

## Abstract

*Population growth, growing food and energy demand, changing climate, water shortages – great challenges for society. Water resources management also needs to become more resilient in order to adapt. This article offers a new way of looking at water related problems. The special approach of integral water management (not to be mistaken for integrated water management) shows hidden linkages behind water related processes. Water problems are human problems and are not to be solved without understanding the human factor behind. This way cause and effect becomes clearer and the wider understanding offers a higher opportunity to find the right solutions.*

## Keywords

*integral water management · value driven measures · integrated technical and philosophical aspects*

## 1 Introduction

### 1.1 What the word integral means in water management

For industrialized and urbanized river basins the achievement of good qualitative and quantitative status of all water bodies by 2015 - as main goal of the Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 - depends on many factors. Such as the future landscaping measures that are necessitated by climate change [2] or any other influences. However as landscaping measures are human induced actions, good water status depends on human choices.

Water management should fulfill the needs of society. These needs differ between one social value system to another and the choices made for landscaping measures also depend on these needs. Value systems shall therefore be handled as main indicators for water management. More focus is to be added on what these human needs are, how they change in time, and what they are based on. Drivers as traditions, education and other human factors shall be mapped and defined. Integral water management offers a methodology for that purpose.

Integral water management analyzes the human factor of water related problems and applies integrated water management techniques.

### 1.2 Integral vs. integrated water management

In 2002 the Technical Advisory Committee of the Global Water Partnership defined integrated water resources management at the Johannesburg World Summit on Sustainable Development “as a process, which promotes the coordinated development and management of water, land and related resources in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems,” and said that water should be managed under the principles of good governance, public participation, and in a basin-wide context.

In order to maximize social welfare and to successfully use the principle of public participation, the needs and values of society must be understood. Although integrated water management highlights the importance of these interior aspects, it doesn't try to map, analyze and respond to those. Integral water

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management aims to fill this gap: the needs of society that are to be fulfilled are being mapped in four quadrants using Integral theory by Ken Wilber [3] [6]:

The four quadrants cover four different groups of needs at three levels (physiosphere, biosphere, noosphere):

- Upper right (UR): Individual, objective needs (e.g. at level of biosphere: high life-expectancy)
- Upper left (UL): Individual, subjective needs (e.g. at level of noosphere: high life-satisfaction and well-being)
- Lower left (LL): Collective subjective needs (e.g. at level of noosphere: acceptance of different value systems, peace)
- Lower right (LR): Collective, objective needs (e.g. at level of noosphere: Social equity (uniform distribution); Economic efficiency (Pareto efficiency); and Ecological sustainability)

*Integrated* water management only focuses on two of the quadrants:

- (UR) Individual, objective needs – good physical, chemical, biological status of river systems (e.g. good water quality)
- (LR) Collective, objective needs – economic (e.g. sustainable water management) social and legal (e.g. WFD stakeholder involvement) sustainability

Whereas *Integral* water management further includes the other two quadrants that focus on the human aspect that are mapped by the subjective quadrants:

- (UL) Individual, subjective needs - psychological aspects (e.g. subjective well-being)
- (LL) Collective subjective needs - ethical aspects (e.g. peaceful cooperation between different cultures of upstream and downstream countries)

According to Figure 1 - integral water management can be defined as a concept that works with the physical, chemical, biological, ecological, but also the economic, social, legal, and cultural aspects of water systems. These relate to different human values and needs such as access to safe water, water justice, well-being; etc.

### 1.3 Value systems and integral water management

Human needs that strongly form water management can be grouped to different value systems. The psychosocial developmental model by Clare W. Graves [5] [9] is a widely used and practical classification model of emerging value systems. Graves identified eight major value systems that can be described by life conditions and the brain's coping conditions with them. The eight levels of existence are: A-N Automatic; B-O Autistic, C-P Egocentric, D-Q Absolutistic, E-R Multiplistic, F-S Relativistic, G-T Systemic, and the H-U Differential level. 'A' stands for the neurological system in the brain upon which

the psychological system is based. 'N' stands for the existential problems that can be coped with the 'A' neurological system. The different states arise and come to stage center in man's mind as each successive set of human problems are resolved. Using Graves' model we have formed a developmental model of human needs and ethical values in social systems which is useable to simulate optional adaptation strategies to water challenges [4]:

In the next chapter the application of emerging value systems model in scenario methodology will be presented. It shows how the shifts in value systems provide a guide for selecting and positioning specific landscaping measures.

## 2 Integral water management practice in Europe

### 2.1 Value-driven scenarios on the geomorphology and ecology of lower Rhine floodplains

Within the cooperation of the Utrecht University and another research institution [10] the great potential for the application of psychosocial developmental models in river management is illustrated. The study presents a new methodology of developing and evaluating scenarios for river management strategies by integrating psychology and sociology with ecology and geomorphology.

Translation of the psychosocial model-based scenarios into specific spatial layouts of landscaping measures was done [10] by a workshop that brought ten experts together with backgrounds in ecology, hydraulics, cyclic floodplain rejuvenation, transition management, integrated river management and geomorphology. The workshop participants were given a presentation to clarify the mindset of people living according to different value systems (Table 1). Subsequently, the participants agreed upon landscaping measures (Table 2) representative for three respective value systems out of Graves' eight major value systems.

They stated that the current dominant value system in the Netherlands, with its consensual attitude and attention for ecology and landscape diversity, can be considered Systemic (F-S) [10]. Hence, a Systemic value system provided the logical starting point for the scenarios. Starting from there, they have proposed three different scenarios that are likely given the possible dynamics in value systems in relation to the time horizon of 2050. The scenarios are the following:

- 1 F-S: strengthening of the Relativistic value system
- 2 E-R: shifting to lower level Multiplistic value system
- 3 G-T: shifting to higher level Systemic value system

The Multiplistic value system was oriented towards low costs, blue print, being engineering-dominated, water follows function, and low hydrodynamic roughness. The Relativistic value system was translated into landscaping measures that could be the result of consensus finding, equality between different groups, 'grass roots', and natural design. The landscaping measures for the Systemic scenario had to display adaptation of incorporating novel techniques, a big picture view, natural design,

**Tab. 1.** Emerging value systems and needs

<b>Für-Ijjas levels</b>	<b>Main needs</b>	<b>Life conditions</b>	<b>Coping tools</b>
Surviving individuals	biophysical needs	N - State of nature, biological urges and drives: physical senses dictate the state of being	A - Instinctive: natural instincts and reflexes direct; automatic existence
Superstitious clans/tribes	temporary security within group	O - Threatening and full of mysterious powers and spirits that must be placated and appeased	B - Animistic: according to tradition and ritual ways of the group/tribe
Egocentric warriors	individual security	P - The world is a jungle where the strong prevail and the weak serve. Nature is to be conquered.	C – Egocentric: ego wants dominance, conquest and power; exploitive, aggressive
Conformist groups	long term safety within group	Q - Higher authority punishes bad behavior but rewards good work.	D- Absolutistic: obedient, conforming; conservative, hierarchic, driven by guilt
Creative hedonists	long term individual safety, mental, behavioral independence	R - The environment is full of resources; the world is full of possibilities.	E – Multiplistic: pragmatic to achieve results; testing options, rational, modern, effective, selfish, arrogant, creative
Communities of human beings	long term individual safety within group, emotional freedom	S - Humanity is living in a habitat wherein people can find love and purpose through affiliation and sharing.	F – Relativistic: responding to human needs, affiliative, consensual, fluid, accepting, less efficient
System-thinking humans	finding and realizing self-worth	T - The world is a chaotic organism where change is the norm and uncertainty is an acceptable state of being.	G – Systemic: functional, integrative, interdependent, existential, flexible, questioning, needs more time for complexity
Holistic communities of human beings	finding and realizing self-worth within holistic system	U – A delicately balanced system of interlocking forces in jeopardy at humanities hands	H - Holistic: experiential: transpersonal; collective consciousness; collaborative; interconnected

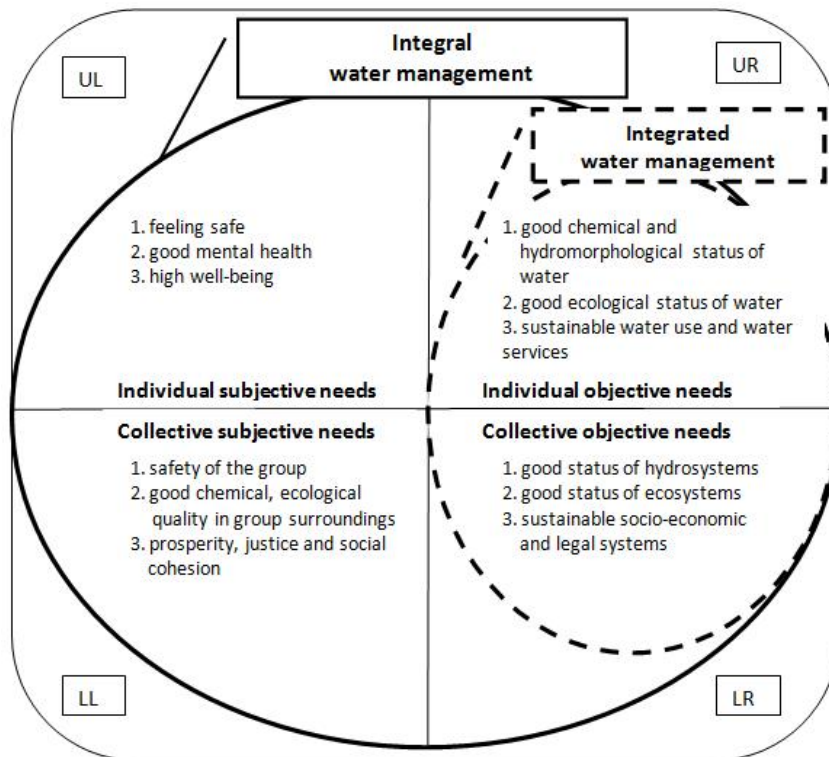


Fig. 1. Integral water management vs. integrated water management

Tab. 2. Systemic, Multiplistic and Absolutistic river management scenarios [10]

Value system	River management	Implementation
<p>E-R Multiplistic</p> <ul style="list-style-type: none"> <li>• Conquering the physical universe</li> <li>• Oriented at technology and competition</li> <li>• Pragmatic</li> </ul>	<ul style="list-style-type: none"> <li>• Cost-benefit analysis</li> <li>• Dike raising is a cheap option</li> </ul>	<ul style="list-style-type: none"> <li>• Dike raising, groyne lowering</li> <li>• Removal of hydraulic bottle-necks</li> <li>• Removal of vegetation that obstructs flow</li> <li>• Removal of minor embankments</li> <li>• Retention areas</li> </ul>
<p>F-S Relativistic</p> <ul style="list-style-type: none"> <li>• Living with the human element</li> <li>• Getting along with others</li> <li>• Consensual</li> </ul>	<ul style="list-style-type: none"> <li>• Polder mentality, local communities have a say</li> <li>• Focus on ecology</li> <li>• Dike raising is no option</li> </ul>	<ul style="list-style-type: none"> <li>• Space for the river combined with ecological restoration</li> <li>• Cyclic floodplain rejuvenation</li> <li>• Solutions for individual floodplain sections</li> <li>• Groyne lowering</li> </ul>
<p>G-T Systemic</p> <ul style="list-style-type: none"> <li>• Restoring vision in a disordered world</li> <li>• Integrative</li> </ul>	<ul style="list-style-type: none"> <li>• Spatially coherent plan for the whole river section</li> <li>• Participation of local communities</li> <li>• Water as guiding principle</li> <li>• Dike raising when needed</li> </ul>	<ul style="list-style-type: none"> <li>• Side channels follow the historic swale channels</li> <li>• Cyclic floodplain rejuvenation</li> <li>• Local initiatives in line with the overall direction</li> <li>• Multi-purpose groyne lowering</li> </ul>

and win-win situations. Conclusions were that (1) analysis of value systems provides a broad interpretive framework for scenario development, which guides the choices for transitions and (2) the biogeomorphology is affected by climate change (+58% deposition) but the effects of the local landscaping measures (depending on the dominant value systems) are even stronger [10].

## 2.2 Problem Solving with Secondary Water Course Rehabilitation in Rome Metropolitan Area

The project “Urban River Basin Enhancement Methods” (URBEM) funded by the European Commission 5th Framework Programme - a study of existing urban river rehabilitation schemes [8] has been carried out. The overall aim of the study was to provide an overview of the state of the art of urban river rehabilitation in Europe, including experiences from countries of other continents. The case studies showed for instance that in most cases the monitoring of river rehabilitation was limited to the measurements of ecological parameters, and although being a vital part of the success of a rehabilitation scheme, ecological aspects alone do not cover all urban aspects. Particularly in urban areas social, aesthetic, and economic aspects must also be considered when dealing with the impact of urban river rehabilitation [8].

One of the URBEMs’ case studies was about the Borough of Bella Monaca (subject of the EU urban regeneration program) containing the rehabilitation of the “Bella Monaca Ditch”. Goals of the project were to maintain a constant water flow, the treatment of solid waste, the consolidation and enhancement of the morphology and vegetation of the riverbed, to give back an adjacent area to the citizens, and to activate participation and education projects.

The following Table shows how the integral model was used to diagnose water management challenges in the area:

Table 4 shows the objective, inter-objective, subjective and inter-subjective realms of the project. In the objective quadrants soil engineering methods, water quality and quantity, law and regulations, infrastructure, city structure are mapped, while in the subjective quadrants values, individual ethics, traditions, education are shown. It is obvious that low environmental awareness (UL), low respect of laws and regulations, the fact of traditionally abusing water (Egocentric), as well as having little openness for innovation (Absolutistic) can be a basis for limited soil bio engineering methods, (UR) a not comprehensive law and regulation system, competitive administration system and peripheral social problems (LR). A much more complex and resilient water management can be realized, if the links between these processes have been made clear.

## 3 Integral water management in Hungary

### 3.1 Value based integral water management in Szigetköz

Szigetköz is one of Hungary’s most precious and most sensitive natural wetlands. However the question of how much society is willing to pay for its protection and rehabilitation is

difficult to answer. When rehabilitation becomes necessary, decision makers need to know the economic value of the wetland in order to see society’s support for and the financial scale of the investment.

Two methods have been used for the economic evaluation of Szigetköz: benefit transfer and contingent valuation [1]. Benefit transfer evaluates natural resources by transferring available information from studies already completed in another location and/or context. Contingent evaluation method asks individuals how much they are willing to pay (WTP) for the conservation or rehabilitation of a good health status of the wetland.

However the question of „how much one is willing to pay for Szigetköz” reveals only Szigetköz’ ecological state of health. It does not ask for the „willingness to pay” for avoiding potential problems on human capital and/or for social cohesion caused by the restoration work on Szigetköz. The different versions of restoring the territory may have an enormous effect on local tourism and ecotourism as well as on local people’s state of health. As an example several years could be needed for landscaping measures whilst many kilometers of the Danube river bank must not be entered by visitors or locals. Children may grow up without authentically experiencing their own home river bank which can later lead to low environmental awareness and a weak sense of place.

Figure 2 shows a possible model of integral planning for Szigetköz rehabilitation. Six alternatives have been developed by different experts with social participation and have been published by the Ministry of Environment. For each of the alternatives the following factors, indicators, and needs are to be considered:

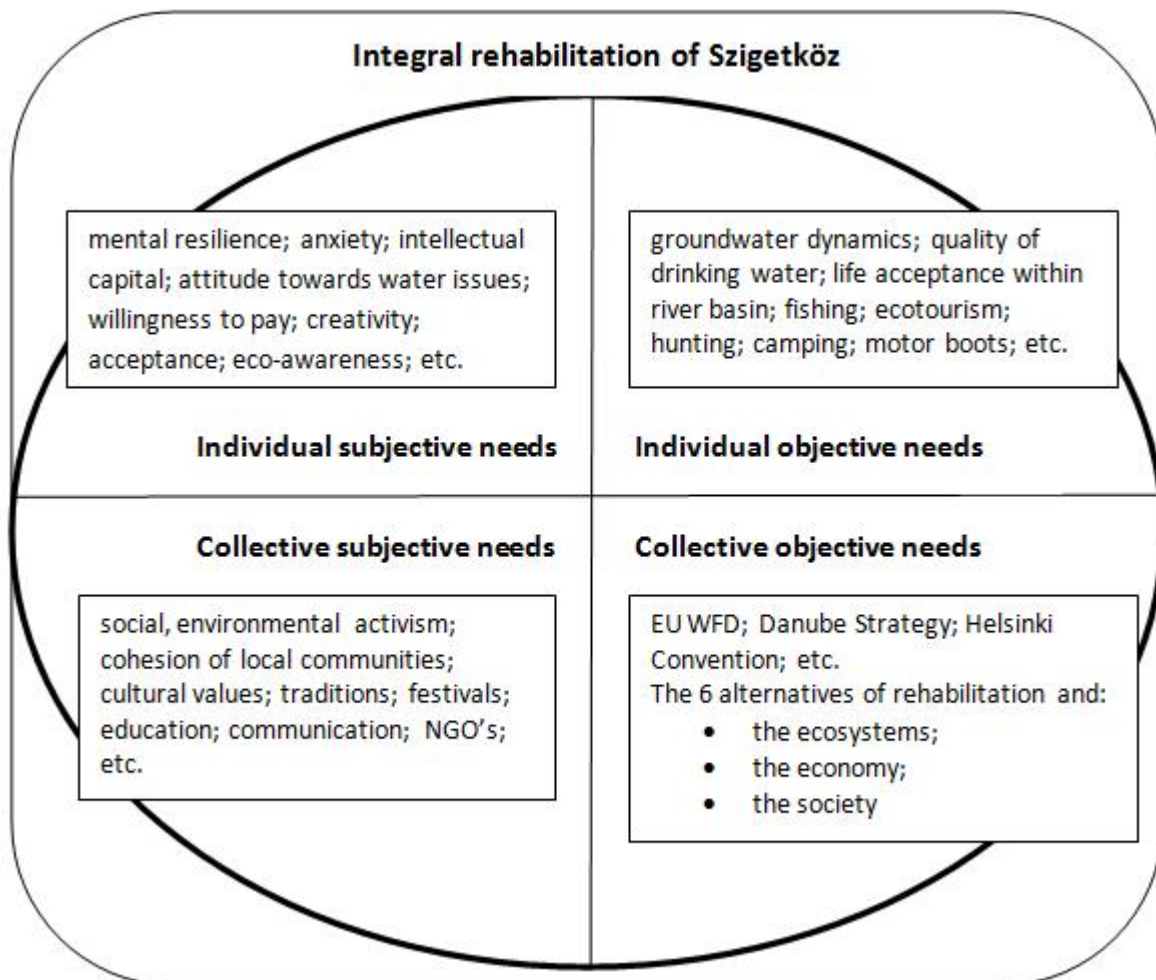
What could further be done is a similar scenario development with the application of the psychosocial development model like it has been done in the case of the Rhine (Table 2). The six different alternatives of the Szigetköz rehabilitation can be interpreted as options for different landscaping measures of different value systems. As the six alternatives have been developed by different representatives of different value systems (NGO’s, Ministry, experts, market sector) the dominant value systems directing water management in Hungary could be clarified. This would mean a similar method than applied in the program of the Rome water course rehabilitation where psychosocial levels were identified and linked to water management problems.

In the followings a similar model is presented based on the findings of the project “Common foundation of rehabilitation of branchsystem in Szigetköz-Csallóköz Danube flood area – Social Needs Report” [7]:

Within the quadrant of the collective subjective needs typical conflicts still exists between different interest groups. These conflicts need more attention. The conflicting groups are: the energy and the water sector, lobbyists and decision-makers of the capital and of the country side, experts of different scientific fields, representatives of environmental protection and of water

**Tab. 3.** Integral planning for water course rehabilitation in Rome Metropolitan Area [8]

Individual subjective factors	Individual objective factors
<ul style="list-style-type: none"> <li>• Personal responsibility of users and leaders: single persons, private initiative - <i>Relativistic</i></li> <li>• Environmental awareness: beginning with new generations</li> <li>• Personal integrity: abusive system</li> <li>• Psychosocial level: <i>Absolutistic, Egocentric</i></li> <li>• Information and education: beginning</li> </ul>	<ul style="list-style-type: none"> <li>• Water quality: extremely bad</li> <li>• Quantity: 1000mm/a, distribution winter month</li> <li>• Soil bio engineering methods: limited, presence of sewage collector, solid rock, lack of water, lack of rain, lack of maintenance</li> <li>• User habits: violence, destruction, little problem awareness</li> </ul>
Collective subjective factors	Collective objective factors
<ul style="list-style-type: none"> <li>• Water traditionally: abused</li> <li>• Respect of laws and regulations: weak</li> <li>• Environmental awareness: low</li> <li>• Cultural approach to nature: abusive</li> <li>• Psychosocial level: <i>Absolutistic, Egocentric</i> in periphery</li> <li>• Little openness to innovation, participation</li> <li>• Administrative habits: little problem awareness</li> <li>• Openness to sustainable use: beginning</li> </ul>	<ul style="list-style-type: none"> <li>• Law and regulations: not comprehensive, not implemented, habit rights</li> <li>• Polluter pays principle: not applied</li> <li>• Strategic spatial planning: crisis management</li> <li>• Urban systems: planning by doing, social problems in periphery, violence</li> <li>• Provision of basic infrastructure: crisis management</li> <li>• Administrative system: competition</li> </ul>



**Fig. 2.** Integral model of Szigetköz rehabilitation

**Tab. 4.** Integral analyses of Szigetköz rehabilitation

<b>Individual subjective factors</b>	<b>Individual objective factors</b>
<ul style="list-style-type: none"> <li>• Good knowledge on Danube rehabilitation issues by mayors of 26 surrounding villages and cities, by representatives of several NGO's and by representatives of local businesses</li> <li>• Mayors feel to be abandoned by government</li> <li>• Only one of the 6 alternatives were discussed at Szigetköz Platform</li> <li>• Relatively weak social cohesion and loosing old traditions but growing environmental awareness</li> </ul>	<ul style="list-style-type: none"> <li>• Weak rehabilitation activity by local governments (e.g. bridge rehabilitation) and little access to funds</li> <li>• Bathing, cycling and fishing as most important activities for locals; future needs of healthy living, eco-tourism and recreational activities</li> <li>• Possible water quality impacts</li> <li>• Difficulties for the people living alongside of the river</li> </ul>
<b>Collective subjective factors</b>	<b>Collective objective factors</b>
<ul style="list-style-type: none"> <li>• Consensus: economic breakthrough spots (e.g. "decent" tourism) establishing "Szigetközösen Platform"; bottom up planning of Szigetköz-Csallóköz National Park; need for international small boat traffic on Old-Danube</li> <li>• Conflict: need for more public information; all rehabilitation alternatives radically rejected by one NGO; all NGO's want the alternatives to be further discussed</li> </ul>	<ul style="list-style-type: none"> <li>• Need for complex rehabilitation</li> <li>• Economic breakthrough spots: new enterprises on water sports tourism, fishing, eco-tourism and horse riding but also the national park</li> <li>• Local businesses only support national park if no limitations for their business or compensatory funds</li> <li>• Investments on rehabilitation (possible new stimulus for local economic growth); but high costs of rehabilitation measures</li> </ul>

management as well as groups of nature/environment protection.

In order to understand ongoing conflicts according to this issue the alternative landscaping measures could be translated into integral water management scenarios by experts of integrated water management together with experts of psychosocial development. If there is lack of psychosocial development experts, then an introduction of Graves' system may help water engineers, ecologists, economists, modeling experts etc. to clarify the motivations of the different value systems.

#### 4 Conclusions

In Hungary forced command economy and absolutistic value system ruled for many decades. Individuality was not dignified, few people took control and lived quite well while talking up "the people". This smaller group was driven by egocentric value system. If a more complex psychosocial value system becomes controlled by a less complex one (Absolutistic controlled by Egocentric) than society gets arrested or moves towards regression instead of moving towards development, innovation and change [11]. In Hungary the Absolutistic value system has been controlled by the Egocentric system. The Egocentric value system has weaker ethical norms and can only understand and solve problems from a less complex neurological point of view. As a few Egocentric elites controlled the forced command economy, neither individual creativity was dignified, nor innovation whilst economic depression, social apathy, growing debts and undergoing regulations as accepted social norm appeared.

These symptoms seem to be still alive, so we may consider that Hungary has been arrested in the conflict between the Egocentric and Absolutistic value system. Before Hungary can stabilize at a healthy "democratic" Multiplistic level - problems of the Egocentric level must be solved. According to Graves [5] for that purpose first a healthy conservative structure of the Absolutistic psychosocial level must stabilize as inevitable criteria for the next level. If Multiplistic level is healthy within the society than intellectual property, creativity, and innovation rule. In this situation water management negotiations can result in real win-win solutions. (However Relativistic and Systemic levels - with their needs for functional sustainability and social harmony - are still quite far away on the horizon.)

All of these "hidden" processes belong to the subjective and inter-subjective quadrants of the integral water management model. Without having information about these hidden interior processes - decision making will only be based on half of the truth. If interior reality lacks on consensus than objective quadrants alone can not offer win-win solutions.

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