

Resource cost and climate change

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Global Water Crisis

- Over 1 billion people don't have access to clean drinking water; more than 2 billion lack access to adequate sanitation; and millions die every year due to preventable water-related diseases.
- 5 million people – mainly children – die every year from preventable, water-related disease is surely one of the great tragedies of our time.
- Over 34 million people might perish in the next 20 years from water-related disease
- Hundreds of billions of dollars are needed to bring safe water to everyone who needs it. Since international water aid is so paltry, many of these experts claim that privatization of water services is the only way to help the poor.
- Are solutions to the global water crisis that don't involve massive dams, large-scale infrastructure, and tens or hundreds of billions of dollars

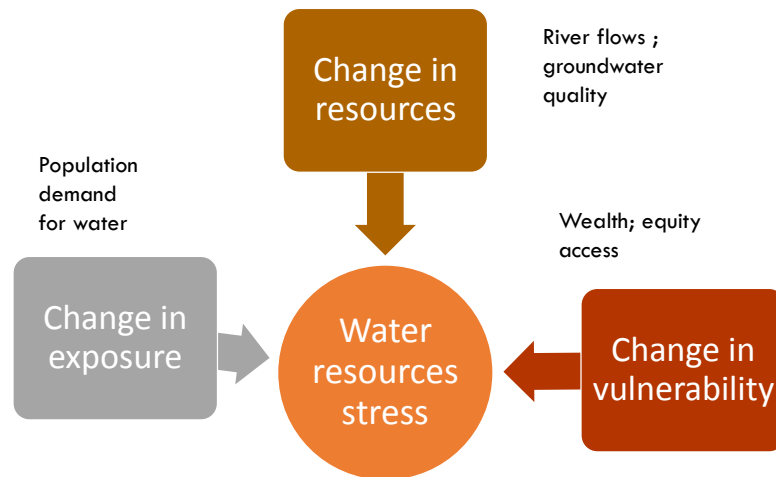
Water and Climate Change

- Climate change will lead to more precipitation - but also to more evaporation
- Precipitation will probably increase in some areas and decline in others.
- **Changing precipitation patterns will affect how much water can be captured.**
- **The drier the climate, the more sensitive is the local hydrology.**
- High-latitude regions may see more runoff due to greater precipitation.
- The effects on the tropics are harder to predict.
- **Reservoirs and wells would be affected.**
- New patterns of runoff and evaporation will also affect natural ecosystems.
- Rising seas could invade coastal freshwater supplies.
- **Reduced water supplies would place additional stress on people, agriculture, and the environment.**
- **Conflicts could be sparked by the additional pressures.**
- Improved water resource management can help to reduce vulnerabilities.

Water resources in climate change

- All medium and long term scenarios is underlying a reduction of water resources availability in South and Eastern European Region.
- The human needs for water and sanitation and the so much desired economic development will put pressure on the more scarce water resources
- The future water policy will have to develop a system for efficient, equitable and sustainable water allocation
- Water economic valuation and use an economic instrument should be an important element of this future policy

Drivers of change



Key Objectives of Public Policy in Allocation of Water Resources

Efficiency: organization of production & consumption such that all unambiguous possibilities for increasing economic well-being have been exhausted. For water, this is achieved where the marginal social benefits of water use are equated to the marginal social cost of supply, or for a given source, where the marginal social benefits of water use are equated across users.

Equity: fairness of distribution of resources and impacts across society. Equal access to water resources, the distribution of property rights, and the distribution of the costs and benefits of policy interventions

Environment and Sustainability: Consideration of intergenerational equity & the critical nature of ecological services provided by water resources provide two rationales for considering sustainability.

Environmental and Resource Costs

Environmental costs: Costs of damage that water uses impose on the environment and ecosystems and those who use the environment (e.g. a reduction in the ecological quality of aquatic ecosystems; salinization and degradation of productive soils).

Resource costs: Costs of foregone opportunities which other uses suffer due to the depletion of the resource beyond its natural rate of recharge or recovery (e.g. linked to the over-abstraction of groundwater).

Source: WATECO glossary

Water is an economic good

- Water is not free. Somebody does pay!

Opportunity cost concept: - when scarce, water has a value in alternative use

- Value and charges are two different things
 - the value of water is essential for allocation
 - the price of water is essential for cost recovery/feasibility
- Economic instruments: essential tools for demand management
 - regulating behaviour: conserve and save!
 - service levels <-> affordability/willingness-to-pay
 - market as the regulator!? (e.g. Australia, Chile)
- Transparent subsidies for the poor
 - many countries will need subsidies far into the century!

Water Value

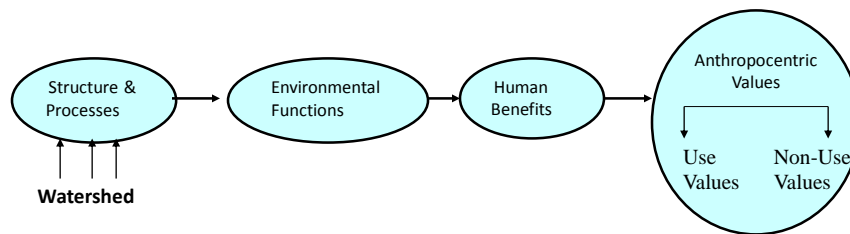
FINANCIAL COSTS					RESOURCE COST	ENVIRONMENTAL COST
COST OF WATER	TOTAL ECONOMIC VALUE	CAPITAL COST	OPERATION & MAINTENANCE (O&M) COST	RESOURCE ADMIN COST	FORGONE VALUE OF ALTERNATIVE USES (present/future)	IN SITU VALUE (Cost of Saline intrusion Land Subsidence Drought Buffer)
	PAID BY USERS	CAPITAL COST (credit often subsidized)	O&M COST (energy often subsidized)	RES.* ADMIN COST		
					* Frequently not levied or do not cover real costs	

Meanings of economic value

- A commodity has an economic value when people are *willing to pay* for it, rather than go without
- Water is an essential commodity, so the value of a small/basic amount for survival is infinite—people would pay *any* price.
- After basic needs are met, people buy water based on its price compared to other goods they might buy.
- Water's value is the willingness to pay for water

An Economic Framework to Measure Value of Environmental Functions

Need for economic efficiency and social equity in WRM over the long-term. Thus, need to incorporate full cost recovery of water services.



...A crucial component of Cost-Benefit Analysis

Classification of Economic Instruments		
<i>Economic Instrument</i>	<i>Advantages</i>	<i>Disadvantages</i>
1. Standards and Quotas	Public is familiar with this instrument	Not economically efficient
2. Water abstraction charges	Adjustment of price signals to reflect actual resource costs; encourage new technologies; flexibility; generation of revenues	Low charges will have minimal impact on user behavior and will continue in resource over-utilization
3. Pollution charges	Same as water abstraction charges; polluter-pays principle	Same as water abstraction charges
4. Subsidies on water saving measures	Readily acceptable	Financial Constraints
5. Tradable permits	Quantity based targets that are able to attain least-cost outcome. Allows flexibility.	May entail high transaction costs
6. Voluntary agreements	Readily acceptable	Requires good co-operation between Government and farmers organizations
7. Liability legislation	Assess and recover damages ex-post but can also act as prevention incentives	Require an advanced legal system; high control costs; burden of proof

Valuing water

- **Water as an Economic Good:** After basic needs are met, water should be allocated to the highest value uses.
- **Water value provides critical information for decisions about:**
 - Efficient and equitable allocation of water among competing users, both*
 - *within the present generation*
 - *between present and future generation*
 - Efficient and equitable infrastructure investment in the water sector (how much, where, when)*
 - Efficient degree of treatment of wastewater*
 - Design of economic instruments: water pricing, property rights, tradable water rights' markets, taxes on water depletion and pollution, etc.*

Water tariffs and water value

**System of National Accounts (SNA) values water at price of transaction.
Why can't we just use this value?**

- Because the price charged by water suppliers—if any—often unrelated to value of water, too low
- Water price often does not even reflect full costs of water supply
- Water is not supplied by competitive markets due to natural characteristics
 - Necessary for human survival
 - Natural monopoly
 - Characteristics of public good
 - Property rights not always well defined for multiple use or sequential use
 - 'Bulky' commodity (very high transport costs relative to value inhibiting trade)

Water tariffs and water value

- Some markets for trading water rights are developing in
 - Australia,
 - California,
 - Chile
 but these markets are still not common
- Price of tradable water rights does not yet provide a reliable indicator of value because in the markets are too few traders
- It is necessary to estimate the input of water economic value

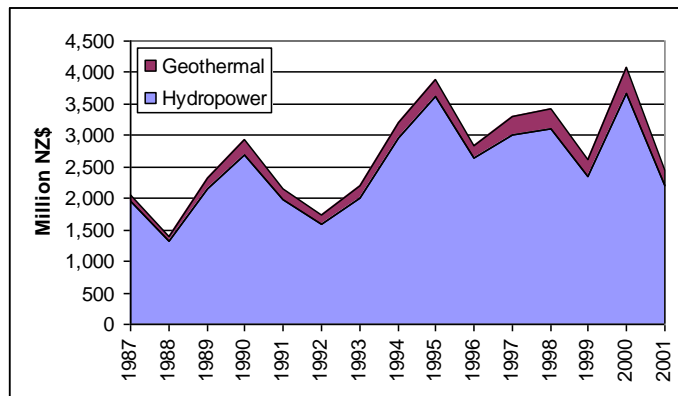
Water Valuation Techniques

- **Residual value** -Marginal contribution of water to output, measured by subtracting all other costs from revenue
- **Production function approach** - Marginal contribution measured as the change in output from a unit increase in water input in a given sector
- **Optimization models and programming** -Marginal contribution measured as the change in sectorial output from reallocation of water across the entire economy
- **Hedonic pricing** -Price differential paid for land with water resources
- **Opportunity Cost** - Price differential for alternative (example: replacing hydroelectric power with coal-fired electricity)
- **Contingent Valuation Method** - Survey of users, especially household water use and recreational services (based on surveys of willingness to pay)

Optimization models: Valuing multiple uses of water

- Residual value and related techniques are good to estimate the value of water in a single use, or several closely related uses
- To estimate the value of all uses of water in an economy, then modeling is needed
 - Linear programming
 - Computable General Equilibrium (CGE) modeling
 - Econometric modeling
- But these approaches are better used for evaluating changes in water allocation among users, rather than values in current allocation.

Example of Water Asset Value in New Zealand concerning Hydropower & Geothermal Power



Water Resource Cost Present Policy

- Water allocation and water price is still a very high political issue
- Priorities for water allocation are established based on the importance in the national economy not necessary having in mind the most market value
- Environmental water requirements (non-value costs) are still not ranking in high priorities
- In the climate change conditions the water allocation should be more based on the economic analysis of alternative costs

