

Water Designing for Sustainability, Purity and Comfort

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The objective of this paper is to present designs involving water and architecture and explore this dual impact that water has on human lives and the environment. On one hand, architects use materials and forms to communicate ideas, while at the same time the use of water elements could become a point of gathering, a source of power, a place of culture and reflection, or a place of imagination. Many examples of history will be mentioned, where connections among people, water and environment were fortified. For example, in ancient Greece, “balaneion” was called the bath, where all social events were discussed and sometimes many philosophical declamations took place. People need connections to the past in order to help them make some sense of the increasingly complex world.

Nowadays, sustainable architecture encourages the use of water for many environmental and social reasons. Water could be effective at cooling interior spaces, and when combined with plants it could provide natural air conditioning. This paper will highlight some recent innovations, which we have already accomplished on our projects. The use of vertical wall of plants and waterworks is able to enhance interior spaces and provide comfort to their users by achieving energy efficiency and at the same time creating positive impacts on health, safety and community welfare. In a holistic view, sustainable architecture could be an interconnected network of natural and social systems that provides a diverse range of environmental, cultural and economic benefits.

Keywords: *Greek baths “balaneion”, sustainable architecture, sustainable tourism development, water features.*

1. Introduction

Water can enliven architecture and then both of them could create unique and unusual projects. The purpose of this paper is to identify the meaning of integrating water in our architectural design not only for aesthetic purposes but also for environmental too. Since recently global world has confronted many challenges due to climate change, architects should adopt and develop a sustainable approach. Sustainable architecture should consider how to use water, how to use this vital element which is mysteriously beautiful when combined in architectural designs. These days, more than ever, that water supply becomes increasingly scarce in many regions, such as the Mediterranean and particularly Greece – where our studied projects took place –, that suffer from droughts and have experienced increased levels of irrigation, architects could use in their designs recycled water devices.

Due to the continuous progress of technology, once again, architects should take the responsible role of balancing this relationship between people’s actions and natural resources. More specifically, the rhythms of human beings on the one hand and nature on the other hand are

driven totally separate. According to Brundtland report, “any development should meet the needs of the present without compromising the ability of future generations to meet their own needs” (Brundtland 1987). Therefore, it is urgent to look back in history where many examples of architecture integrated with water can be noticed and evaluate this relationship in order to comprehend the meaning of those two elements, which contribute to creating sustainable communities.

2. Methods

The methodology of the research would try to emphasize the relationship of architecture and water in order to realize and evaluate how these two elements could be interconnected. More specifically, it is essential to underline that sustainable architecture could promote the interaction of environmental, socio-cultural and economic issues in order to preserve nature and provide welfare to social communities as well as to protect cultural heritage and eventually to provide economic growth for people, respectively. Subsequently, the use of water could contribute

on all the aforementioned sustainable aspects either by cooling particular areas or by creating emotions and featuring as a meeting point so as to encourage connections among people, water and environment.

The research will point out: a) the significance of water over many centuries and especially its implementation in ancient Greek baths in order to understand the influences on our current designs, b) the analysis of literature studying concrete philosophers and architects and their views upon water, c) analysis of global trends related to sustainability in the tourism sector, which is characterized of leisure activities, in order to determine our intentions on applying water features on hotel resorts, d) the analysis of projects which have been completed in order to explore the integration of water into architectural proposals not only for aesthetic reasons but also for environmental, e) conclusions, where the key role of architects on sustainability issues is underlined and the importance of using that natural element, water, which contributes on obtaining environmental friendly buildings, creates welfare for social communities and leads on economic growth.

3. Results

3.1. References of water in ancient Greece: The case of "balaneion". In previous centuries architecture was organized in relation to water, such examples are baths and spas in ancient Greece. More specifically, "balaneion" implies a bath, which was too popular in Greek culture and society. According to Bonneville "the history of public baths begins in Greece in the sixth century B.C. (Bonneville 1994). It is where the Greek community has exercised both physically and intellectually. Over years, this communal and almost daily activity, bathing, was evolved as a high art as people were socialized, gathered and relaxed over these community centers.

Furthermore, public baths have been integrated into the social system as meeting points. Many ancient Greeks organized social events with their friends or colleagues, philosophers gave their declamations, even politicians attempted to get closer with their voters in order to influence them for their causes. Sometimes, these baths accommodated various other spaces, such as libraries as well as restaurants. Therefore it is obvious, that Greek baths became focal points for social and recreational activity. "Balaneion" and its architecture became a precursor for current spa centers, as we will conceptualize further on through the description of particular projects.

3.2. The significance of water. In many cases, architects achieve to integrate water into the built environment forming it in such a way that there is no discrimination between these two elements. Moreover, both of them, architecture and water, could motivate people to use their senses, as they create distinctive sights, sounds and touches. More specifically, sounds of water are variable; it could splash against things or could move around solid objects or it could even fall on a surface and create different forms every time. Additionally, it can offer some connections with nature or eliminate noises that are not desirable. In this case, when the sound of water is almost inexistent, people could

find emotional rescue and live some moments of relaxation and meditation. Victor Schaubberger, an Austrian naturalist, indicated this magical role of water in an undistributed environment, such as the Austrian forests, by spending many years observing them (Callum 1997). Furthermore, according to Thales of Miletus and Plato, two philosophers in ancient and classical Greece respectively, "water would be the start of all things". Rivers and projects with water features can be found in all cultures. Also, Stephen Crafti refers in his book *H₂O Architecture*, that the role of water is not just to impress visitors but when it is applied with skill and imagination, it can even strengthen architectural forms and provide environmental, social and economical benefits for the building's users (Crafti 2005). "Water can be experienced in a whole variety of ways. It creates different kinds of atmosphere and moods that appeal to our feelings" (Woodward 2005).

Finally, the reflection of water on different surfaces could give meaning to a building. It has the ability to add an element of imagination either by converting the solidity of a building material to a more temporary one, as well as it could fill shadows with light in many other cases. Therefore, it is clear that water's beauty is in its fluidity, transparency and reflexivity.

3.3. Waterworks contributing on sustainable tourism development. One of our main cooperations is related to touristic resorts, as various hoteliers assign us to design and apply sustainable solutions to them. We are aware that the tourism sector confronts many environmental impacts that occur due to climate change and decreased amount of natural resources. Therefore, it is urgent for this industry to start taking responsibility in order to implement environmental, social and economic sustainability. These distinguished resorts should be characterized of an excellent designed environment in order to respond to global tourism pressures and market needs. Also, they should contain leisure facilities, which incorporate features of natural beauty and satisfy visitor's preferences, who seek for a unique holiday experience. Water has been a prime motivator of leisure and we, as architects, should attempt to persuade the hotel shareholders that waterworks contribute at some point on the cooling effect and therefore should be integrated into our architectural proposals.

That is why we proposed diverse artificial water facilities for every studied project in order to apply cooling devices, which would produce better quality and more comfortable indoor and outdoor environmental areas. At this point it should be mentioned that this conventional environmental control for closed spaces is called *micro-space* environment creation while the placement of water facilities throughout outdoor spaces in order to create a wide range of thermal environments is called *macro space*.

Every project which is going to be analyzed has its own potential and our aim was to provide inspired solutions that fulfill the needs and wishes of both the customers and the hotel managers. In any case, all our architectural projects are characterized by a people-focused approach and highlight this relationship between the built environment and the natural environment with people's best quality of

life. Applying this natural element is essential, as water could invite someone to touch it. Also it could captivate the eye at a distance as well as it could provide a refreshing sense.

3.4. A channel of water in Lindian Village, Lardos, Rhodes. First of all we will analyze a channel of water 260 m long, which has been designed among various complicated architectural arrangements in a hotel complex called “Lindian Village” that is situated in a Greek island in the eastern Aegean Sea, Rhodes (Fig. 1). It was constructed in 2004 and was proposed not just for decorative and aesthetic reasons but also for environmental benefits. The channel takes advantage of the spring and summer breezes, which are frequent on the island, in order to improve the thermal comfort in the surrounding area.

Actually, we were aware that this channel of water could play a significant role in the landscape design of the project as it could be integrated among the proposed number of buildings constructed and present an intrinsic quality of movement and noise as well as of sparkle and coolness. Especially, as Rhodes is characterized of hot and dry climate, applying this water channel could offer either interesting walking and bicycle trails for people or even more a magnificent view which visitors could enjoy from their balconies.



Fig. 1. A channel of water in Lindian Village, Rhodes, Greece

Additionally, we were influenced of the fact that ancient Greek cities were mostly developed near water so that societies were able to benefit with access to trade not only of products but also of ideas, including language, writing and technology. Many cultural events were organized in the towns surrounding by those water features. Therefore, it can be mentioned that a channel of water not only played an important role in country’s geography but also could be the life blood in contemporary Greek civilization.

3.5. A water-wall in Oceania Club, Nea Moudania, Halkidiki. The second project which is going to be presented is a water wall designed in 2005 for a hotel “Oceania Club” situated in Northern Greece (Fig. 2). This external water wall, 15.50 m long and 12 m high, covers a high retaining wall and is directly revealed since it is a welcoming element for the guests visiting the swimming pools and at the same time it is a way to allow a cooling breeze to circulate.

In addition, it was designed to provide as natural a space as possible, where visitors could relax and at the

same time experience the various aspects of water, such as the swimming pools, the sea and the water wall. Also, the reflective quality produced provides a seductive logic and charm while at the same time it creates interesting sounds.

In terms of the cooling effect, it can be said that these types of water elements contribute on an improvement on the thermal comfort of the visitors. According to many studies water walls present a lower albedo than other building materials used. Therefore, they can play a key role in the overall design concept, especially in resorts situated in coastal areas as they could take advantage of the sea breeze effect too.



Fig. 2. A water-wall in Oceania Club, Halkidiki, Greece

3.6 Water features in Sani Beach Club, Sani, Halkidiki.

The next which will be analyzed is a project completed in 2010 which reveals the construction of a Spa Center in “Sani Beach Club” situated in Northern Greece. In this case, water has been used in the reception area of the center both for reference to the history of Spas in ancient Greece and also, for environmental purposes as it provides a spot of coolness and serenity for the visitors as soon as they enter the building. More specifically, water runs over a glass of 260 mm height and 360 mm width and forms rhythmic patterns by running down through the whole surface (Fig. 3).



Fig. 3. A water-wall in Sani Beach Club, Halkidiki, Greece

According to Greek history, in mid-2nd millenium BC many bathing practices such as small bathtubs, wash basins

and foot baths took place at Knossos, Crete as well as in Akrotiri, Santorini. Those public baths, which contributed on people's hygiene and relaxation consist the foundation for current modern spa facilities.

Furthermore, Hippocrates (460-370 BC), the most celebrated physician of antiquity, underlined the significance of thermal water for therapeutic purposes such as healing skin diseases as well as for relieving muscular and joint pain. Plato, a Greek philosopher, also believed in therapeutic benefits of hot bath and mineral waters.



Fig. 4. A pond of water in Sani Beach Club, Halkidiki, Greece

It has already been mentioned that “Balaneion” created the social and architectural context for one of the earliest forms of spa in ancient Greek civilization. Many social gatherings centered on these public baths. Subsequently, those communal bathing facilities that took place in ancient Greece, are exerted a formative influence in current development of spa centers.

Furthermore, a pond of water combined with native plants has been placed in the courtyard of the Spa Center (Fig. 4). It acts as a cooling zone to its own meso-space, which due to its evaporation achieves to lower the temperature of the environment. This is important especially during spring and summer periods, when the spa-center is open for the public.

Waterworks in this scheme achieve three goals; the first one is to enhance Spa Center's aesthetic appeal. The second goal is to make a direct reference to ancient Greek baths and the third one is to attempt to be a successful device of climate control.

3.7. Fountain in Sani Beach Hotel, Sani, Halkidiki.

In 2011, the Hotel managers of “Sani Beach Hotel” were looking for a new approach for the external area of the entrance of the Hotel. We thought up that an ideal solution that would work harmonically with the overall concept of the hotel would be a fountain on exceptional dimensions of 31 m long and 9 m wide with terraced levels that use recycled water (Fig. 5). Additionally, that would show the essential mobility of water and could be a symbol of what the visitors would expect to meet inside the Hotel. At the same time an improvement of the microclimatic conditions through evaporation could be accomplished.



Fig. 5. A fountain in Sani Beach Hotel, Halkidiki, Greece

In ancient Greece, cities such as Athens, Corinth used to develop various fountains. Those constructed elements were featured as terminating points of aqueducts that brought water down from mountains in order to offer drinking water. One example could be the “Enneacrounos”, a fountain built from the Athenian ruler Peisistratos, and contributed on providing better quality of water to local residents. Therefore, it can be mentioned that from a historical perspective, fountains used to play a significant role on improving the life of a community while in contemporary Greek architecture, those water features could contribute on successful and recognizable place or building making.

3.8. Ponds of Water and Green Wall in Sani Beach Hotel, Sani, Halkidiki.

Finally, in the recently renovation of the pool bar area in “Sani Beach Hotel”, we were influenced of the continuously growing need for sustainable tourism development and we proposed not only small ponds of water but also a green wall, that would be placed in a central point of the pool-bar area (Fig. 6). In this case, there would be opportunities provided for people's interaction and leisure while at the same time thermal comfort would be improved within the indoor area.

Moreover, our intention behind that project was to provide environmental friendly spaces that people could use as a meeting point and feel comfortable despite the high temperatures of summer periods. More specifically, we attempted to moderate extreme temperatures, by decreasing it approximately 5°C, in order to avoid the continuous use of the mechanical cooling system. Subsequently, that could contribute on energy savings as less electricity would be required. As the project has just been completed in April 2013 we cannot provide any quantitative data. However, we

could certainly assure the shareholders of the hotel for an expected reduction on energy consumption.



Fig. 6. *Small ponds of water and a green wall*

From the point of applying a green wall (Fig. 7) in the specific project, we could achieve to transfer features of nature, such as green plants, in the internal environment. Through that we accomplished to obtain environmental, recreational and healthy benefits for the Hotel's clients by enhancing air quality as well as by lowering temperatures inside the building during summer period.



Fig. 7. *A green wall in Sani Beach Hotel, Halkidiki, Greece*

According to available data that focuses on indoor air quality, it is essential for architects to choose materials which on the one hand would increase ventilation rates and on the other hand they would avoid common contaminants, such as VOCs, that are harmful for people. Therefore, that contaminated air should be replaced with fresher and cleaner air, where in our case that green wall containing a range of plants, could attain to that.

Furthermore, this green wall improves aesthetically the environment in order to satisfy the Hotel shareholders, while at the same time it improves the air quality in order to satisfy the visitors. The various plants applied could absorb carbon dioxide and replace it with oxygen through the photosynthesis effect. From a psychological viewpoint, many studies have indicated that visitors would take into account the presence of green plants in the indoor environment and would consider positively the benefits acquired. Subsequently, that would make them experience happiness, relaxation and a sense of desire to stay longer in

this area as well as to re-visit this destination, which was our primary intention. From the viewpoint of the hotel managers that would also benefit them as on the one hand this vertical wall could provide the maximum green space with minimum use of floor space and on the other hand the specific space would be more energy efficient as less air-condition systems would be used and that would reduce their operational costs. Also, they would provide more attractive and healthy living environment for their visitors as well as they would improve their environmental image.

4. Conclusions

As architects, we use materials and forms in every design proposed in order to communicate ideas and to create environments which encourage the interaction between people and nature. In reality, these materials and forms should highlight the significance of natural environment as well as accomplish welfare among people.

As has been outlined on all the aforementioned projects, water, as a natural material with invariable identity, could be integrated properly in our architectural designs and create unique environments. In addition both hoteliers and customers could realize its significant quality and the benefits acquired through it.

Water improves not only aesthetically the spaces but also contributes on the environmental performance of every design. Especially, it is essential to be applied when we attempt to improve the microclimatic conditions of a place. That would result to decrease temperatures and obtain thermal comfort as well as to promote communication and interaction among people because water could be featured as a meeting point. Actually, our aim should always be to provide sustainable solutions and create environments that enhance the social, cultural, environmental and economic aspects of each building's users.

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