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Water and H_2O Difference in Terms of International Relationship

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ABSTRACT

It is "True" to say that water literally and scientifically is composed of some elements (H_2O). But this is to miss the reality of what water REALLY is. It is also "True" to say that the definition very much depends on where you look from. Geopolitical changes, rapid development, water- energy-food-environment nexus, securitisation of water, climate change etc. force us to define its actual meaning especially in terms of international relationship. From this approach, the meaning of this word is gaining a wider and deeper definition not a word but a "concept". Water is a general term to describe the stuff you drink and bathe with, and it, even in the purest and other social, socio-political, economical, socio-economical, international, strategical impurities in what we call "water". This bulk "water" will play very important role for the future of the world under the of systems, has much else than just hydrogen and oxygen. Therefore there are all sorts of minerals climate change impacts as well as increasing global inequality. This requires more attention to difference between Water term and H_2O in terms of international relationship. Society of 21st Century must be aware of the higher degree of social accountability of "water" than before. A higher degree of geopolitical, social, strategical and international accountability of water is therefore need to built into the process, with a wider recognition that water cannot be described on scientific and technological terms alone as H_2O. "Water" means more than H_2O in this respect since the half of 20th Century. In this paper, I will examine this difference by looking more closely at the social and hydro political notion of water.

***Keywords*:** Water, Water Concept; Water for Future; International Water; Water-Politics; Hydro-Politics; Water Definition; Water and Diplomacy

1. INTRODUCTION

Water can be seen as solid, liquid and sweet gas form in the word. In liquid form, the fresh, salty and brackish water resources are not only directly vital to the human being, animals and vegetables' own need but also it creates a vital natural environment for all living things.Therefore, it is vital to the vegetative state, wildlife, social life as being of the main source of the life. That is actually a natural and fundamental difference between bulk water term and H_2O. In fact a literature survey shows that it is a straightforward fact, corrections to it are endlessly ignored, but it is simply false to say that water is H_2O unless we are speaking very, very loosely.

It is mentioned Michael Weisberg's paper, Water is *Not* H_2O (PDF) and summarized van Brakel's "Chemistry as the Science of the Transformation of Substances".Holly VandeWall also puts it very nicely in her paper, "Why Water Is Not H_2O, and Other Critiques of Essentialist Ontology from the Philosophy of Chemistry," in *Philosophy of Science* vol. 74, no. 5 (December 2007).

Some expert claims that "the idea that water simply is H_2O is one of those false reductions Even if you'll get a ratio of hydrogen to oxygen that's roughly 2:1 in a fluid like water but it does not have the macroscopic properties (pH, boiling point, etc.) of water then we have not water but a mixture of hydrogen and oxygen molecules in their elemental form".

Chemical analysis and experiment deals with water not as an individuated molecule but in macroscopic quantities. All the typical observable properties of water - its pH, its density, its boiling and freezing points, its utility as a solvent, are dependent not upon its atomic ratio but the interactions between the dissociated ions.

Philosophers of chemistry have been arguing this point for at least 25 years. What makes a liquid water? A strong version of "psychological essentialism" predicts. That people use the presence or absence of H_2O as the primary determinant of what liquids they call "Water." As for Putnam's intuition that the presence of H_2O, not more readily observed properties like being clear and odorless, is a critical factor for willingness to call a liquid "water," this intuition is so widely shared that it is often assumed without further comment [14,15].

Barbara C. Malt's studies [12] indicate that the liquids people actually consider to water are only partly determined by a belief about the presence of H_2O. They also provide evidence for the importance of several dimensions other than H_2O in determining what is water.

Thanks to authors of this extreamly valuable and detailed investigations on definitions of water and H_2O.We must be aware of the elemental form and the macroscopic properties of the water if we really want to define the what "water" is and what H_2O means. We should also know that "What makes a liquid water" and essentialist beliefs on water term.

We will investigate here none of them but we will try to provide evidence for the importance of several dimensions of water term other than H_20 in defining water and H_2O difference. We will focus on the considerable difference between meanings of water and H_2O terms to define water term will play more important role in terms of international relationship in near future. We will start to search these differences considering three main points given below;

a- Physical
b- Chemical
c- Economical-Social and Political

Actually, the main goal of this article is to draw attention on increasing strategical importance of water in international relationship. I use the difference between water and H_2O in terms of social and political aspects which are deeply impacted to international relations and social life.

It is well known that Water covers about three - quarters of the Earth's surface in solid form (ice) and liquid form and is prevalent in the lower atmosphere in its gaseous form, water-vapor. Water is an essential component of all organisms, being necessary for most biological processes.

Water is one of the most interesting natural resources that can be subject to different review. In this context, water resources have many place in physics and chemistry, social science, environmental science and international relations.

There has been rapidly increased the relation between water resources and socio-economics, socio-political developments since last three decades. Rapidly growing water, food, energy and environment nexus changed classical water management approach as well as meaning of water resources.

Water resources are not only an individual sectoral need, but it has been a vital connector between different sectors. Therefore today's water isn't only a subject of engineering studies, it is also a subject of political economics, environmental, social sciences. In this condition to examine in details, the effect of water in the physical, chemical, environmental, social and political field need to identify the difference between Water and H_2O terms. I think it is possible to say that although we are aware of the other sectors more than ever, the water community is still not fully engaging them.

2. WATER and H_2O

2. 1. What is Water?

Most people, when they are asked this question , would probably respond something like "It is a clear odorless liquid that we can find it in lakes and rivers that humans and animals drink" But the philosopher Hillary Putnam argued in his paper [8] that such responses only describe what water is typically like;they don't constitute the meaning of the world "water"

Putnam's approach takes as fundamental the idea that word meanings are not a matter of mental representation; they are a matter of truths about the word.Putnam also assumes that people use words in a way consistent with this claim;According to Putnam, people would only consider a clear odorless liquid found in a lake to be water if it were composed of H_2O. If discovered actually be some other compound they wouldn't want to call it "Water" [8].

This approach helps provide a resolution to the dilemma faced by traditional approaches to word meaning and conceptual structure.

2. 2. Water as a sector!

Cooperation is the key to achieving security, efficiency, and sustainability [1]. Then it is accepted that **"Water is not an isolated sector, but a connector"**

"If water is an isolated sector or not " was an issue that was repeated during the Stockholm Water Week 2013 and in the closing plenary session. It was explained that the water community must stop thinking of "water" as a sector. Water crosses sectors and regions

and is vital for most human activities. There was also a lot of talk on the "nexus" and many sessions focused on finding new ways to improve cooperation to address all sectors in a holistic way, as the optimal solution for one can have negative impacts on others. Therefore

2. 3. Why "Water" will be more important in future, not H_2O

Global inequality has increased over the last two hundred years by orders of magnitude out of all proportion to anything experienced in the world before.

In 1820, differences in per capita income between countries were no more than about 3 to 1. They grew over the 19th century, slowly at first, then more rapidly until 1913. Inequalities continued to grow over the 20th century, though also comparatively slowly until well into the post-Second World War period [3].

The richest countries – those with a fifth of the world's population – had in 1997 per capita incomes 74 times that of the poorest countries. The 2014 Human Development Report - Sustaining Human Progress: Reducing Vulnerabilities and Building Resilience provides a fresh perspective on vulnerability.

According to income-based measures of poverty, 1.2 billion people live with $1.25 or less a day. However, according to the UNDP Multidimensional Poverty Index, almost 1.5 billion people in 91 developing countries are living in poverty with overlapping deprivations in health, education and living standards. And although poverty is declining overall, almost 800 million people are at risk of falling back into poverty if setbacks occur.

Inequality is still increasing, in countries and between countries. Even on the basis of the assumptions underlying the high-growth scenarios the gaps between the OECD countries and the poorest countries will be even larger in 2030. Inequality in a globalised world is a cause of migration, environmental degradation, disease transmission and political instability. Extreme inequality exacerbates all these tendencies [3].

It is ultimately inconsistent with the global fulfilment of access to water right a sanitation, as recognised in the UN Declarations.

UNDP's Global Human Development Report 2006 entitled Beyond Scarcity: Power, Poverty and the Global Water Crisis has been launched by the UNDP Administrator Kemal Dervis. Kemal Dervis is explaining the water situation and analysing the reasons in Foreword of the Report as follows;

> "Water for livelihoods poses a different set of challenges. Te world is not running out of the water, but many millions of its most vulnerable people live in areas subject to mounting water stress. Some 1.4 billion people live in river basins in which water use exceeds recharge rates. Te symptoms of overuse are disturbingly clear: Rivers are drying up, groundwater tables are falling and water-based ecosystems are being rapid degraded. Put bluntly, the world is running down one of its most precious natural resources and running up an unsustainable ecological debt that will be inherited by future generations."

This Report argues that the roots of the crisis in water can be traced to poverty, inequality and unequal power relationships, as well as flawed water management policies that exacerbate scarcity. Access to water for life is a basic human need and a fundamental human right. Yet in our increasingly prosperous world, more than 1 billion people are denied the

right to clean water and 2.6 billion people lack access to adequate sanitation. Test headline numbers capture only one dimension of the problem.

At the start of the 21st-century un- clean water is the world's second biggest killer of children. As this Report shows, the sources of the problem vary by country, but several themes emerge. First, few countries treat water and sanitation as a political priority, as witnessed by limited budget al- locations. Second, some of the world's poorest people are paying some of the world's highest prices for water, reflecting the limited coverage of water utilities in the slums and informal settlements where poor people live.

Third, the international community has failed to prioritize water and sanitation in the partnerships for development that have coalesced around the Millennium Development Goals. Underlying each of these problems is the fact that the people suffering the most from the water and sanitation crisis—poor people in general and poor women in particular—ofen lack the political voice needed to assert their claims to water.

2. 4. Some Water Type Definitions

Before examining to Water term and H_2O, it will be useful to identify some water words explaining a different type of water used in the daily life. Water doesn't refer only to liquids that people believe to be entirely H_2O. The set of common water types obtained includes liquids referred to as "distilled water","purified water" suggests in itself that there are waters believed to contrastin composition with this pure forms.

Drinking water - Drinking water is just that: water that is intended for drinking. It is safe for human consumption and comes from a municipal source. There are no added ingredients besides what is consideredusual and safe for any tap water, such as fluoride.

Distilled water - Distilled water is a type of purified water. It's water that has gone through a rigorous filtration process to strip it not only of contaminants, but any natural minerals as well. This water is best for use in small appliances — like hot water urns, or steam irons, because if you use it, you won't have that mineral buildup that you often get when you use tap water. Though it may seem counterintuitive, this water is not necessarily the best for human consumption since all of the water's natural, and often beneficial, minerals are absent.

Purified water - Purified water is water that comes from any source, but has been purified to remove any chemicals or contaminants (H_2O). Types of purification include distillation, deionization, reverse osmosis, and carbon filtration. Like distilled water, it has its own advantages and disadvantages, the advantages being that potentially harmful chemicals may be taken out and the disadvantage being that beneficial minerals may be taken out as well.

Spring water - This is what you often find in bottled water. It's from an underground source and may or may not have been treated and purified. Though spring water sounds more appealing (like many others, I imagine my spring water coming from a rushing fresh spring at the base of a tall snow-capped mountain), it's not necessarily the best water for drinking if you have other options.

Studies done by the scientist have found contaminants in bottled water such as coliform, arsenic and phthalates. Much of bottled water is labeled as spring water when in fact it is coming from a municipal source and is nothing more than glorified tap water. This topic has been a popular one in recent years, sparking much controversy.

2. 5. What is H_20 ?

Could it be a scientific name of Water or could it be a chemical name of Water? When somebody answer this question saying that "**H_2O is the chemical formula for water.** Each water molecule has two hydrogen atoms and one oxygen atom. Each hydrogen atom is attached to the oxygen atom with a polar covalent bond"

Some other people say, " H_2O is water. There is no chemical name for it. Water is two hydrogen atoms covalently bonded to a single oxygen atom"

This two approach include right points. When we look at structure of H_2O ,we can see that the hydrogens form a 104.5-degree angle with one another. The oxygen has two extra electron pairs that distort the structure from the regular tetrahedral angle of 109.5.

Putnam and Kripke [8,9] seem to believe that in the case of water, chemists describe a chemical kind who's members include all and only the molecules with molecular formula H_2O. Appealing to this fact and to thecoordination principle, they conclude that water is H_2O. **In fact,the scientific name for water is dihydrogen oxide**. A water molecule is neutrally charged, but the oxygen atom is more negative because it attracts the electrons more strongly than the hydrogen atoms. Because of its unique structure, **H_2O** is one of the only compounds that is less dense as a solid than as a liquid.Then it is clear that water word meaning is not representing the H_2O in this context.

2. 6. Water and H_2O characteristics from different angles

2. 6. 1. Physical

To examined difference between water and H_2O from the physical angle. Water is physically a mass substance. However in the first sight, we can see an important physical specification of water as solid, liquid and gas. Water as a physical mass can create hydrostatic and hydro-mechanical forces.

In brief, the main physical difference between water and H_2O, Water considered as a mass and carries within other useful minerals. Water as a resource can be classified clean water, dirty water, waste water and purified water. Water as a gas and solid should take steam, ice, and glaciers title.

After these explanations, as a physical most fundamental difference between water and H_2O is that bulk water is a natural resource created by natural's hydrologic cycle, but H_20 can be taken as a chemical substance that can be created with technology in laboratories.

2. 6. 2. Chemical

When we examine the chemical difference between water and H_2O we can see that H_2O is a liquid (it the temperature), colorless, odorless, tasteless substance. Unlike H_2O, natural bulk water has a self-cleaning feature in the natural hydrologic cycle, if water has become salted and dirty by pouring into river and ocean, it can be clean with evaporates into atmosphere and return to fresh water. However rainwater also separated from H_2O, because it isn't pure. With airborne gas especially coal of densely populated areas and exposed sulfuric acid fall to earth, therefore natural water isn't utterly pure H_2O water. In fact, H_2O is not a synonym for water, neither in bulk nor as a single molecule.

Some people define H_2O as not a material but only a molecular formula of water. Opposite of this approach, some people define each material has a molecular formula, but it is incorrect to say this material should be the same with this formula.

Michael Weisberg [2] says, "closer examination of what water really is, I believe, shows that for chemists, water isn't just the set of all molecules with molecular formula H_2O. There are multiple chemical kinds that might reasonably be coordinated with the ordinary language kind water."

In this case, water as a chemical substance, which can carry many minerals important for living and appears as a natural liquid to life, and production of strong chemical solvents used in many of the fields.

Michael Weisberg have discussed his argument " Water is Not H_2O" with an assumption of semantic externalist theories as he called the coordination principle in his article [2]. This is the idea that natural language kind and scientific kinds line up or can be mapped onto one another one-to-one.

He concluded his analysis like that "A closer look at the water shows that there is not this type of simple one-to-one match between chemical and ordinary language kinds. In fact, the use of kind terms in chemistry is often con- text sensitive and in cases where chemists want to ensure no ambiguity, they use a very complex and nuanced set of kind terms, none of which could be reasonably associated with the ordinary language kind term "water" alone [2].

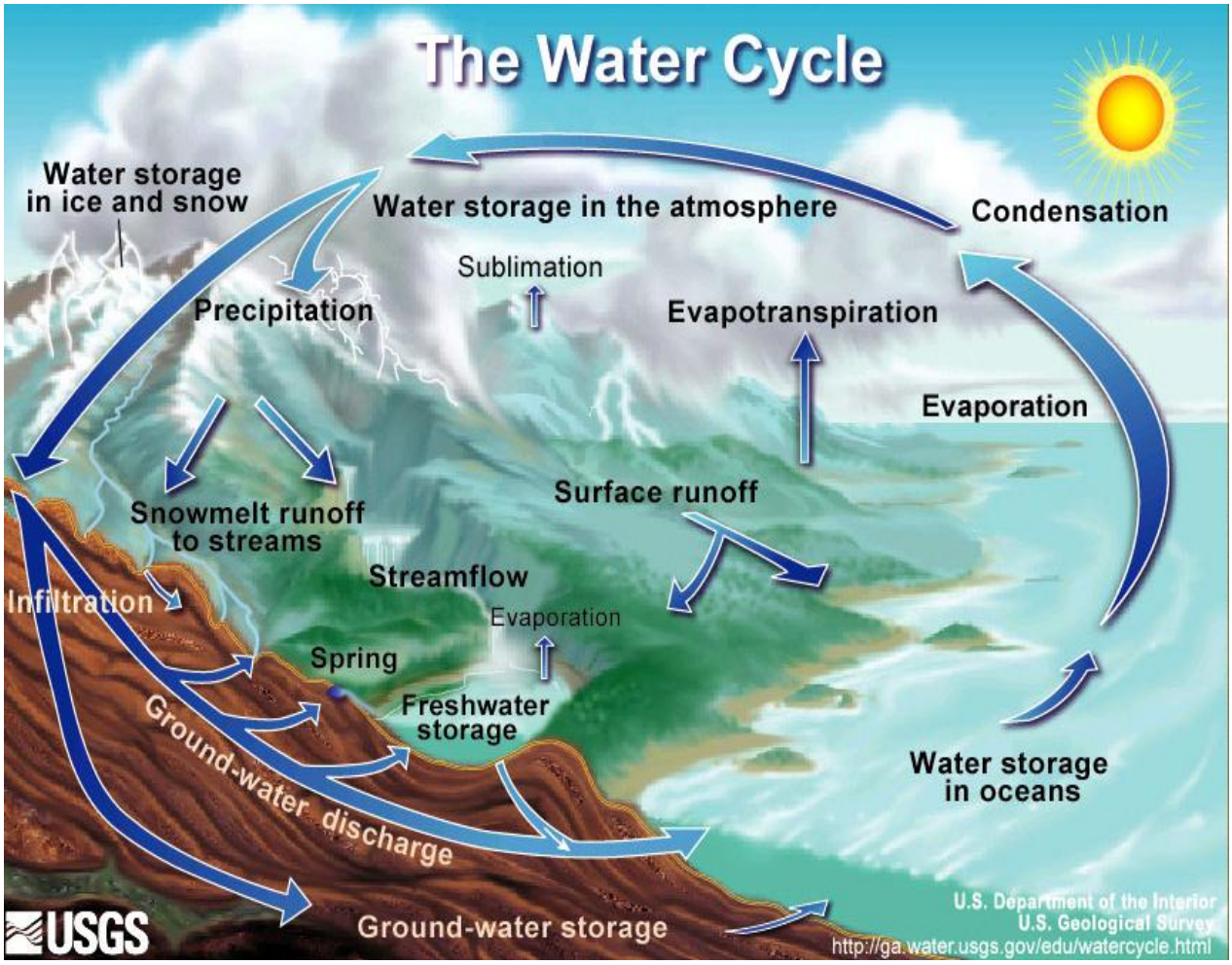

Figure 1. Hydrologic cycle.

Since we cannot just turn to chemistry to find a single chemical kind that can be used to determine the extension of "water," there isn't any strict sense in which water is H_2O, because exactly what water depends on the context in which "water" is uttered [2].

2. 6. 3. To view water and H_2O from economic-social and political angle

The main aim of this article is investigating "economic-social and political" difference between Water term and H_2O and show the effects of this difference to water resources management and international relations.

It is useful at the beginning of this section to make determination that point; when we are view to economic-social and political for water and H_2O, we've focused further Water than H_2O, because water is massive and hydrologically recycled natural resources.

Massive (bulk) characteristics and a regionally (in a basin) used feature of bulk water can make it a very powerful force of regional development. Water is also an international trade good, a social resource, human right and as a geopolitical resource that is affected on international balance of power. Today economic, social and political considerations for this vital liquid entirely is done through with "natural fresh water" not H_2O.

2. 6. 4. Technological Water: H_2O

The technology of the treatment of wastewater and seawater, despite all the force review shows there can be a common alternative to the mass of water caused by natural hydrologic cycle, The main reason is that millions of years of natural fresh water resources "a natural balance" to be formed as a result and widely reach us. However, technologically treated or produced water can damage the natural balance of the ecosystem and has some difficulties in vast amount of water production as well as utilization services.

Therefore, this vital liquid made on global economic, social and political evaluation of the subject is not H_2O "water is formed in the natural cycle"

When we talk about technological water, first thing to cross us mind the advantage of the developed countries that had advanced technology to produce. As a result of scientific and technological development that countries are the advantage which developing technology on the market and control the products of the market. In this case, the production and trade of H_2O also can be an advantage of these countries.

Globalization and securitization have increased the global, commercial and political interest of "Natural, bulk water resources" and water has been commercialized, internationalized and politicized since last 25 years.

2. 6. 5. Social

When the meaning of "H_2O and Water" is considered from a social point of view, it can be realized that H_2O has no meaning when bulk Water is very meaningful. In this context natural and bulk water to become human rights, development force.

The social dimension of the water was identified as access to the adequate amount of water in the past. But this concept has been much differed recently. From the social point the concept of water isn't just human, it the concept is whole surroundings habitat. As well water, energy, and food relation are very important to increasing social sectors, such as the energy associated with water and food security.

2. 6. 6. Political

Introduced in the previous section, improving the meaning of the social rights of water also affecting to political meaning of Water. In this study, the definitions of the water and H_2O have been used as a political concept, Water instead of H_2O taken from the angle of national and international policy.

Therefore, the water, together with politics comes into a water-policy concept. After mid-20th century as a political concept of natural and bulk water has become the subject of international politics.

This natural resource in the international politics described as "securitized resource " and strategic natural resource. Therefore nowadays especially limited natural bulk water play a very important role in international relations.

3. CONCLUSIONS

Water and H_2O terms can also be described from other different angles like that; water is a name of a vital fluid produced by a natural hydrologic cycle and H_2O is only water's molecular formula to shown in chemical composition figure. It is worthwhile to focus on Water and H_2O difference in terms of international relationship. The most important reason is that the bulk Water term has gain social, political, strategical, economical, ecological, geopolitical meaning which H_2O term can't at all. From the beginning of 21st Century, water has become a key source of energy, food environmental security. Climate change and other factors after the first decade of the 21st Century have increased the importance of water; however the increased threats and the importance of water. No satisfactory "Unity of goal and unity of effort" has been developed and no multilateral agreements have been signed between riparian countries.

New threats of the 21th century show that a paradigm shift is needed from classical water cooperation to new water collaboration. Technological developments from terms of production H_2O cannot be effective enough to solve water shortage problems completely, but can create a partial solution in specific regions. And this indicates that being aware of the difference between technological H_2O and natural bulk Water resource; international relations can be developed more effectively.

Therefore, in this article have tried to show "Difference between water term meaning and H_2O in terms of water policy and international relations. The dominant factors related to water in international relations of the 21th century will be "Natural bulk water resources produced by the hydrologic cycle". The effect of produced technological water (H_2O) will remain local and limited in the international relationship. Mankind when entered in 20th Century, they have not known water development, water management, transboundary water, climate change terms of 21st century,

20th Century began with the scientific knowledge physical law and chemical contents of water that developed at the end of 19th century. However at the beginning of the 21th-century importance of water from political, social and international relations angles have become more than from the other entire feature.

It is also important to know that the gap between the richest country and poorest countries in 1820 was 3 to 1 in terms of constant price per capita income. This gap grew to 11 to 1 in 1913, 35 to 1 in 1950, 44 to 1 in 1973 and 72 to 1 in 1992 [3].

The gap was 85 to1 when the globalized world was entering the 21st Century. The wide global gaps and often growing global inequality need to be put high on the international economic agenda for the 21st century.This requires an applicable, effective new international water policy and rapid implementation in shared river basins. Because approximately 276 river basins cross the political boundaries of two or more countries. These rivers serve as a primary source of freshwater for approximately 40 percent of the world's population. Globally about 2 billion people depend on groundwater, sourced from over 300 transboundary aquifer systems. Around 60 percent of the world's international river basins lack any type of cooperative management framework. Therefore, water collaboration need between riparian states is getting more and more.It is clear that this water term can't be described only as H_2O or H_2O doesn't correspond the vast meanings of the "water"

Therefore when we use "Water" related with different issues in 21st Century, we should be aware of that the word of "water" has wide range of meanings from cooperation to conflict, from food security to energy security, from strategy to economy, from commercial product to human right that H_20 never has.

Biography

Dursun Yıldız is a hydropolitics expert and Director of the Hydropolitics Academy Association located in Ankara-Turkey .He is a civil engineer and used to be Deputy Director at State Hydraulic Works in Turkey; completed hydroinformatics post graduate course at the IHE in Delft,Technical training programme in USBR-USA and a master degree in Hydropolitics at the Hacettepe University-Turkey. He has over 5 years of teaching experiences in some Turkish Universities and now works as head of his own Hydro Energy & Strategy consulting company located in Ankara. He has published severel inernational articles and 11 Books. He recieved Most Succesful Reseracher Award on International Water Issues from Turkish Agricultural Association in 2008.

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