



## WATER VALUED IN GREEN INFRASTRUCTURE DESIGNS AND HUMAN BEHAVIOURS: ECOCENTRIC VALUES AND THEIR ACCEPTANCE BY HUMAN BEINGS.

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### HIGHLIGHTS

- Humans like to have all senses contented, whilst navigating in urban space; senses are heightened especially when we come close to water.
- Human and natural systems blend in urban settings through a network of natural spaces.
- Integrated green infrastructure is able to maintain human physical and psychological health.

### ABSTRACT

Designers are anthropocentric in their processes and final products; green infrastructure in cities expresses people's relationship to the environment in terms of resource management primarily. The natural world is transformed into urban green arrangement for the economic and cultural benefit of humans. Most experts believe that by offering people the opportunity to participate in running and preserving certain ecosystems could have a very positive impact to human health and wellbeing. Environmental psychology suggests that we can provoke heightened experiences in people's minds by designing dynamic flowing water patterns and deep ponds. Designed landscapes have always blended with built manmade environment in a dynamic way. Natural and artificial landscapes interweave with built marvels of human creativity; historic places and urban areas develop and blend in harmony with natural habitat. Most historical cities emerged along water sources as dynamic ecosystems. The authors of this paper discuss the importance of water changing culture and behaviours in both urban and rural areas with reference to some noteworthy case studies and instances across Europe and, in particular, in recent cases of renaturation of rivers.

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## **1. INTRODUCTION**

Nowadays we believe that by integrating human and natural systems through a network of spaces in urban settings, we should be able to create perfect concepts and designs for the future of our cities; we create green infrastructure to maintain human physical and psychological health. We also propose ecosystem services which, for example, include biological treatment of stormwater and wastewater. As citizens we love urban agriculture along our streets and in our piazzas; we show a tendency to be immersed in a naturalistic setting. We like to have all our senses contented, whilst walking along our streets. Not only eyesight should be indulged by naturalistic artificial ecosystems, but also smell and taste. And, of course, our inner self dreams and rejoices when we come close to water; we start imagining water springing from the ground, running along rivers, forming lakes and reaching far away seashores.

It is the effect of well-designed green infrastructure that defines that feeling of happiness, relaxation and freshness in most urban spaces. Most citizens love countryside, but they are not able to have it every day. Certainly we should love to be always pampered in clean, warm or cool environment all day long. On the other hand, this does not happen, unless we decide to spend some quality time by enjoying daylight walks in green spaces or by spending time in other recreational activities in open green spaces. Nowadays our pace of life and how urban designers often design cities does not allow us to understand how ecosystems work in reality and, above all, how nature should be embedded in our lives by avoiding prejudices and unconscious fears.

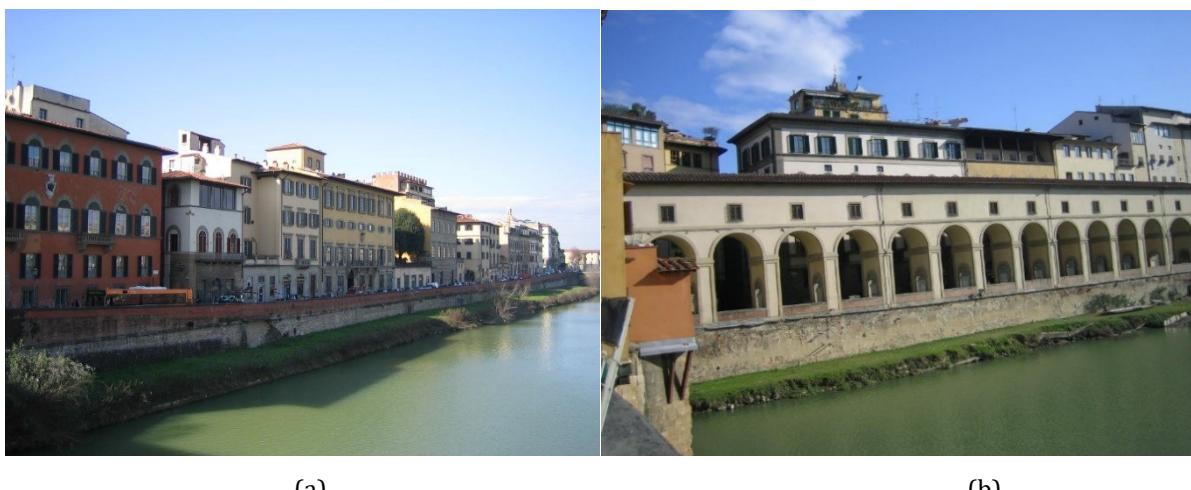
Designers are anthropocentric in their processes and final outcomes. Thus, green infrastructure in cities addresses pollution, habitat of some species, recreation, open space and urban form; it expresses people's relationship to the environment in terms of resource management primarily. This means that, through design, the natural world is rehabilitated into urban green arrangement for the economic and cultural benefit of humans. We profess green infrastructure by providing sound ecosystem services and by promising to preserve human benefits; experts believe that citizens are motivated to participate in the improvement and maintenance of civic landscapes when these latter contribute to the quality of life of the people living in proximity. But, how can we be sure that by providing systems which offer air and water quality, for example, we make the ethos of our designs transparent to all inhabitants? Hence, experts and scientists try to persuade people to participate in running and maintaining certain ecosystems, such as, for example, stormwater wetlands; science proves that this could have a very positive impact to human health and especially the human brain.

Scientists affirm that there is convincing evidence that cultural ecosystem services can be aesthetic and spiritual at the same time. There is belief amongst designers that people respond to landscape beauty and scale with admiration and respect. People love textures, colours, harmony, etc. in landscapes offered to them either as physical places or virtual reality environments (images, videos, etc.) Environmental psychology suggests that, by creating green infrastructure which can trigger memories and visions of landscapes in which we have already been (i.e. countryside walks, parks and historical enduring landscapes) or we have seen in photos and films and published in magazines, journals and books, we can stimulate heightened experiences in people's minds. For instance, landscape architectural design has the power to instigate experiences of cool, green colour of the forest and implicates humid, fragrant air. Landscape designers add sound and thrill by means of dynamic patterns of rushing water and especially fast-moving water and deep ponds. We stroll in a landscape made of sounds and views of running water and this reminds us immediately the image of a powerful river; we want the green infrastructure to lead us from places where we live to places like rough rivers and spectacular waterfalls. The experts believe that this heightened experience can be healthy and satisfying to all senses.

Designed landscapes have always blended with built manmade environment in a dynamic way. Architecture and engineering have already created an invaluable heritage and are still dynamically cooperating forming and developing further the future of humanity. Great buildings are frozen in time and still testimony of people's endeavours in arts, design, architecture, engineering and urbanism. Thus, natural and artificial landscapes interweave with built marvels of human creativity; historic places and urban areas developing from and around green infrastructural designs manage to blend in harmony with natural habitat. Most historical cities emerged along water sources. Especially water has been always their aid and positive associate by helping their inhabitants with their trades and economic growth. With time passing by, both cityscapes and landscapes underwent often substantial alterations, not always to their benefit. Although efforts are made to preserve the original configuration of green spaces and water assets supporting cities, sometimes engineering works, such as the construction of canals and flood defenses might have altered both the built and natural environments in such a way that, people could feel disaffected and thus, their reaction could be abandoning the places where their ancestors and they used to live. Today designers and engineers try to recover and/or restore cityscapes and landscapes through *renaturation* of the rivers; this is something which is proved to be a success not only in inner-cities, but also along historical riversides and also across discharge areas for the excess of the flows of the rivers.

## 2. HISTORICAL URBAN AND RURAL LANDSCAPES ALONG WATER COURSES

Since late medieval and Renaissance times many European cities, such as Florence, for instance, based their growth and welfare of their citizens on uninterrupted water availability for their textile and leather trades; most buildings emerged almost at the edge of the banks of the torrents feeding the Arno River or the ditches surrounding the city walls. The built setting not only spread out, but also managed to embrace the river itself (Fig. 1).



**Figure 1:** Florence, Italy. (a) Arno River-view from Ponte Vecchio Bridge (towards South). (b) Vasari's corridor along Uffizi Galleries. *Source: © the author-Eleni Tracada*

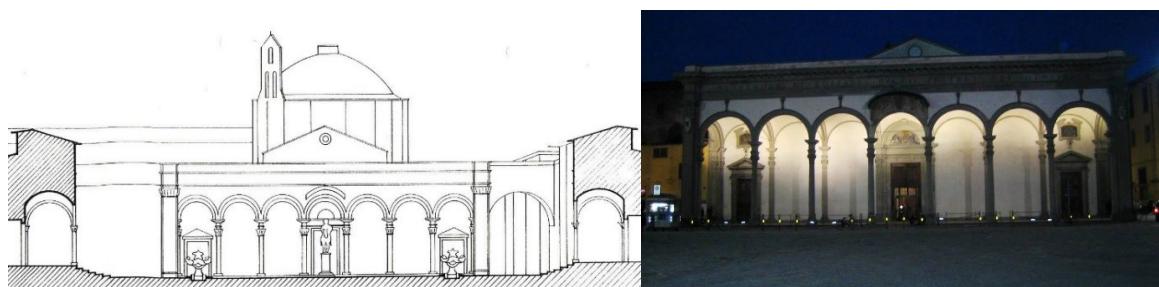
In the case of Florence, for many centuries the banks of the river were used for recreation, whilst grey (and perhaps extremely polluted) water from textile and leather manufacturing was released unremittingly in it. Then again the banks of the same river were clean and full of wildlife before crossing

the city of Florence and joining the drainage system of its soiled ditches. This can be also seen in Leonardo Da Vinci drawings (and, further on in time as well), such as his *Il Paesaggio con fiume* (19x28,5 cm), dated 1473 and preserved in the Cabinet of Drawings and Prints of the Uffizi Galleries in Florence. The exact date on this drawing is 5th August 1473; perhaps it is the first drawing dated by Leonardo. In addition, this drawing is considered as the first one in Western arts as illustrating a pure landscape. And, as such, it was treated by Leonardo himself as a separate and distinctive theme, thus, detached from sacred or profane themes and imagery; it was simply a celebration of a powerful river flowing in a splendid landscape (Fig. 2).



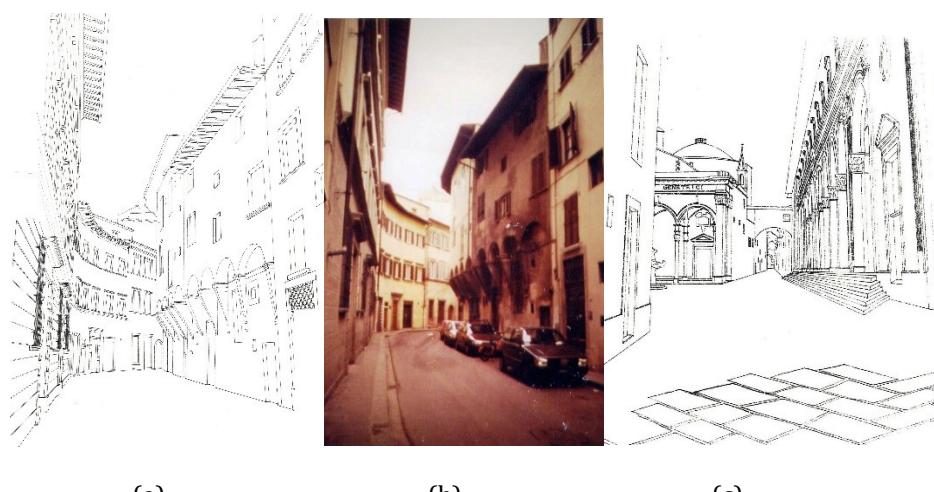
**Figure 2:** Landscape in the Arno River Valley (*Paesaggio con Fiume*) in the *Gabinetto dei Disegni e delle Stampe* in Uffizi Galleries, Florence. Source: By Leonardo da Vinci - Galleria degli Uffizi, Public Domain, <https://commons.wikimedia.org/w/index.php?curid=2835301>

the modern city in expansion). The shape of the flow of this ancient torrent in the Fibbiai and Castellaccio streets form and flows of pedestrian or vehicle traffic, whilst the discharge area became one of the most famous piazzas of Florence to the north of the Cathedral (Fig. 3).



**Figure 3:** Cityscape formed by the Mugnone Torrent, once surrounding the first defense walls: the discharge area in front of the Santissima Annunziata Church. Source: © the author-Eleni Tracada

The flow of the river changed, but the width of its original bed and banks is clearly visible; the long-standing houses along one side of the Castellaccio Street still face this space as if they were overlooking the once flowing waters underneath (Fig. 4). And in the underground basements (once at the same level with the upper parts of the banks of the Mugnone River) of these houses, , one of the authors (whilst studying and practicing in Florence some decade ago) found and noted some old wells surrounded by walls, once including courtyards and shaded agricultural gardens. This was a thriving area once in which most major religious institutes, hospices and a hospital developed, still a strong centre engaging with arts, festivals, vintage eco-products markets and University of Florence institutes. Today we find out that this area has been somehow neglected and needs more attention and care.



**Figure 4:** Cityscape formed by the Mugnone Torrent: (a), (b) Castellaccio Street, (c) Fibbiai Street view towards the Santissima Annunziata Church and Piazza. *Source: © the author-Eleni Tracada*

However, at times rivers and large water sources became malevolent elements, and of course when their inundations can destroy entire cities. By living, studying and working in Florence for many years, one of the authors believes that the Arno River is still a wild creature of nature, ruling the entire territory from the mountainous northern Tuscany up to the seaside. Although today there are still people who remember the great devastation that the river triggered in 1966 with his water inundating the entire plane inside and outside Florence, they also treasure and love this course of water. The water in this river has been always the central character of an everlasting drama in which people and nature cooperate and act as one dynamic ecosystem. For instance, bridges (like the Ponte Vecchio Bridge) became famous all over the world in good and bad times, during celebrations in Medieval and Renaissance times and ferocious inundations, with one of the first ones occurring and having been recorded in 1333; its signs are still visible along the stone walls as an etched line. In good times the ancient Ponte Vecchio bridge becomes a relaxing part of the promenade heading from the ancient centre towards the Boboli gardens (which were created in Renaissance times), one of the most beautiful green parks of Renaissance and beyond. As students of architecture in Florence, once we used to walk along this route to reach the gardens, relax, think, and be inspired, whatever the weather. The gardens encompass artificial ponds, fountains and grottos. Boboli Gardens' wells and nearby fountains at the corners of the streets or in piazzas are still fed by Arno River's water (Fig. 5)



(a)

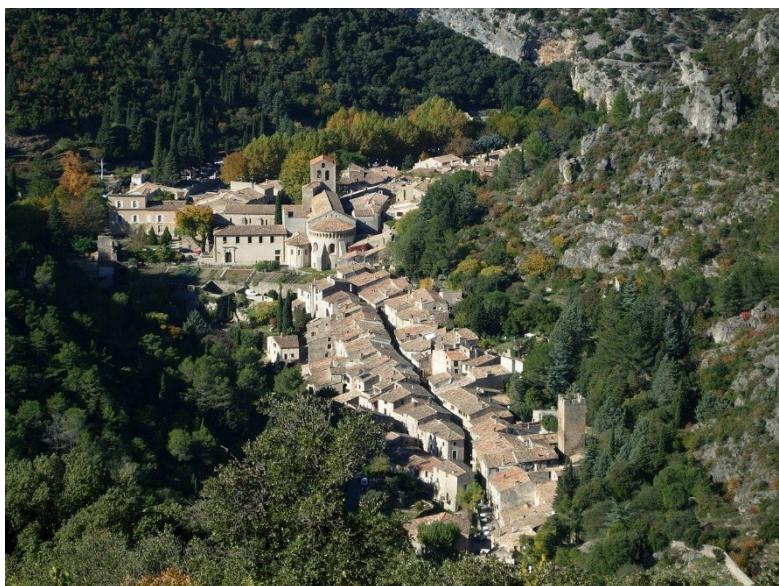
(b)

**Figure 5:** The Arno River effect on the City of Florence green infrastructure:

(a) Bernardo Buontalenti's corner fountain. *Source: © the author-Eleni Tracada*

(b) Perseus and horse, Boboli Gardens, Florence. *Source: I, Sailko, via Wikimedia Commons*

### 3. CONSERVATION AND 'RENATURATION' OF HISTORICAL AND CULTURAL LANDSCAPES



**Figure 6:** The 'Saint-Guilhem-le-Désert - Gorges of Hérault' classified site-Aerial view. *Source: The Grands Sites de France network at <https://www.saintguilhem-valleeherault.fr/en/the-grand-site-of-france>*

As we have mentioned above, existing or recently restored green infrastructure can lead us to great buildings and through the cultural landscape. Art and religion and culture prosper together when embedded in natural ecosystems as a source of amazement, creativeness, peace and replenishment. This happened to one of the authors in Florence years ago and in recent years in France in a remote historical village on the mountains; that is the medieval settlement of Saint-Guilhem-le-Désert. In the heart of the Hérault Gorges, in the Val de Gellone, the medieval village of Saint-Guilhem-le-Désert is in a green setting along the meandering Verdus stream. Its houses are ordered and arranged tightly together in ancient alleyways. Built around the Abbey of Gellone, the village has kept its impressive

medieval imprint and constitutes a rare, harmonious heritage site in Languedoc. Saint-Guilhem-le-Désert is a classified site, and one of the most beautiful villages in France; its abbey is registered as a World Heritage Site by UNESCO in conjunction with the French section of Saint James' Way to Santiago de Compostela in Western Spain (Fig. 6).

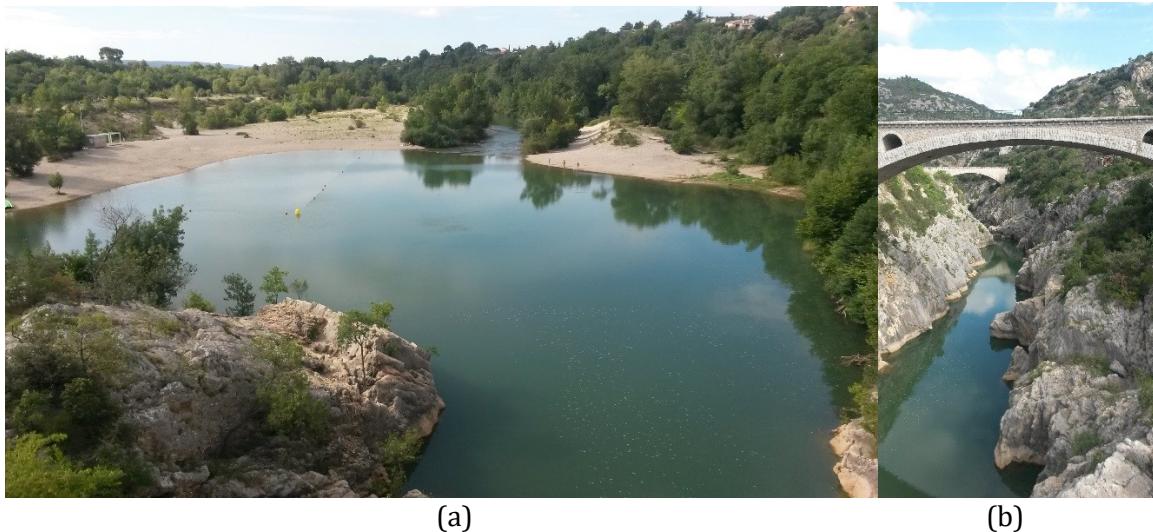
The 'Saint-Guilhem-le-Désert - Gorges of Hérault' classified site is situated in the valley of the river Hérault approximately 40 km west of the City of Montpellier. The entire heritage or classified area consists of five municipalities: Saint-Guilhem-le-Désert, Aniane, Saint Jean de Fos, Montpeyroux and Puéchabon. In this area extending from the hills of Saint-Guilhem-le-Désert, joining the Hérault Gorges and Languedoc Piemont, an agricultural zone characterised by vineyards and olive groves, we can see impressive landscapes and architecture. Few miles down the valley from the medieval village of Saint-Guilhem-le-Désert we find *Pont du Diable* (Devil's bridge) on the Herault River and the Clamouse ancient caves. Twenty years ago the local authorities decided to set up a 'Classified Site plan' by considering the large numbers of 650-700 000 visitors per year; the intention was to improve facilities at first. The administration has already carried out improvements, such as a welcome centre at the Pont du Diable, a shuttle system connecting the bridge with the village of Saint-Guilhem-le-Désert during the summer, and restoration works on the alleys and squares of the villages. In 2010, the Hérault Valley municipality, administrators of the Site since 2002, received the accreditation 'Grand site de France' (Classified Site) from the government. A long-term management plan has been put in place to ensure that 'Saint-Guilhem-le-Désert - Gorges of Hérault' is a site managed sensitively, being both welcoming for its visitors and preserving its heritage. The Grands Sites de France network was created in 2000 and today brings together 37 Grands Sites that include exceptional, protected and listed cultural landscapes. All the site managers in this large network share their belief in sustainable development and transmit 'the sense of places' that is specific to each Grand Site (Fig. 7).



**Figure 7:** The 'Saint-Guilhem-le-Désert - Gorges of Hérault' classified site- the Abbey of Gellone. Source: © the author-Eleni Tracada

By getting inspiration by its nickname *Le bout du monde* (=the end of the world), the author felt that there was some cultural and physical landscape affiliation to what Dante Alighieri described as *Inferno* and especially as *Purgatorio* within a mixture of natural and manmade ancient and new landscapes. the

author stayed there with her students and students and staff from other European countries. All students were selected for the international research project Dance Architecture Spatiality (2012-2014). Our students were stimulated by both historical built and natural or artificial green infrastructure of this village; they created drawings, music, poetry and performances. The author felt enchanted by all places inside, above and around the village. At the time the author's imagination was triggered by inspiration to feel and write. That scenery created by a powerful river running through a deep valley for many centuries has triggered human fantasy, skillful narrative and legitimate awe to the author and scholar. At the end an entire chapter published in a book (Dance Architecture Spatiality- Saint-Guilhem-le-Désert 2014) made connections between humanism, urbanism and cultural renaturalised landscapes, such as this powerful Grand Site complemented by *Pont du Diable* (=Devil's Bridge)(Fig. 8).



**Figure 8:** The Herault River under Pont du Diable: (a) The view from the central part of the bridge looking towards the renaturation area of the river. (b) Pont du Diable and the entrance to the 'Purgatorio' valley. Source: © the author-Eleni Tracada

During the author's stay to this superb village, she, her students and her colleagues had the opportunity to wonder along its narrow streets and constantly gaze towards the heights of the surrounding hills and mountains. They were listening to the sound of rushing water even during the rain falling on the brick roofs and washing walls and streets. The water was running everywhere: along the main river, in smaller streams under houses and churches. Water flows into pools and fountains along the narrow streets and inside the courtyards of the ancient monasteries. There was some sort reluctance in the author to try to climb towards the high and steep crests of these ancient advances of prehistorically melted rocks, which stemmed gorges and currents of the ancient river below. She was always tempted to stay in contact with the flowing water and feel moistening smells and textured walls washed by water running or filling shaded spaces and basements. When she was in Florence she had come across an inscription on a wall which was just lines from Dante Alighieri's 'Purgatorio'; the famous Florentine poet described the Arno River as central part of his Purgatorio space, hanging between Hell ('Inferno', thus, above the eternal fire in the heart of the earth) and Paradise (the heights of heaven on the top of the mountains with the route to salvation, such as the route to Santiago da Compostella, starting the Devil's Bridge). In fact the water shapes the entire village of Saint-Guilhem-le-Désert, its architecture and surrounding natural landscape. The water becomes central to the culture and the emotions and inspirations of all visitors, not only the inhabitants of these places (Fig. 9).



**Figure 9:** Saint-Guilhem-le-Désert – Water shaping architecture and landscape by the Abbey of Gellone. Source: © the author-Eleni Tracada

Saint-Guilhem-le-Désert grew around Gellone Abbey and near Pont du Diable (=Devil's Bridge). The road crossing the village extends towards that bridge and continues along it; it offers the pilgrims spectacular views downwards to the gorges of the Hérault River below. The water is a powerful element in the entire landscape and, according to seasons and weather conditions, it emerges, runs, jumps, hides underground, tumbles out again and deepens under the Devil's Bridge, till it finds a reasonably peaceful exit towards the plane and finally reaches the sea. However the most fascinating part of the landscape is *Le Bout du Monde* (=the end or edge of the world), the dominant path that crosses the village starting from an area that the author felt as the border between Limbo and the ascent towards the redemption of both body and soul. It happens that the path coincides with the famous holy route known as the Camino de Santiago de Compostela. Thus, the route crossing Saint-Guilhem-le-Désert and the mountainous area above it, is part of the *Camino* (path/route) and, as such, it embraces tradition, rituals and myths of an era during which Guilhem, Charlemagne's cousin, became a saint; perhaps poems and music were performed many times along that route by blending with the sound of rushing water. The fact that the route reaches the heights above the village via Devil's bridge may give us the sense of an entry to a purification area (some kind of 'Purgatorio') inside the deep valley, the so-called *Le Bout du Monde* (= the end of the world), whilst the damned go to the underground and disappear. Metaphors and myths intertwine with religion and the outcome could be spiritual contemplation and/or artistic inspiration. In this case, the cultural existing ecosystems have an immediate impact to us who experience the natural world with our senses and appreciate it with our minds. Visual perception dominates our sensory experiences; nature rewards us with everlasting stimulation and contributes to our health and creativity at the same time, whilst all other senses are triggered as well. Some elements of nature are more powerful than others; that is the water in all seasons, in all kinds of landscapes as the ones we have already mentioned here.

## 5. CONCLUSION

Metaphors and myths intertwine with religion and the outcome could be spiritual contemplation and/or artistic inspiration. In this case, the cultural existing ecosystems have an immediate impact to us who experience the natural world with our senses and appreciate it with our minds. Visual perception dominates our sensory experiences; nature rewards us with everlasting stimulation and contributes to our health and creativity at the same time, whilst all other senses are triggered as well. Some elements of nature are more powerful than others; that is the water in all seasons, in all kinds of landscapes as the

ones we have already mentioned here. By thinking at the Florentine cityscapes and landscapes, renaturation should extend far beyond the centre of the city not only towards the valley, but also reaching the mountains where a powerful Arno River finds its water, from the mountains and heights of Paradise to the Purgatory of the valley and the final liberation to the sea. In few words all works and interventions should extend to a larger territory in order to avoid painful disasters of floods, just as Leonardo had planned and designed them centuries ago.

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