

Decision making in times of scarce water resources

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Future water scarcity

- In 1972 the President's Commission on Population and the American Future evaluated water resources and growing demand
- The study identified water scarcity areas over the next 50 years and the central Appalachian region was one of these
- This central Bluegrass area has been hit with mild to serious droughts several times over the last decades, and drought was widespread this summer.
- It is not a question of IF we will reach a point where water rationing will occur; it's just a question of when

Future water scarcity

- There are two other aspects of water scarcity:
- Many communities deal with the lack of potable, quality water
- Many communities deal with lack of access to public water

Decisions in times of scarcity

- When water resources are limited, what influences our understanding of the nature of the problem and our identification and implementation of potential solutions?
- What value do we assign to different water uses?
- How should water allocation decisions in times of scarcity be made? What factors should be considered?
- Who should decide?

Adaptive behavior

- We are capable of purposeful action by:
- Reflecting on the meaning of the consequences of our actions, and if we determine the consequences to be “problematic, then either
 - Developing strategies to control the consequential actions or
 - Developing strategies to mitigate the consequences

Adaptive behavior

- We use our ability to symbolize to create unique images of the biophysical and social environments that may or may not reflect the actual conditions
- Our adaptive behavior is in response to our perceptions and definitions of these environments, not the actual conditions
- As a result, a particular situation may be defined differently and responded to differently by various groups in society

Adaptive behavior

- We select our adaptive responses from a repertoire of possible actions that are bounded by our society's culture, structure, and processes
- What is problematic is that, even if we recognize that our behavior is maladaptive (creating a problem), the constraints of cultural precedents, institutional arrangements and social relationships might make changing these behaviors difficult, if not impossible

Adaptive behavior

- Why does this happen?
- There is a time lag between the perception of environmental conditions, their interpretation as problematic and the initiation of action
- During this time lag, cognitive, emotional, political and economic investments in current patterns of action are built up and the behavior may be reinforced by obligations, interests and power relationships

Adaptive behavior

- These investments in the status quo, the taken-for-granted social world, establish the framework within which we must define and address an issue
- It is easier, for example, to stimulate wants than to limit them, especially when these wants are seen as entitlements and when growth, progress, and rising expectations are dominant cultural values
- And access to resources, such as water, is seen as an inherent right

Factors influencing adaptation in times of crisis

Meaning and value of time

- Adaptive behavior takes place within a temporal context that reflects cultural preferences for the time between action and consequences
- Moreover, action strategies reflect the meaning and value we attach to time (delayed vs immediate costs and benefits)
 - We prefer short term actions with immediate consequences
 - We ignore long-term consequences of behaviors with short term benefits

Meaning and value of time

- The preference for short-term or immediate benefits contributes to a tendency toward **technological escalation** or the selection of actions to solve the undesired outcomes from one technological strategy by introducing another technological strategy
 - Problem: There is a water shortage
 - Solution: Build a new pipeline or dam
 - Problem: There is contamination of the water supply from agricultural chemicals
 - Solution: Add new scrubbers to the water processing plant

Uncertainty-risk tolerance

- This is the degree to which members of a society tolerate uncertainty and accept risks
- If uncertainty tolerance is low, there will be an emphasis on strategies designed to produce quick results with higher certainty of success
- If risk tolerance is low, there will be an emphasis on strategies with predictable results
 - Problem: There is a water shortage
 - Solution: Raise the price of water to cut consumption
 - Problem: Drinking water has excess levels of nitrates
 - Solution: Ban the use of agricultural chemicals

Uncertainty-risk tolerance and fairness and equity in adaptive strategies

- Should the fairness in the burden of the consequences of an adaptive strategy be a factor in decision-making? risk assessment?
- In other words, quick and predictable results may lead to some groups bearing a greater burden than others
- For example, if agriculture is granted priority in access to water followed by industrial users and then residential and finally commercial users, is it fair to have commercial users bear a disproportionate share of the burden of limiting water use?

Uncertainty-risk tolerance and fairness and equity in adaptive strategies

- Should fairness include intergenerational harms and benefits? That is,
- How should we value harms that appear in future generations while leaving the current generation relatively untouched?
- How should we value benefits that occur to the current generation but not to future generations?

Opportunity costs

- These are the costs of any course of action as compared to alternatives
 - Continue what we are doing or stop what we are doing
 - Change what we are doing and therefore choose to do something different (option A, B, C)
- Opportunity costs involve the social transformation of individual valuations of what is “better” or “desirable” into strategic actions
- Opportunity costs are measured in both material and nonmaterial ways

Opportunity costs illustrated

- Use of septic tanks as the primary method of handling residential sewage in Mammoth Cave area
- The cost of extending lines to geographically distant homes is high for communities
- Rural home owners use septic tanks either because no public sewer is available or, the cost of hooking on is greater than the cost of a septic system

Opportunity costs illustrated

- The communities around Mammoth Cave derive considerable public and private income from tourism to the Cave
- Many of the rural residences on septic systems are owned by those earning a living from tourism to the cave area

Opportunity costs illustrated

- The cumulative effects of decisions arising from community evaluations of the opportunity costs of using:
 - Scarce public funds to build a public sanitary sewer system (Action A) vs
 - Scarce public funds for some other purpose (Action B)
- Combined with individual evaluations of the opportunity costs for :
 - Installing a simple septic system (Action C) vs
 - Not building on your property because it is not serviced by a public sewer (Action D)
- Has led to a persistent decline in the quality of the underground water environment leading to a loss in tourism numbers and revenues

Opportunity costs illustrated

- In times of scarcity, there are opportunity costs associated with any decision to reallocate water from current to other uses
- Lack of irrigation water at a critical production time can devastate this year's harvest
- But how does this stack up to limiting access to water by industries? Or, small businesses?

Deprivation and adaptation

- Deprivation involves habituated tolerance, or the socially defined level of individual or group expectations or wants
- Habituated tolerance acts as a buffering effect which influences the threshold at which people perceive and define changes in the environment
- This means there must be a high level of negative effects must accumulate to trigger a demand for adaptive action

Deprivation and adaptation

- For example, if my water has always had a metallic taste, I may not perceive changes in water quality due to contaminants,
- Until the level of contamination passes the threshold of my habituated tolerance for poor tasting water

Deprivation and adaptation

- Similarly, the decline in the quality of Lake Michigan did not happen overnight
- Over a period of decades, water quality deteriorated
- And municipalities drawing drinking water from the lake adapted by investing in more and better water processing equipment
- And others posted signs that warned people not to swim in Lake Michigan or eat fish caught in it

Deprivation and adaptation

- Habituated tolerance presents a barrier to:
- The perception of changes in water quality and quantity
- Our definition of changes as problematic,
- And ultimately may lead us to decide that action to mitigate negative consequences is not necessary

Externalities

- Externalities reflect the degree to which the social system permits the “costs” of actions (or nonactions) to be “passed on” or “shared” with others
- In a social system structured to permit externalities, decision-makers are not responsible for the full costs of any consequences as a result of their actions

Externalities

- When costs are externalized, buffering occurs
- This is when a deleterious strategy persists because other factors encourage it to do so by spreading costs and risks among a larger population

Externalities and adaptation

- Externalities occur when agricultural practices – such as allowing cattle to gather in or near streams - lead to poor quality water
- Municipalities downstream need to intensify their treatment processes to insure the water is safe
- Here, agriculture has externalized the cost of minimizing the impact of livestock on water quality and individual consumers do not recognize this problem because they are buffered from the effects because the higher cost of water treatment is shared by all users

Social exchange

- Social exchange is the reciprocal exchange of obligations and favors built into the particular arrangement of social relationships
- Social exchange is about the establishment of vested interests in customary ways of doing, thinking and living

Social exchange

- Social exchange leads to adaptational drift or the accumulation of decisions in order to preserve a desired cultural style – the status quo
- An aura of rationality undergirds adaptational drift, arguing that the status quo can be maintained with planning and, that the status quo is both “right and proper”

Social exchange and adaptation

- All water users have vested interests in maintaining the current pattern of allocation and consumption
- From the perspective of vested interests, it is absurd to question the agricultural use of scarce water resources in the arid West and absurd to question whether there should be continued population growth in arid Nevada given the insufficiency of water resources

Social exchange and adaptation

- These questions are absurd because with proper planning we can continue to support a growing population in a region of scarce water resources
- And people have a right to do what they want with their land, even if this means growing cotton in arid Nevada
- And so, what some would call maladaptive water consumption persist because we all agree that there are no alternatives to our current path

Social exchange and adaptation

- In general, people tend to be *loss averse* -- a loss from the status quo is seen as more undesirable than a gain is seen as desirable
- For example, requiring me to limit water consumption today so that at some time in the future there will be water available to me and all other users, is typically viewed as a loss for me

Summary

- Water scarcity is more often defined as an inconvenience rather than as a situation which requires adaptive action
- Because access to inexpensive, potable water is a taken-for-granted component of modern life – We don't think about what happens when we turn the tap, until something doesn't come out

Summary

- There are many cultural factors that stand in the way of recognizing emerging problems with the availability and quality of water
- Even when we recognize that certain patterns of behavior and social processes are maladaptive, we may find it difficult to act so as to mitigate the negative consequences
- Knowledge, in other words, does not always translate into action, or if it does, it may not be action that resolves the situation