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THE ECONOMIC VALUE OF WATER: RESULTS OF A WORKSHOP IN CARACAS, VENEZUELA NOVEMBER 2000

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August 2001

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Cover: Epera Indian boy with broken hand pump, La Chunga, Panama.
(photo by Michael E. Campana)

I. Introduction

In November 2000 a small workshop of 14 people met in Caracas, Venezuela, to discuss the "value" of water.[1] The meeting was sponsored by the International Water Resources Network (IWRN),[2] the Organization of American States (OAS), The Nature Conservancy, the University of New Mexico, and the National Oceanic and Atmospheric Administration (NOAA). The meeting was hosted by Jose Ochoa-Iturbe, Director of the School of Civil Engineering at the Universidad Catolica Andres Bello. The participants represented a mix of academics, water administrators, government officials and NGOs (non-governmental organizations) from around the Americas.[3] Although many of the participants are economists, multiple disciplines and perspectives were represented. The meeting occurred as part of a process for stimulating discussion about water issues in the Americas. During and after IWRN's Dialog III in Panama, the participants at a session on water valuation discussed the need for an intermediate meeting that would keep the discussion moving forward. The feeling was that the time interval between Dialogs was too long and significant time was spent at each Dialog repeating conversations that had occurred before. An intermediate conference was organized in Caracas to fill that need. This document was produced as a result of the Caracas meeting and is meant to serve as an input to IWRN's Dialog IV in Brazil. The document should not be looked on as the final word but as an intermediate step meant to stimulate additional discussion.

The meeting in Caracas was recorded and extensive notes were taken of the two days of discussion. Significant discussion occurred on the meaning of "value" and "valuation". Part of the problem is "value" can be used in more than one way and is sometimes confused by non-economists with the concepts of "cost" or "price". As a result, the economists present produced a consensus diagram and reached a degree of agreement on an approach that can be taken to put these terms in perspective.[4] Toward the end of the meeting the participants were asked to produce a list of statements upon which they thought agreement could be reached. The lively discussion produced by those statements and the consensus diagram form the basis for this report.

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[1] Funding for the workshop was partially provided by NOAA's Office of Sustainable Development and Intergovernmental Affairs, Order No. 40-AA-NA-0A1205. Additional funding was provided by the Water Resources Program, the Department of Economics, and the Department of Geography of the University of New Mexico.

[2] The IWRN began in 1993 and has sponsored three Dialogs on water. A fourth is scheduled in Iguacu Falls, Brazil, in September 2001.

[3] The participants included: Armando Bertranou, David Brookshire, Michael Campana, Marlou Church, Jaime Collado, Luis Gamez, Bernhard Greisinger, Sara Hernandez, Andrei Jouravlev, A. Eduardo Lanna, Olen Paul Matthews, Molly McIntosh, Claude de Patoul, and Hugo Romero.

[4] The diagram was modified from one developed by Peter Rogers: Peter Rogers, Ramesh Bhatia and Annette Huberp (1998), *Water as a social and economic good: how to put the principle into practice*, Global Water Partnership/Swedish International Development Cooperation Agency, Stockholm, Sweden.

After the conference concluded, a summary of the discussion associated with the economists' diagram was made. Also, the points of agreement were organized around several themes and the discussion on each point was summarized. Additional points were added based on the conversation during the two-day conference. At that point the draft was reviewed and points were added to fill in any gaps that were present. A draft version was then circulated to all the participants, and they were given an opportunity to respond. The responses were incorporated to produce this document.

Although this document is intended to serve as input into Dialog IV, it can be put to other uses as well. Because the report is designed for use by those who are not economists, it can serve as a resource to sort out the confusion associated with the concepts of value, valuation, cost, and price. The report can also be used to show the benefits and limitations of a valuation process. People throughout the Americas are struggling with how to assign a value to water. This report will provide a set of useful ideas to help in this process.

II. Value and Cost Analysis

There was considerable discussion regarding the components of an economic analysis and an understanding of what we referred to as "complete" value and costs. This was an attempt to recognize what values actually fall within the domain of economic analysis and what values are beyond economics or alternatively, in addition to economic values.

Figure 1 and 2 present these taxonomies. In Figure 1, a distinction was drawn between efficiency analysis (the typical domain of economics) and beyond efficiency. Within the efficiency category there are two broad concepts of goods that are valued. Those that are traditionally traded in the market place (private goods -- apples, oranges, etc.) in some fashion and those which are not typically traded in the market place (non-market or public goods -- air quality, watershed preservation, etc.). The sum of these was referred to as full economic value. In addition to economic value, it was fully recognized that there are values above and beyond those thought of as being within the domain of economics. These would include but are not necessarily limited to cultural and religious values.

Within the domain of cost analysis, Figure 2 presents a taxonomy. Full economic costs encompass notions such as capital costs, and the others listed as well as technological externalities. Technological externalities can be thought of as costs that individuals or firms imposed on others. An example might be if a paper mill dumps waste upstream from a town; the town thus has to treat the water to restore the river water to a potable level. Pecuniary externalities are those that are generated through the price system. One can think of these as ripple effects or secondary effects. If a watershed was a major recreational site and suddenly became denuded as a result of a natural disaster (volcano or landslide), then the nearby merchants would possibly go out of business. Complete economic costs thus include pecuniary and full economic costs.

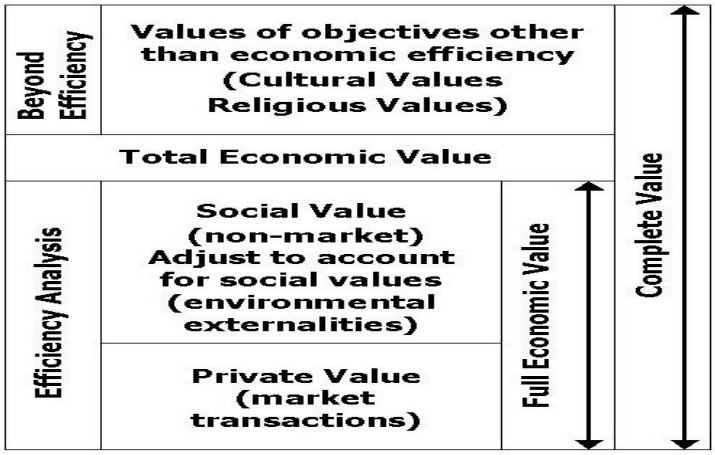

Figure 1. Value Analysis

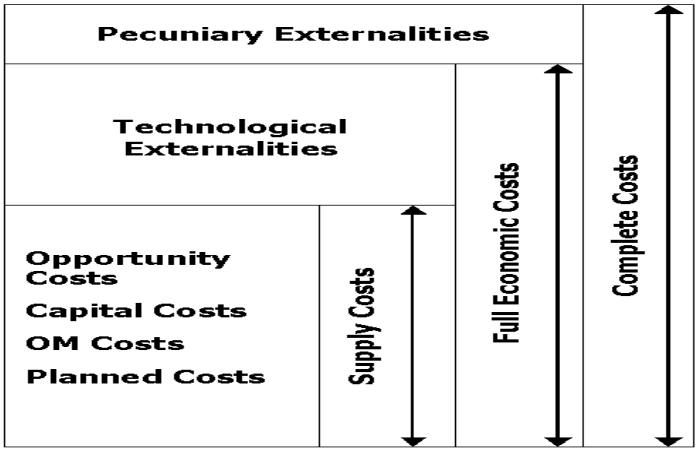

Figure 2. Cost Analysis

III. Points of Discussion

The following points of discussion are grouped together under broad headings. After each statement is a summary of the discussion that took place during the meeting. Not everyone was in complete agreement with all the statements listed below. When possible, conflicting views are included in the discussion.

A. Meaning of Value/Valuation

Because value and valuation can have more than one meaning, care must be taken when the terms are used. On more than one occasion, the discussion at the meeting became confused when the intended meaning was unclear.

A.1. Statements:

- **Valuing a resource is not the same thing as valuation of a resource. Value means both to appreciate (subjective) and to measure.**
- **Some people believe water cannot or should not be "valued" economically.**

A.1. Discussion: The group had many different perspectives on the meaning of value. Those perspectives are represented in the statements below.

(1) Value has qualitative and quantitative connotations. Care needs to be taken in how the word is used in order to avoid confusion. Both meanings are important to this discussion. Frequently when people talk about valuation of water, they are talking about a kind of economic measurement—an indicator. But, value can also be used in a subjective sense. When using the concept in a subjective sense, some people may assume water is so important (valuable) that it is beyond economic measurement. The subjective importance (value) of water is sometimes measured by looking at indicators such as people's preferences. "Value," when determined in this way, is useful in determining the "relative" importance of water. Measuring the economic value of water also shows "relative" importance (value).

(2) In theory economists can place an economic value on anything. It is useful in some cases but not all. The usefulness of the valuation depends on the problem and how it is defined.

(3) Economics is a very powerful organizing principle, but economics does not own the term "value" or "valuation". Although multiple sets of meanings exist for value, economists can generally agree on the term's definition and different uses. Economists can also accept different approaches to value and valuation. Non-economists are generally not as clear on what they mean by value and valuation.

(4) Economic values can be determined for market and non-market goods. Non-market goods are those goods that are not traditionally exchanged in a market setting. Clean air and endangered species are examples. Even though these goods are not traditionally exchanged in a market, they can be assigned an economic value and doing so can be useful. For example, potable water is a necessity. If the costs of providing potable water are to be recuperated, both traditional costs and environmental costs need to be included. Environmental costs should not be considered a luxury.

(5) In some circumstances using monetary measurements to place an economic value on water may be accepted and necessary. But, value/valuation is not the same as water pricing. A difference exists between cost, value, and price.

(6) Economic measurements may be inappropriate to some people. Although some people may look on valuation as a very technical concept, for others it is not. For some people or in some indigenous cultures, water may be so important that putting a monetary value on it is considered inappropriate. Economic value is not a good indicator of overall value for these people. If economic value is not appropriate, another indicator needs to be found. This does not necessarily mean a price cannot be charged for the use of water, but that its importance (overall value) cannot be determined in terms of money.

A.2. Statement:

- **The overall value of water includes non-economic value—social equity, environmental sustainability, and other things.**

A.2. Discussion: In the economic valuation of water, we should strive to place the market and non-market values on an equal footing. Water valuation should not be limited to economic efficiency. Value of water should mean all values—economic value, social value, strategic value, atmospheric value etc. Economic value includes environmental value. Environmental externalities usually represent real costs/real welfare changes that should not be ignored if optimal resource allocation is the goal. Ignoring important environmental externalities introduces a potential for resource misallocation and can accentuate distributional or equity problems. We can't always put a number on environmental values. That is why we use economics because it gives us a number. Social equity and ecosystem sustainability must also be considered. Figures 1 and 2 capture these different aspects of valuation.

B. Purpose of Valuation

The group recognized the limitations of economic valuation and other forms of valuation. However, they considered valuation, in whatever form, to be a useful tool for decision makers. The group also agreed that water valuation needs to go beyond economic values. Although ecological and equity values of water are difficult to measure, estimation methods can provide water managers relevant insights. Because the "overall value" of water is hard to estimate, measuring whether decisions are optimal is difficult. As a result the decision process needs to be legitimized.

This legitimacy can only be achieved when all stakeholders participate in the decision-making process. This participation ought to occur during all phases of the decision-making process from the gathering of data through implementation and monitoring (see section on stakeholders).

B.1. Statement:

- **Economic valuation of water is a helpful tool and provides input for decision-making. Economic valuation is not a management plan. It works on specific problems.**

B.1. Discussion: Economic valuation of water is useful in the administration and management of water. It should be integrated into the planning process. However, economic valuation in itself, is not the end result or goal of the planning process. For specific problems, economic valuation can provide a way of organizing the issues and looking at the trade-offs. Other forms of valuation may also be useful.

B.2. Statement:

- **Valuing water is a process for changing people's uses and actions within a watershed.**

B.2. Discussion: This means that people need to learn the importance of water. The process is one of education or capacity building. For example, if people understand water is scarce and are aware of conservation techniques, their probability of using the techniques will increase. Valuation is more than economics.

B.3. Statement:

- **Economic instruments can sometimes be effective in changing behavior.**

B.3. Discussion:

(1) Economic instruments can be effective in inducing change, but because of the fugitive and elusive nature of water, this is relatively more difficult to achieve in water resources management and use than in most other sectors of the economy. Determine what change is desirable and choose appropriate instruments. Regulation and pricing schemes are examples of what is meant by economic instruments. Policy makers can use these economic instruments to achieve certain goals. For example, the price consumers pay for water can be raised in order to stimulate conservation. In order to compare the efficiency of economic instruments, one needs to consider market and non-market values. Non-market values refer to those goods that are not traditionally exchanged in a market setting. Traditionally the non-market component has been left out.

(2) One participant feels that regulation is not an example of what is meant by economic instruments. Pricing and transferable rights are economic instruments. Because of peculiar characteristics of water, their application is usually (or must be) accompanied by regulation, but regulation itself is not an economic instrument.

B.4. Statement:

- **Both economic and non-economic instruments should be considered for solving problems related to "value". Their relative efficiency should be explored.**

B.4. Discussion: Because overall valuation is more than economic value, we need to consider issues that are beyond the realm of economics. This area can be quite large.

B.5. Statements:

- **Economic valuation has its limitations, but economics works well within an agreed upon framework.**
- **Economic valuation is one tool for measuring if a goal is reached.**
- **Valuation, as part of a planning process, is a mechanism for reaching a goal.**

B.5. Discussion: Economics is useful tool, and within limits, economics is one (not the!) tool for evaluation of goals. Also, as part of the planning process, economic instruments may be evaluated and selected as a means of achieving the goal. These notions were generally accepted. The third point focused upon what else valuation is in and of itself. There is a temporal aspect to this that can be forward-looking or retrospective. In the process of setting goals and making plans, a variety of valuation methods can be used. A general class of valuation methods allows decision makers to see the trade-offs between different potential goals before the goal is set, both in a qualitative and quantitative framework. This allows them to discern what specifically is the best thing to do. It was noted that valuation methods also can be used retrospectively to determine whether the goals have been reached.

C. Issues and Limitations of Valuation

Throughout the meeting considerable discussion occurred about the uses and limitations of valuation. Uncertainty in valuation increases when data is of poor quality and when we do not have complete understanding of the processes involved. Valuation methodologies also have their limitations. The statements and discussion below reflect these concerns.

C.1. Statement:

- **Keep it simple.**

C.1. Discussion: This theme occurred at many points over the two days of discussion.

(1) Often discussions of value and valuation use technical language. Care needs to be taken to insure information communicated is at a level understandable by the intended audience. Simple language may be needed.

(2) Valuation has to be a practical tool. Some countries in this hemisphere are at the very initial steps of applying economic instruments to these problems. Some institutions in the area may not implement the instruments if they are too complex. Even though many economic instruments are complex, many are also uncomplicated. People should be encouraged to start using them. For example, if we charge someone 10X what they are paying for water they will change their behavior. We need to start with the simple solutions we know we can implement. That does not mean we should ignore the more complicated problems and solutions.

(3) The objective of policy is to change behavior. Decision makers should not overestimate what an economic instrument can achieve. For example, they need to recognize that economic instruments are not good for some things like economic inequities. They should also pay attention to the conditions needed for the application of economic instruments and to compare their effectiveness to that of other management options or instruments. They need to get down to earth. Economic valuation can be very useful for improving the use and management of water resources. It can be kept simple.

C.2. Statement:

- **Scientific data and analysis are uncertain/imprecise because of the complexity of natural and human systems.**

C.2. Discussion: Scientific models are simplifications of reality. They generally fail to capture the complexity and interrelationships within a hydrologic system. For example, models can be developed to answer scientific and engineering questions related to surface and groundwater flows. Because the goal of these models is water movement, they may not provide information decision makers need to solve policy problems unrelated to water movement.

C.3. Statement:

- **Data interpretation is not absolute. It may depend on who analyzes it and for what purpose**.

C.3. Discussion: Often data are scarce or inaccurate. Interpretation may be limited to a "best guess". Even when data are plentiful, different interpretations are possible. Experts in the field may use different analytic techniques and arrive at different answers. Different techniques may be designed to achieve different purposes. In addition, analytic techniques may improve over time allowing for more accurate analyses.

C.4. Statement:

- **The lack of scientific information should not be used as an excuse not to do valuation.**

C.4. Discussion: Although water valuation is an imperfect process, it does have benefits. Lack of scientific information creates a degree of uncertainty in any results produced by analysis. However, it is better to use the information available rather than do nothing.

C.5. Statement:

- **Economics is only as good as the biophysical and institutional frameworks.**

C.5. Discussion: To the extent that biophysical models and institutional frameworks have uncertainty or lack of precision, then the economics used to evaluate goals or conduct analysis will also embody that uncertainty and/or imprecision.

C.6. Statement:

- **Economic instruments are useful, but at some point laws may be needed.**

C.6. Discussion: There is disagreement on this statement.

(1) The usefulness of economic instruments may be limited by their institutional setting, but usefulness may be improved if the setting is changed. For example, by creating legal definitions for property rights, the usefulness of markets can be improved. In other instances, a resource may be considered so important that legal prohibitions are preferable for their protection.

(2) Laws are always needed, and economic instruments (or any other instruments) cannot be used without adequate legal framework. Rather than an either/or question, this mainly refers to determining the composition of an adequate mix of command-and-control and economic instruments with the emphasis, as far as water is concerned, on the former with the latter playing a useful but largely complementary role.

D. Valuation and Thresholds

A society often feels that some resources are intrinsically valuable or that the provision of some resources is so important the resource should not be reduced below certain threshold levels. The value (importance) assigned to these resources is a statement of that society's preferences. The costs of these preferences can to some extent be determined. Costs include both the notion of keeping the resource at some threshold level and the cost of allowing the resource to go below that level.

The idea of thresholds or safe minimum standards for both biophysical and human needs allows for an analysis of whether the risk of loss is intolerably costly or not. In the case of endangered species, this might result in society deciding that the costs are too high to maintain the species. In the case of human needs for safe drinking water, the decision might be that the costs must be borne to reach some minimum level.

D.1. Statements:

- **Water is a basic human need.**
- **Water should not be priced so high the poor get shut out.**

D.1. Discussion: At various times the group discussed the importance of water to humans. Although agreement was not reached on whether water is a basic human right, there was agreement that life was not possible without it.

(1) Safe minimum standards include the amount of water needed for survival. Many in the group had strong feelings that provision of the volume needed for survival was a basic right. Many in the group also felt the amount needed for survival should be provided at an affordable price.

(2) The safe minimum requirement of water for each human being has an infinite value. Identify the safe minimum requirement and take it out of the normal allocation system.

(3) If economic institutions could solve everything, we would not be here. Markets fail. Do we want a market for water or a hybrid system? Some people do not have clean water. This may not be a human right but a basic right. The market will not allocate for a safe minimum standard. Therefore, we need to consider the mix of rules and regulations needed. Certain things need to be taken off the table.

(4) Is access to water a human right? People are losing access to water required for basic needs. We need to protect a sustainable water supply for those needs. Public institutions are failing in their obligations in these areas. Access to water is a political decision. The market will not solve this problem.

D.2. Statement:

- **Safe minimum standards and requirements are uncertain and dynamic.**

D.2. Discussion: The discussion was aimed at the basis for determining safe minimum standards for ecosystems and human health. Part of the basis for the standard concerns the biophysical requirements for ecosystem and human survival. Beyond this bare minimum, societies can raise the standard to improve the quality of life. Agreement was reached that the standards are uncertain and dynamic regardless of the basis.

(1) Safe minimum standards for ecosystem protection or human health may change with time. What is considered acceptable at one point in time may change with additional research. As a result a degree of uncertainty always exists in their use. Even within a given country health standards are not absolute. For example, scientists may find that people can tolerate more arsenic than was once thought. Standards change with time as we get more information and get better at measuring and understanding things and processes. Standards also change as circumstances and our preferences change.

(2) Safe minimum standards cannot be used alone. They are part of a much broader process. Norms are different in every country. For example, health standards are not uniform across the region.

(3) Safe minimum standards can be based on biophysical needs. For example, how many whales do we need to maintain a viable whale population? The answer is uncertain. This is more of a biophysical answer than a preference answer. Learning more narrows the uncertainty gap.

(4) Safe minimum standards depend in part on the context used to define the standard. What are you looking for in the safe standard? Is it for determining the ecological equilibrium of a population or is it for basic human needs. For each of these a completely different approach may be needed for the same safe minimum standard.

(5) Safe minimum standard is a decision-making tool. Safe minimum standards may be a preferred analysis over cost benefit analysis in decision making.

D.2. Statement:

- **Critical and unique resources should be identified and priorities established.**

D.2. Discussion: Resources in this instance are broadly defined. Resources include ecosystems and parts of ecosystems. Critical resources are those resources society feels deserve some degree of protection. For example, an endangered species or the water quality of a stream could be considered critical resources. Unique resources are resources that are limited in number. Society may desire to protect them because they are rare. Examples include the Grand Canyon and Iguacu Falls.

(1) You cannot protect something and not change anything. When changes are made something else is impacted. We live in an interrelated system. Because of that, we need to set priorities for those resources we desire to protect. Not all resources will be viewed equally.

(2) The precautionary principle can be used to help identify resources in need of protection and the level of protection they need. Sometimes resources have heavy use and scientists do not understand the potential consequences of the use. The consequences could lead to a total loss of the resource, a significant reduction in its availability, or even no harm. The precautionary principle is based on the idea that use may need to be curtailed because the consequences of the use are unknown or uncertain. Unwanted consequences can result from the uncertainty. As a result decisions should err on the side of caution.

(3) The concept of irreversibility is related. If a particular use depletes a resource below a certain threshold, the resource may be lost. For example, the number of animals in a species may be reduced to a point that recovery of the population is impossible.

(4) Decision makers need be realistic. Not everything is equal, and importance will vary with different circumstances. Decision makers need to identify and set priorities. Not everything will be protected equally.

(5) Unique resources may be viewed as so important they take precedence over all other potential uses. For unique resources, minimum standards may need to be looked at in a different light if society's preference is protection at any cost.

D.3. Statement:

- **"Safe minimum standards" is a useful tool in determining the level of protection needed for critical and unique resources.**

D.3. Discussion: Safe minimum standards are a biophysical and behavioral concept.

(1) Safe minimum standards from a biophysical perspective include a number of concepts such as the precautionary principle and irreversibility mentioned above. Related concepts include "stress line" and "resilience". All these concepts relate to biophysical measurements of environmental or human health.

(2) Although everyone could agree that safe minimum standards have a biophysical component, there was less consensus over whether safe minimum standards have a behavioral component or how that behavioral component functions. The behavioral component is related to the idea that standards are based in part on societal preferences and are not solely attached to "science". The idea of species survivability illustrates this point. If all resources are considered equal, then "science" can guide us to what is needed to optimize conditions for each species. However, choices related to a single species may not be beneficial to an entire ecosystem.

If a choice is made to enhance conditions for one species, another species may be harmed by the same choice. Not all species will benefit equally from a single management option. Because management options do not provide uniform benefits for all resources, critical and unique resources need to be identified. Once identified, the level of protection needed for the resource can be determined. In setting the level of protection needed for a resource, the impacts different management choices have on other resources can be examined. Trade-offs may need to be made in any protection scheme. Greater protection should be provided to critical and unique resources because society has decided they are important.

D.4. Statement:

- **Critical human needs should be identified and priorities established.**

D.4. Discussion: Critical human needs include such things as respect for culture, provision of adequate safe drinking water, and provision of adequate health care. As a minimum, critical human needs include those things needed for life. Beyond that, critical human needs are those aspects of human well being society feels deserve some degree of protection. From a cultural point of view, this could include freedom of religion or a belief in the sanctity of water.

(1) Providing for basic/critical human needs has impacts on both human and environmental systems. Because we live in an interrelated system, human needs cannot be provided for without changing something. However, basic or critical human needs can be provided for in many ways. The different ways of providing for those needs will have different impacts on the environment and on other people. Priorities need to be set for the potential solutions based on the impacts of the solution and the degree to which human needs are satisfied. Not all cultures will prefer the same solution. As a result, societal choices will have different impacts.

(2) The precautionary principle used above can also be used for human needs. Scientific standards for human needs are not completely known. For example, we do not know what level of arsenic in drinking water is safe for human health. As a result, the standard chosen should reflect this scientific uncertainty.

(3) In making choices to provide for human needs, impacts will occur to the environment and to other people. In determining the preferred solutions, consideration must also be given to what is needed to provide for basic human survival and what is needed for survival with dignity. Choices related to human survival may ignore impacts on the environment and elsewhere. Choices that go beyond that survival need to examine the tradeoffs between the added benefits to humans and the impacts of the choice.

D.5. Statement:

- **Safe minimum requirements (levels) should be determined for human needs.**

D.5. Discussion: Safe minimum standards for humans include both the biophysical and cultural needs of humans. Biophysical standards relate to the minimum needed for human survival and to the level needed for a healthy population. Many different choices exist on how human health standards can be met. These choices may have different costs, have different levels of protection, and have different impacts.
The level chosen must take these other items into account. Safe minimum levels for other human needs are more amorphous and reflect to a large extent societal preferences, priorities, and interpretations.

D.6. Statement:

- **Based on the "precautionary principle" and the "risk of irreversible changes", the lack of scientific or accurate data should not be used as an excuse to postpone actions directed toward watershed health.**

D.6. Discussion: Although there is general agreement on the statement, one participant felt that limiting this to "watershed health" was too narrow.

(1) Even though we do not have all data or the solutions to a problem, both humans and resources require protection. To do nothing may lead to permanent loss of resources or to loss of human life. Action needs to be taken to protect these identified preferences regardless of the knowledge base. Action should not be postponed.

(2) One participant has suggested that the term watershed health is too narrow and would substitute the words "resolution of critical problems" or "improvement of water management and use." The change should also be made in E.7.

E. The Planning Process and Valuation

Valuation is part, not all, of the planning process. The planning process needs to consider elements of resource allocation that are not captured by economics. Planning involves issues of social equity, ecosystem sustainability, economic efficiency and other things. In the planning process, trade-offs must be considered between different types of goals. Setting a goal that improves social equity may require a reduced goal for ecosystem sustainability. For example, the goal of increased agricultural productivity may require land to be cleared reducing critical habitat for species. Not everyone will agree on the value (importance) of these different goals. People have different preferences. The planning process needs to consider and evaluate these "differing views". Economic valuation and other forms of valuation can be used in the assessment of these differing views.

E.1. Statement:

- **The planning process is a way of prioritizing goals, which include but are not limited to 1. enhancement of social equity; 2. ecosystem sustainability; and 3. economic efficiency.**

E.1. Discussion: In the planning process goals are set to achieve economic efficiency, ecosystem sustainability, and enhanced social equity. Economic valuation is used as part of this planning process.

In the course of using economic valuation methods, decision makers should not only concern themselves with economic efficiency, but also with enhancement of social equity and ecosystem sustainability. Valuation goes beyond economic valuation. Valuation can be used to help set the goals and to measure whether the goals are achieved. Enhancing social equity by supplying the minimum amount of safe drinking water needed for human survival can be an important goal. Achieving that goal can have environmental impacts or costs. Valuation can be used to provide decision makers information about those impacts and costs.

E.2. Statement:

- **The planning process needs to approach water management systems from an integrated land, water, and human vision.**

E.2. Discussion: Because the management of water cannot be separated from the management of land and other related resources, an integrated management approach is needed which should be carried out at the river basin level. Economic, social, ethical, and environmental factors must also be considered. These and other human considerations are part of an integrated approach. An integrated vision needs to be as broad as possible in order to integrate all these elements in the planning process.

E.3. Statement:

- **All management options, including economic instruments, should be identified and evaluated in order to determine what their potential is for achieving or reviewing the goals specified in a plan.**

E.3. Discussion: In the planning process there are many ways of reaching a goal. Many methods are available including economic instruments. As part of the planning process all potential methods for achieving a goal should be identified. They should then be evaluated to determine their potential for success, their effectiveness in relation to other management options, the conditions needed for their application, their acceptance by stakeholders, and the impacts of their use.

E.4. Statement:

- **Economic and other analyses used in the planning process require detailed and reliable data/information that are acceptable to all parties involved. The data/information and results of analyses must be made available to all interested parties.**

E.4. Discussion: Not everyone agreed that a consensus must be reached on the data, but others were adamant about it.

(1) This statement applies not only to the valuation process but to any analysis used in planning. Data and information that are not considered scientific data are also included. The data/information should be as detailed as possible and an assessment of reliability should be made. Both the data/information and the results of any analysis must be disseminated to all stakeholders. Parties complaining about the data or the methodology used in the analysis must be given an opportunity to express their concerns. In some cases a party may complain the data are unreliable because the other party collected it. They may disagree on the methodology used. Reaching an agreement is one step in the planning process and should be a goal of the process. If agreement can be reached on the reliability of data/information and the methodology used for analysis, the planning process will be much smoother. Having people buy-in to the data source, methodology used, and data reliability is essential to the planning process. Many in the group were insistent there must be agreement.

(2) In principle agreement is very desirable, but as a practical matter that may not be possible. Within some institutional structures problems may occur if consensus is required or there are mechanisms for challenging the data used in the planning process. If parties do not agree on data/information reliability or methodologies used for analysis, then the planning process may end in a legal or political forum where the dispute may be resolved arbitrarily and undesirably. This occurs in part because the decisions made on the basis of data and methodology affect interests of the parties involved, so one should not really expect that the parties would be objective/neutral in their judgement/selection of data and methodology. Experience suggests that consensus/agreements can often be reached only if the parties concerned know that if they do not reach them then a decision will be imposed by someone else. There are many cases in the countries of the region, as well as elsewhere, in which the decision-making process was rendered ineffective because one party, understanding that its interests will be affected, stalled the process by challenging the data, the methodology or something else.

E.5. Statement:

- **Valuing water is a dynamic process, not an activity.**

E.5. Discussion: Valuing water has a temporal aspect. An activity is a one-time event while processes take place over time. If "valuing water" is looked on as a way of showing people the importance of water, then a continuing process is needed.

The continuing process is needed because conditions, preferences and our knowledge base change, and hence the value of water itself also changes. Valuing water is also part of the planning process. As we plan, individuals become more knowledgeable as to what the issues are and preferences change. More people are involved in planing processes today because of public participation requirements and broad interpretations of who the stakeholders are. As more individuals and groups are brought into the process, the underlying value of water potentially changes as a result of changing preferences. Often when water valuation is done in relation to some project, the people commissioning the valuation study look on this as a one-time event. However, this is really an open-ended process.

E.6. Statement:

- **Equity in water use includes both people and the environment.**

E.6. Discussion: In the planning process equity in water allocation and use is often a goal. The way water is allocated affects water quality and the ability of others to use the resource. Because fresh water is a finite and vulnerable resource, satisfying all needs is generally not possible. Because the same molecule of water may be used and reused as it passes through the hydrologic cycle, it is essential to encourage multiple use of water resources and adopt a multi-sectoral approach to water resources management. In the planning process the needs of both humans and the environment must be considered. Valuation methods can be used to look at the trade-offs between human use and environmental needs in the allocation and use of water.

E.7. Statement:

- **Monitoring methods should be developed to measure progress or failure of actions/policies in relation to watershed health.**

E.7. Discussion: Measuring the success of the planning process is important. Were the established goals reached? Monitoring methods need to be developed to determine if the methods used to achieve the goal of watershed health are met. The results can then be fed into the next step in the planning process. (Also see comments in D.6 with regard to watershed health).

E.8. Statement:

- **The plan is not the end of the process. Plans need to be translated into action.**

E.8 Discussion: The group was concerned with failure to implement plans. Discussion on this occurred on many occasions.

(1) Making a plan is not the end goal. The planning process should identify the goals and determine the best methods for achieving the goals. The methods selected need to be implementable and implemented.

(2) In order to implement plans stakeholders need to be involved in the process. When plans are top down and government directed, implementation may be resisted and the planning process may be rejected. People have to understand the different components of a plan in order to accept them. If they have not been involved in the process, it is more difficult to understand the plan. Participation is also an important source of information for the planning/decision-making process and helps improve the quality of plans/decisions.

(3) Many people have the perception that development takes precedence over plans. For this and other reasons some people conclude that the planning instrument is not very good.

(4) Planning is essential to ensure multiple use of water resources as well as the integration of water management with the management of other resources. It is also needed to ensure that water use is optimized not only in the short term but also the long term.

F. The Role of Stakeholders

Stakeholders are an important component in the valuation process. Stakeholder preferences in how water should be managed should be part of the planning and decision process. Water management systems that do not consider stakeholder views lack legitimacy. Participation must be meaningful. This includes at the minimum: notice to those affected; provision of all interested parties with the information they need to formulate their views; an opportunity to be heard and present evidence before the decision is made; rational standards for decision; and a public announcement and publication of the decision with its rationale.

F.1. Statement:

- **Water management systems should be democratized.**

F.1. Discussion: Stakeholders, defined in the broadest possible sense, need a voice in the planning and decision making process for water management. Management should involve stakeholders.

F.2. Statement:

- **Legitimacy requires stakeholder participation in all phases of decisions.**

F.2. Discussion: Decisions that ignore stakeholder input or do not allow it lack legitimacy. Arbitrary decisions made by government or managers can meet with public resistance. A process that allows and considers stakeholder input gains greater public acceptance. Participation is also an important source of information for the planning/decision-making process and helps improve the quality of plans/decisions.

F.3. Statement:

- **Stakeholder interests should be considered in the water valuation process.**

F.3. Discussion: This concept is not really stakeholder involvement in the sense of stakeholders being active in the process. During planning, when water valuation methods are being used, information about the stakeholders needs to be considered. This includes social structure, preferences and other items.

F.3. Statements:

- **The impact of decisions on local interests should be carefully considered.**
- **Decision making with regard to water resources should be decentralized.**

F.3. Discussion: Considerable discussion occurred on whether the decision-making process should be decentralized. Part of the concern was that local interests are sometimes ignored when decisions are made. Decentralization would put decision-making power in the hands of those local interests.

(1) Not everyone agreed that local interests were the most relevant level for decision makers. Stakeholders may exist at the national and international level as well as local. Local interests may not represent this broader public interest and may be less sensitive to environmental values held by a majority of the population. Although no consensus was reached on the proper level of government to make decisions, the needs of local interests were recognized as important. All decisions made should consider the impacts of the decision on local interests.

(2) Local participation should be part of planning, but often there are time and budget constraints. Therefore, from a practical perspective it is not always possible.

(3) Local governments need to be strengthened because they have the final say on land use in many countries. Land use is directly related to water quantity and quality. However, local governments often do not have the tools to plan for or control land use. In addition, priorities at the local and national level may differ. Differences in priorities are acceptable if legal jurisdiction over land use activities is clearly defined.

(4) It is essential to break with the pattern of paternalistic centralization which characterizes government action in several countries. It prevents society from organizing to manage water resources, making it impossible to implement plans. This may be the greatest obstacle to implementation.

G. The Role of Capacity Building in Valuation

Capacity building is important to both concepts of water value. People need to be taught the value (importance) of water and how their use of water affects water quality and quantity. Decision makers also need to learn how to use methods for measuring the economic value of water. Capacity building is needed for water management. Trained professionals are needed for valuing water. Public awareness is needed for using water wisely.

G.1. Statements:

- **Capacity building is part of the process of valuing water.**
- **Capacity building is a requirement for effectively using water valuation.**

G.1. Discussion: Capacity building includes public education, user education/awareness, and technical capacity building. Capacity building is a requirement for effectively using water valuation methods. Capacity building is needed because people do not know how to use valuation methods. Trained professionals are needed to do this within an institutional setting (institutional strengthening). Water users also need to understand the value of the water they use (public awareness). Capacity building is needed for water management. Trained professionals are needed for valuing water. Public awareness is needed for using water wisely.

G.2. Statements:

- **Water valuation can be used to help raise public awareness.**
- **The results obtained from using water valuation methods can be used to educate the public.**

G.2. Discussion: The results from water valuation studies can be used to educate the public about many water related issues. In order for the public to accept the results, they must have confidence in the methodology used in the valuation process. They must also have confidence in the persons doing the valuation and the process used. One way to build this confidence is through stakeholder involvement in the process. Viable and accessible information needs to be provided. As part of education and raising public awareness, water users need to learn how to use water efficiently. Efficient and innovative technologies should be stressed in the education process.

H. Property Rights

Property rights include formal rights established by law, which include documentation related to title or ownership and informal "rights" or "expectations" associated with actual practice or use. These may not have the same formality as other "rights" but nevertheless may create expectations on the user's part. In addition to formal and informal rights, a particular use may be public or private depending on how it is defined.

For example, the general public may be allowed to use a river for white water rafting without a formal permit. This informal public right is shared equally by all users. If use intensifies, a government agency may regulate use and require permits. The regulatory action gives the right a degree of formality and may limit the public's use of the river. If the number of permits allowed is fixed at a small number and the permits can be traded, a market for the permits could develop giving the permits a "private" property aspect. As this example shows, drawing a distinction between public water rights and private water rights is sometimes hard to do. However, distinguishing between the two kinds of rights is important. Whatever the right, it should be clearly defined. Although rights should be clearly defined, they seldom are. Value and valuation depend on how property rights are defined. Economics is an outcome of the property rights system.

H.1. Statement:

- **The hydrologic cycle makes it difficult to establish exclusive water rights.**

H.1. Discussion: Because water is a mobile resource, many management problems are created that require legal resolution. As water moves through the hydrologic cycle, it can be used by multiple people in succession. For example, water can be used to generate electricity, and at another time and place, the same water can be used by a farmer to irrigate corn. Such uses alter the hydrologic cycle and modify the environment. Because the same drop of water can be reused many times by humans and is also needed to maintain environmental integrity, conflicts between different uses are frequent. Water law attempts to resolve these conflicts by encouraging desirable uses and discouraging undesirable ones. Uses are encouraged or discouraged by establishing water rights and through the exercise of government regulatory power.

H.2. Statement:

- **Differences between public and private rights need to be determined and defined.**

H.2. Discussion: Most countries have some kind of mix between public and private water rights. Even in those places where the government has absolute control over water, private rights to use water may be established through a contract.

(1) Public water rights are sometimes discussed under the idea of "public interest" rights, and they may not be well defined. The "public interest" has two interrelated aspects. The general public may have rights to use water in place, and governments can control the way water is used in order to benefit the public. Even when governments claim ownership or absolute control over water, they have a duty to manage water to benefit the public. Swimming, fishing, canoeing, and commercial navigation are examples of the public's right to use water in place. These public rights let members of the general public use water for the specified purpose. The government ("public") can also control the way water is used through such things as public works projects that can significantly impact water use.

Other government controls are more regulatory in nature and include environmental protection, water quality improvement, and hydropower regulation among other things. These government controls may be within the authority of multiple levels of government which can lead to conflicting uses. Also, these public assertions of power or control can conflict with private rights. As societal values change, shifts in the role of public and private rights can occur.

(2) Private rights systems allocate water to individuals for their use. Private rights may conflict with public rights to recreation and environmental protection. A private right implies that individuals have a degree of temporal exclusivity in the use of water. Private rights systems often ignore the fact that the same molecule of water is often used sequentially by many users as it passes through the hydrologic cycle. A water allocation system which does not take this fact into consideration cannot promote multiple use and full utilization of water resources while protecting the right of all water users to continue using water in the same manner as before. For this and other reasons, transfers of private water rights are usually regulated.

(3) Water rights are relational and take on meaning when the exercise of one right conflicts with the exercise of other rights. In addition, water rights are almost never exclusive. This need to share water results in conflicts between individuals who have private rights, between an individual with private rights and people with public rights. Water law is used to resolve conflicts between different claimants by determining the rights and obligations of each party in a dispute.

H.3. Statement:

- **Different economic instruments may be used in reaching a goal depending on the goal and whether the right is public or private.**

H.3. Discussion: If the goal is to create a system for reassigning the way water is used, several solutions may be possible. The solution chosen will depend on the objectives that the allocation system should achieve, and the range of available management options will depend on whether the use is controlled by a private right or a public right. For example, markets can be an efficient way for reassigning private rights assuming certain elements are also present. These elements include well-defined water rights and an oversight/regulation system which ensures that transfers of private water rights do not negatively affect other water uses and users, the environment, and the public interest in general. Obviously, the extent to which markets can encourage efficient water allocation depends upon the extent to which the characteristics of the market approximate those of a perfectly competitive market. Experience with water markets in the real world indicates that they diverge significantly from the competitive paradigm. If the water right is "public," then regulation may be a more appropriate method. Valuation methods can be useful in determining which instrument should be used.

H.4. Statement:

- **Goals for public and private water use may conflict.**

H.4. Discussion: Because water is mobile and ultimately in limited supply in most locations, satisfying all potential public and private goals for the use of water is often impossible. This means that choices have to be made. As part of the planning process preferences can be identified, and valuation methods can be used to evaluate different preferences. Trade-offs between public and private goals need to be considered. They are often mutually incompatible. How the goals are reached or how the preferences are evaluated depends in part on how water rights are defined.

H.5. Statement:

- **Property rights need to be clearly defined.**

H.5. Discussion: Property rights need to be clearly defined in order to distinguish between public and private water rights. Water rights need to be clearly defined before valuation can occur. Water rights need to be clearly defined in order to identify appropriate instruments to be used in the planning process and in plan implementation. Water rights need to be clearly defined before markets can operate. Unfortunately water rights are not always clearly defined. This can create significant problems in water valuation. The elements of the right should also be defined. Does it include a specific volume of water, is the place of use restricted, must the use occur at specified times, or is the way the water is used limited?

H.6. Statement:

- **Water rights need to be recorded so that the rights are protected and the elements are known.**

H.6. Discussion: If water rights are registered or recorded, conflicts may be avoided.

(1) Decision makers and water users need to know how much water is being used and who has rights to it. Other elements of the right may also be important to know such as restrictions on place, time, or way of use.

(2) A water right needs to be well defined and adequately registered/recorded in order to be protected. All water rights in a river basin or other water system are usually hydrologically interconnected to some degree. This means that in order to promote multiple use of water resources and protect the right of all water users to continue using water in the same manner as before, it is essential to define water rights in all their relevant characteristics and to enforce their use according to these characteristics.

The degree to which a more detailed definition of water rights should be adopted depends on various factors, particularly on the degree to which the system is interconnected, on the degree to which multiple use of water resources is important, and on the degree to which water rights of some users or some water uses depend on return flows.

H.7. Statement:

- **A system needs to be developed that will allow water use and water rights to change.**

H.7. Discussion: Water uses should not be locked in place forever. Systems need to be developed that allow for changes in use. Changes in use generally mean a change in the water right since "use" is one of the defining elements of a right. Methods developed for changing uses must consider the property rights structure. For example, markets are one way changes in private rights can be made.

Markets require clearly defined property rights. If economic efficiency, social equity and environmental protection are the goals, then water markets also need an effective regulatory system to ensure that transfers of water rights do not harm other water uses and users, the environment and the society in general.

H.8 Statement:

- **Property rights in water are less secure or less clear when there are problems with enforcement or enforceability.**

H.8. Discussion: In addition to looking at property rights as private or public, enforcement and enforceability of rights must be examined. For example, if a permit is required for using water but no one is ever asked to prove they have it, enforcement is missing. On the other hand if the place of use is so isolated that it is impossible to monitor the users, enforceability is missing. All these are aspects of property rights institutions and are at the heart of how resources are used.