uses.
  - Develop tools to help motivate people to change behavior.

My Research (current)

- Farm Drought Risk Management
  - All business need to manage risk.
  - Sharing water between users a way to manage risk
    - One justification for water purveyors.
  - Most profitable sharing may not be equal sharing.
  - Where profit opportunities exist, water users will look for ways to exploit them.
  - Do Okanagan farmers 'share' or 'trade' water, where such opportunities exist?
  - How can rules be changed to give water users more flexibility to capitalize on such opportunities?

My Research (current)

- Water quality and house prices
  - Kelowna is supplied city, Glenmore-Ellison, Rutland, Black Mountain, and SEKID.
  - Each has different quality, different pricing, and different communication/education.
  - Are these differences evident in the price of houses?

My Research (proposed)

- The different suppliers to Kelowna have different education/information and different pricing programs.
- What are households doing, in terms of water conservation, esp. expenditures (showers, toilets, etc.)?
- How does this related to the water supplier they are receiving water from?

My Research (proposed)

- Water option markets managed by purveyors.
- Where metered, purveyors know use of each customer.
- Purveyors can manage transfers.
- Water trading, or more simply, buy and sell seniority within system.
  - Nobody looses allotment/entitlement
  - Buying and selling security of supply, not water.
  - More palatable?