Relation between man and water: the awareness of living water for sustainable design.

Cumulus Mumbai 2015:
In a planet of our own - a vision of sustainability with focus on water
http://www.cumulusmumbai2015.org/

# Relation between man and water

## The awareness of living water for sustainable design

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**Abstract:** Water is the most precious and one of the most threatened resources on earth: environmental, economic, social and management factors are posing at risk this precious resource. The roots of these problems can be traced in the loss of relation between man and water: from being a vital element with a spiritual character, water has become seen as just a commodity over which to make profit. Through the analysis of how the changing relation between man and water in history has been translated in the design of different kinds of tools for water management, the aim of this paper is to highlight the importance of the Systemic Design approach, based on the awareness of living water, to the project of water related tools to design sustainable products.

***Key words: Systemic Design, Quality of water, Sustainable development, Water management, Culture, Sustainable design***

### 1. Introduction

Water is a limited resource on the planet and, although it is the most precious element for life, it is also one of the most threatened: overconsumption, depletion of aquifers, water demanding processes, pollution, shift towards a diet richer in meat, climate changes, population growth, increasing demand for energy and goods are posing at risk the availability of this fundamental and priceless resource. Water management during XX century has been characterized by the building of various large scale infrastructures to control floods, transfer water through long distances, supply water for drinking and irrigation and to generate power. Besides the numerous benefits obtained, they also brought many side effect whose environmental cost was enormous (Gleick, 2000). The causes of these damages can be found in the progressive loss of relation between man and

water. How this loss originated and how it is possible to rebuild a relation with water that leads to sustainable management are questions addressed by this paper.
The approach to water in the past, materialized in products and infrastructures, is analyzed in the first section and subsequently compared to the current linear approach to water management. The application of the Systemic Design approach to water management issues is discussed as a way to lead to the design of sustainable products, analyzed in the final section.

**2. Water comprehension in the past**

The relation between man and water originated in the dawn of time: ancient populations had a thorough knowledge of its properties and established deep relations with it.
Long before we had the scientific proof of this, water was already perceived by people as a life-giving element. Early cults from Mesopotamia, Egypt, China and Greece recognized water as the substance of the primordial chaos from which life emerged (Marrin, 2005). Ancient and modern religious symbolism also associates to water properties of purification: Christians baptize people in water as the beginning of a new life; Indu bathe in the Gange to be purified by their sins and Muslims carefully wash themselves before entering the Mosque.

This idea of water as a living element was translated in the construction of tools and systems to store, transport and manage water that, for their shapes and materials, ensured the preservation of its qualities.
The amphora is an extraordinary example of the knowledge ancient people had of water. Thanks to their egg shape, amphorae did not have any square angle that could interfere with the natural movement of water and favor the proliferation of pathogens. The material was also crucial to ensure the correct preservation of the liquid. The porosity of terracotta enabled water to transpire through the walls of the amphora: water layers close to the inner surfaces of the container cooled and moved downwards, while warmer and lighter water at the centre of the amphora raised and moved towards the walls creating a continuous circulation and revitalization of water that could maintain its properties. Moreover, terracotta avoided sunlight to come in direct contact with water, preventing it to warm up (Schauberger and Coats, 1999).
As a fundamental element for life, water was also the core around which social systems were built. Since the beginning, the Balinese Subak was much more than a physical and technological entity consisting of a series of channels to distribute water: it had a social dimension, made by the ensemble of farmers working in it, and a religious dimension,

related to the rites celebrated in the temples disseminated along the hills that established the pace of irrigation activities (Lorenzen and Lorenzen, 2005; Van Aken, 2013). The precise distribution of water shaped the environment and reflected a complex social organization (Van Aken, 2013). Social systems related to irrigation were not only built in places where water was abundant, such as in Bali, but more importantly where water was scarce. In some Andean villages it was the set of rules, rights and duties related to water management and the equal and precise distribution of the scarce water for irrigation that led to the creation of a complex social system around this activity (Trawick, 2001).
These systems of storage, distribution and management of water were sustainable for the material used, the rate of withdrawal of water and the relation with the surrounding ecosystem. While in the Andean village was the equal and precise distribution of water – guaranteed by the set of rules and by the surveillance of the members of the community- that avoided overexploitation of the resource (Trawick, 2001), in Bali this mechanism is enhanced by the diffusion of the philosophy of Tri Hita Karana (lit. the three causes of well being) that "refers to the harmonious relationship between religious-spiritual, human-social and natural-environmental domains of life" (Roth, 2014, **p5**) and that is the basis for the definition of the set of rules of the subak (Lorenzen and Lorenzen, 2005). The qanat, a system for water supply typical of North Africa and diffused in many parts of the world with different names, is considered one of the most sustainable solutions to meet the water needs of arid countries: its sustainability lays in the structure of the system that works with gravity and prevents from overexploitation of the water table it crosses (Endreny and Gokcekus, 2009).

### 3. Water depletion today

This harmonious relation between man and water was broken during a process defined by Certomà (2007) as "disenchantment of nature". While Talete saw water as the origin of everything, with Platone Nature is put in the background compared to the Spirit and it subsequently becomes a burden for it. Thus, in western philosophy, Nature and water as a life giving matter, lose their central role in favor of the predominance of the Logos. They are seen as raw matters, available for free, that gain value only when they are perfected by human work: this commercialization of the natural environment is a legacy of the mechanist paradigm and the basis for the development of modern capitalism (Certomà, 2007). Water, from being a vital and life giving element has been deprived from its spiritual value and has been reduced to a cleaning liquid, to the mere chemical formula $H_2O$ (Illich, 1986), a process defined as "de-socialization of water" (Van Aken, 2013).

This loss of relation led the question of water management to be not anymore a social matter, but a problem to be solved only through engineering: water became perceived as a soulless element to be managed in the most economically efficient way. As a consequence, a large variety of tools and services for the management of water that do not respect its properties was designed. Unlike Romans and Greeks, nowadays we store water in containers whose shape and material respond to the necessity to transport as many units as possible without paying attention to the proper conservation of water. This way, cisterns have a cubic shape whose right angles interrupt the natural inner movement of water; water bottles are transparent and thus do no prevent water heating and exposure to sunlight; and water pipes intersect with right angles, forcing water to move through them in an unnatural way (Wilkes, 2003). Unlike qanats, modern water pumping technology enables the withdrawal of water at a rate much higher than natural one in order to sustain an ever growing production system, causing overexploitation of water resources, fall of water table and salt intrusion (Aguilera-Klink et al., 2000). The side effects of the construction of dams, the symbol of the twentieth century water management paradigm focused on large scale interventions, are becoming more and more evident and include not only alteration of river course and flow, interruption of transportation of organic matter and damaging impact on the communities of human and animals living along the river, but also the impairment of water self-purification capacity (Wei et al., 2009).

The consequences of this broken relation between man and water are nowadays evident: depletion of underground aquifers, river floods, ecosystem alteration, insane water and drought are only some examples. Paradoxically, besides the scientific and technological improvements made, modern societies demonstrate to have much smaller knowledge of water compared to the one of ancient populations. While modern technology focuses on the achievement of maximum efficiency in the short period and uses large scale systems to move external resources but quickly exhausts its potential, the horizon of the results and benefits provided by traditional knowledge are visible over very long time because it never provides a solution to a single problem, but it forms a complex system of social, cultural and economic levels based on the necessity to take care and preserve local resources and environment (Laureano, 2001).
In a world where the growth of the population must face the limitedness of natural resources and especially water, the reconstruction of a relation between man and water is essential to build a sustainable future. What has been lost in the process of technological development is the concept of water as a vital and living organism, an awareness which is

based, but must go beyond the understanding of its chemical properties, and that the Systemic Design approach aims to recover.

**4. A new approach: the Systemic Design**

The Systemic Design (SD) approach (Bistagnino, 2011) finds its roots in the system thinking developed by various exponents of this movement, including Bertalanffy, Prigogine, Bateson, Margulis and Capra who brought a change of paradigm (from mechanistic to holistic) in the scientific vision and in the way to understand Nature. This is interpreted as an open and autopoietic system, as a network of connections that guarantees the existence of life from the smallest molecule to the whole planet (Capra, 2010). In the field of water studies, the leading figures of the systemic vision of this element have been Viktor Schauberger, Theodore Schwenk and John Wilkes who explored the properties of this resource looking at it as a vital and living organism, moving closer to the perception of water of ancient populations.

Recent discoveries in the field of water studies (quantum view of water; particle-exclusion phenomenon; water as a carrier of biological information and with a memory ability) (Toso, 2015) originate from the legacy of these thinkers and are widening our still very small knowledge of this element while confirming in a scientific way some intuitions of ancient people (i.e. Maori believed water had memory that was directly linked with the creation process) (Marrin, 2005).

The SD approach shares the vision of nature as a living organism that provides the best model of efficiency available. In relation to the topic of water, this approach aims to recover a vitalistic vision of this element and the design process is based on the detailed analysis of the behavior and properties of water with the aim to build tools that are truly sustainable. According to this systemic vision, water has been interpreted as an open and self-regulating living system, an interpretation at the basis of the recognition of some peculiar properties of water such as the ability to carry information, to self depurate and structure itself in relation to the stimuli received: the recognition of the *intelligence* of water (Toso, 2015), something that goes beyond what the chemical formula $H_2O$ can express. Moreover, SD taps into the traditional knowledge ancient populations had about water management, which constitutes an important heritage for the modern world, and considers all the dimensions of water with particular attention to the social one.

This kind of approach finds his place in the broader movement hoping for a change in the water management paradigm (Pahl-Wostl et al., 2007).

This awareness of water as a living organism and the understanding of its properties and behavior are the basis for the design of different projects that apply the SD approach.

The majority of the case studies analyzed are focused on the re-energization of water through the induction of a whirling movement recognized as the structure that allows a revitalization, re-oxygenation and purification of water (Schauberger and Coats, 1999) and that is a shape common to an impressively large number of natural creatures (Schwenk, 1996).
The Flowform™ Technology consist of a set of containers with particularly shaped walls that enable the water flowing through them to move in a spiraling way making eight-shaped forms. The design of flowform emerged from a deep observation and understanding of water's natural behavior and the recognition of the essential rhythm carried by water: flowforms are shaped to enable water to replicate its natural movement and to regain its characteristic rhythm, which is at the basis of its life giving properties. The beneficial effects of this revitalized water have been demonstrated in different fields of application that go from health to agriculture (Schwuchow et al., 2010).

Figure.1 Flowform Vortex Garten Darmstadt.

The Vortex Generator (Watreco, 2011) is a tool that, thanks to the inner structure of its chamber, is able to generate vortices from a linear flow of water. It has been tested in the irrigation system of cucumbers and results have shown the beneficial effects revitalized water had on these plants compared to the ones irrigated with common water: increased yield, faster growth, higher viability of plants and longer shelf life of harvested cucumbers were observed in the former case (Ruwaida, 2011).

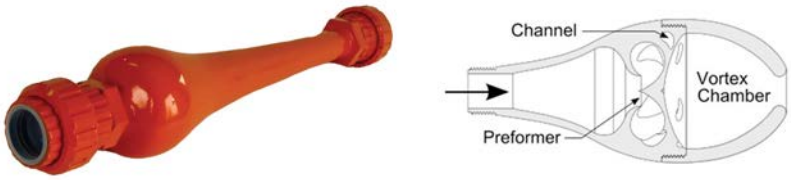


Figure.2 Watreco vortex generator.

The legacy of Romans' knowledge and of Schauberger's teachings is visible in the Water Egg: this egg shaped terracotta tool provides the best form and material for water storage ensuring the maintenance of the natural whirling movement of water which is thus energized and revitalized.
http://www.iwateregg.com/product/product.html)

Figure.3 Water egg.

The Original Vortex Water Energiser™ is a small tool to be placed in the water inlet pipe of the house and energizes the water in it. It is made of cooper and energizes water through vibration without the necessity of electric power supply
(http://www.implosionresearch.com/water.html)

Figure.4 Vortex water energizer.

The Lily impeller (http://www.paxwater.com/impeller-mixers) is a spiral shaped mixer designed to be put in water tanks to induce a whirling movement to the stored water in order to avoid its thermal stratification. Its design has been inspired by the spiraling shape of the lily and wants to mimic the effect of ocean whirlpools.

Figure.5 Lily impeller.

The phenomenon of the particle-exclusion observed in water, according to which water organizes itself moving away suspended particles from the proximity of hydrophilic surfaces, has been exploited for the development of an innovative water depuration system: water flows through a nafion tube and organizes itself in two zones, bulk water in the middle and clean water on the periphery, that are captured by two distinct tubes. Clean water can thus be obtained without the use of membrane filtering. The tool has been tested for different kinds of particles (i.e. topsoil, clay, bacteria and viruses) and provided promising results for application in various fields (Klyuzhin et al, 2008).

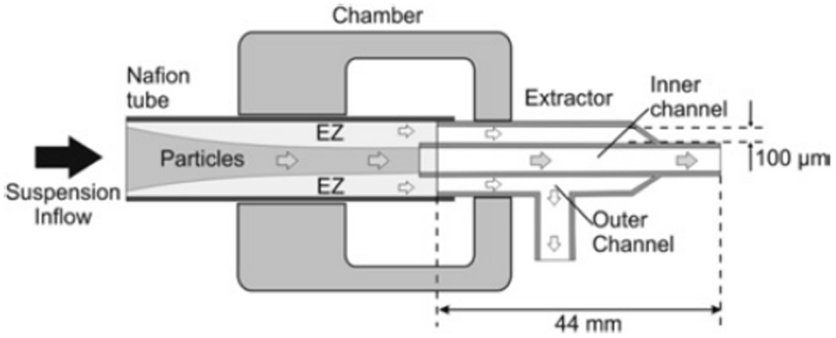


Figure.6 Extractor.

The common element to all these examples is the design process which started from the recognition of water as a living organism and from a thorough observation and knowledge of the element water and of its behavior.

## 5. Conclusions

The problems we face daily highlight the urgent need to rethink the way we handle water management. The analysis carried out in this paper showed the correlation between a certain vision of water and the design of tools: while a vitalistic perception of water was translated into sustainable water management tools, mechanistic vision took form in unsustainable structures. The outcome of this analysis is the necessity to recover the awareness of water as a living organism in order to design sustainable tools for its management. The recovery of ancient wisdom is not a mere return to the past but, combined with modern technology and knowledge from different disciplines, constitutes an innovative approach to better understand the extraordinary potential of water.
The Systemic Design has been described as an innovative approach that, by recognizing the vital nature of water and by giving value to traditional wisdom, answers to this necessity and leads to the design of instruments that not only respect water properties but also enhance its qualities.

## Acknowledgement

Many thanks to Professor Luigi Bistagnino, author and promoter of the Systemic Design approach that helped us to improve this research, and to Dario Toso, whose PhD thesis on the systemic vision of water has been of great support to this article.

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**IMAGES**

Figure 1. "Flowform Vortex Garten Darmstadt" by Reibundweise - Own work. Licensed under CC BY-SA 3.0 via Wikimedia Commons
http://commons.wikimedia.org/wiki/File:Flowform_Vortex_Garten_Darmstadt.jpg#/media/File:Flowform_Vortex_Garten_Darmstadt.jpg

Figure 2. "Vortex Process Technology"
http://www.watreco.com/

Figure 3. "Water Egg"
http://www.iwateregg.com/product/product.html

Figure 4. " Vortex water energizer"
http://www.implosionresearch.com/xcs/prodshow/Gold_Plated_Vortex_Energiser/VEG.html

Figure 5. "Lily impeller"
http://www.paxwater.com/biomimicry

Figure 6. "Extractor"
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