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THE INVISIBLE LANDSCAPE OF ENERGY TRANSITIONS HYDROPOWER EXPLOITATION OF THE PIAVE RIVER BASIN

Energy transitions and the territory: landscapes of energy - The current energy transition towards renewable energies, established as one of the Kyoto strategies for sustainable development, has been afflicted by contradictions and opacity. These contradictions undermine, if not the whole process, certainly parts of it. In the cognizance that the energy transition is not only desirable but also inevitable, it is necessary to shed some light upon these contradictions so as to make the transition more transparent, more democratic and more wholly sustainable. In this debate, the landscape sits in a very significant place and has the potential to make some of these contradictions emerge. Many people think about the landscape as the bearer of values that are considered to be in danger because of the development of renewables, as demonstrated by the many battles waged against wind farms, or, more generally, fought for a better relationship between the energy infrastructure and landscape. Still, some scholars who initiated the concept of the landscape of energy are calling upon the landscape today as a possible instrument for the better governance of this transition (Nadai e Van Der Horst, 2010). Thinking about the *landscape of renewable energy* has the aim—and we share it—of highlighting the undervalued and ignored interdependence (Puttilli, 2014) between the energy systems and the territorial ones, and of laying the foundation for developing renewable energies within a more democratic framework¹. If using the landscape concept appears obvious in a case such as that of *hyper-visible* wind farms, does it still make sense to talk about the energy landscape when energy transformations are a lot less visible (i.e. micro-hydroelectric, biogas, etc.)? Is the landscape concept still useful even when energy transformations are deep yet invisible? What relationships exist between the level of visibility/invisibility and the effectiveness of the landscape concept?

¹ The international research project «Ressources paysagères et ressources énergétiques dans les montagnes sud-européennes. Histoire, comparaison, expérimentation» in this field involved researchers from different European universities and research units—ADESS and CEPAGE in Bordeaux, HEPIA in Geneva, the University of Granada and Iuav University in Venice—within the French national research program «Ignis mutat res». See please Briffaud et al., 2014; Briffaud and Ferrario, 2015. The Italian research group, involving the present article's two authors, studied the Piave river basin. For a deeper analysis of the role of landscape in energy conflicts, please see the work of Ferrario and Castiglioni (2015), which can be considered a premise of the present one. This paper stems from the common work of the authors, but Viviana Ferrario wrote paragraphs 1, 3, 4, 5.1 and 5.2, while Benedetta Castiglioni wrote paragraphs 2, 5.3 and 5.4. The conclusions in paragraph 6 were written commonly.

The objective of this article is therefore to explore more deeply and more incisively the possibilities and advantages of using the landscape to interpret the impact of energy transformations on the territory, trying to focus on not merely visual content—what we call *landscaping*. In the pages to come, we will argue that it would be useful to get to know the *invisible reach* of the landscape, too. In particular, we find that exploring the connection between visibility and invisibility can contribute to the debate about renewable energy sustainability, including social and environmental acceptability and their contradictions.

Among the different forms of energy registered as renewable, we will deal with hydroelectricity, as it seems particularly apt for our purpose: on the one hand because visibility/invisibility characteristics reach extreme levels (as we will demonstrate later), and on the other hand because hydroelectricity has already been the protagonist of a previous energy transition, deeply transforming the landscape and spatial relationships during the past century².

Our case studies are situated in the upper Piave basin, one of the most exploited rivers in terms of hydroelectricity in all of Europe. During the 20th century, the exploitation of this river culminated in the building of the Vajont reservoir, which ended in a well-known catastrophe. Today, the Piave basin is again under a new intense development of renewable energies (microhydroelectric), stirring up some other serious sustainability issues.

Visible/invisible in the landscape - Associating the landscape with invisibility may seem to be an oxymoron. The landscape, in fact, refers to the sensible or perceptible portion of land—that is to say precisely, the visible component—considering that humans use their sense of sight as a primary instrument of perception. However, invisibility exists, is well represented in the landscape and is part of its very existence, as if the visible and invisible dimensions were two sides of the same coin.

We can identify two different invisibilities inherent in the landscape concept. First, it is necessary to remember that the landscape includes not only the materiality and physicality of the visible but also the meanings and values that the observer attributes to the materiality. The ‘landscape wit’, as it is known, lies precisely here, in the designation of ‘both the thing and the image of the thing’ (Farinelli, 1991). Meanings, value attributions and images, although originating from material and visible signifiers, belong to an immaterial dimension that is not caught directly or through sight or other senses. This

² In 1954, Lucio Gambi, in a report on the XVI Geographical Conference trip to the hydropower plants of Cadore and Trentino, highlighted the connections and contradictions among the very visible new hydroelectric landscapes (the reduced flow of rivers downstream, lakes, dams, pylons) and the economic and social dynamics of the valleys concerned, in conflict with ‘the great industrial barons of the plain’ (p. 228). In this reading, which goes far beyond the technical aspects of what we now call the energy landscape, Gambi finds ‘the geographer’s function in the planning field, and in this case in the hydropower planning’ (ibid.).

"invisible component of the landscape" constitutes an essential part of the construction of the sense of place, through the inhabitants' experiences, memories and narratives (Ryden, 1993).

A second invisibility concerns the relationship between landscape and territory, that is, between the landscape itself and the factors and territorial dynamics that have given rise to it and shape it continuously. 'All this is an invisible dimension of the landscape (...) it is the invisible landscape that lies beneath the visible landscape' (Turri, 2004, p. 74). The action of natural factors and, even more, the sedimentation of historical events and practices that over time have contributed and still contribute to shaping the landscape are not directly visible: the landscape itself allows them to be recognised only to a degree. It can convey the clues and traces of these dynamics, and with its forms it can allow going back partly to the causes that produced it. However, what is visible by itself will neither return to the landscapes of the past in their features nor the complex interweaving of dynamics by which these features have been derived in the course of time. Geographers in the past have dealt with this issue several times, with different points of view. According to Sestini, the concept of the 'rational geographical landscape' encompasses not only the 'sensible geographical landscape' but also the landscape 'factors' (Sestini 1963, p. 10). Meanwhile, Gambi warns against the possibility of knowing the geographical facts only through the visible landscape; we also need to be supported by another analysis—in particular, a historical one (Gambi, 1961).

The two aspects of landscape invisibility outlined above are both suggested by Turri in a central chapter of his essay *Il paesaggio e il silenzio*.

Turri reminds us first that 'we see the landscape—which we want to see, that does not disturb our idea of landscape' (Turri, 2004, p.79). In other words, we see only what is consistent with the way in which we interpret the territory and what fits with our projects. Thanks to the filters of perception (intangible, invisible) and to the *modèles paysagères* that shape our representations of the world (Luginbuhl, 2012), 'in the landscape there is always a mystifying dimension that makes it a category of our aesthetic participation in the world more than of our knowledge of reality' (Turri, 2004, p.79).

If this first remark concerns *seeing* the landscape, then the second deals with *building* it. Referring to the set of processes by which the landscape originates, and with special attention to their cultural and political components Turri reminds us that 'the landscape can be built to say different things than you would expect knowing the society that expresses them. With the landscape you can lie, you can represent what you want, setting it up as a stage destined to theatrically tell what society thinks is right and appropriate' (ivi, p. 81). Because these processes can occur with a greater or lesser degree of awareness, this emphasis certainly imposes reflection on the decisional processes and the power relations that underlie the construction of landscapes.

In light of these considerations, if it is true that ‘all research on the landscape can be a search to uncover what is false, what is invisible in the visible, or to make sense of the invisible through the visible’ (ivi, p. 82), the exploration of certain categories of invisible landscapes (par. 4) and the reading of some cases involving the invisible dimension (par. 5) will help us to better understand some of the key issues related to the hydropower exploitation of the Piave basin as well as their implications in ecological, spatial and social terms. At the same time, we will test the heuristic effectiveness of this approach.

3. Hydroelectric landscapes in the Piave River basin

3.1 Landscape and hydropower

The relationship between the development of hydropower and the landscape has been studied under various points of view. The focus has primarily been on the hydroelectric infrastructure, with researchers studying their singular ability to alter and simultaneously reveal the original features of the landscape (Selvafolta, 1998) as well as produce new landscapes, precisely the ‘electric landscapes’ (Pavia, 1998). Temporal distance and the new cultural values attributed to hydroelectric infrastructures and landscapes have fuelled a special attention to their transformation in a cultural heritage (Fontana, 1998; Varaschin et Bouvier, 2010; Rodriguez, 2012). This fact does not cloud the problem of landscape impact and conservation conflicts, which has been an object of lively discussions since the beginning of the development of hydroelectricity. The landscape was, and still is, ‘the background and the subject of a strong comparison, becoming one of the recurring images of the fracture that, at the beginning of the century, seemed to have definitively separated the past from the future and made the present uncertain’ (Caravaggi 1998, p. 97). As long as the opposition is perceived mainly in terms of aesthetics and culture, it can be answered simply by demanding a better landscaping of hydroelectric projects (Parpagliolo, 1923). However, as soon as the conflict stops being strictly visual and moves on to environmental compatibility, it seems to become substantially insoluble (Sognini, 2006). To get out of this impasse, it is necessary to explore the relationship between electric landscapes and territory design, with the aim of paving the way for a reduction in the growing estrangement between energy projects and land policies (Pavia, 1998; Briffaud et al, 2014). These inputs lead us to observe from a different angle the hydroelectric landscapes of the Piave River in order to delve into the contradictions that have characterized and continue to characterize the production of hydroelectricity in the Alpine region.

3.2 Hydropower landscape of the Piave River basin

In comparison to other rivers of the Alps, exploitation of the hydroelectric potential of the Piave River started rather late. Only in the early 20th century, in fact, did we find documented the first small

hydroelectric plants along the river's course and along one of its tributaries. More industrial hydropower development became systematized only in the period between World War I and World War II, following the coming into being of the Adriatic Society of Electricity (SADE), which acquired existing plants and built more of them through its subsidiaries. This is the case of the project involving the waters of the Piave River entering the Santa Croce Lake, which was transformed into a seasonal reservoir, for exploitation along Lapisina valley; this was done in order to supply electricity to industrial electrochemical plants being developed in Porto Marghera. Well known are the interactions among SADE, the Venetian chemical plant and the financial world of Veneto (Reberschak, 2004) that would lead to the construction of a regional monopoly similar to those that were forming in the same decades in other parts of the Alps (Baron, Galasso, 1993). After having abandoned plants and expansion in the region of Istria, which was lost after World War II, SADE turned more decisively towards the upper basin of the Piave to achieve the overall design for energy developed in the 1930s. This was defined using an expression similar to that of the contemporaneous reclamation of the land: 'full exploitation' (EDIS, 1929). Within this ambitious project (Fig. 1), the Vajont dam was to become the greatest among the reservoirs of this system. The tragedy of October 9, 1963, would stop its development.

This extensive project radically changed the mountain landscape, both directly, by introducing new elements (penstocks, power stations, siphons, water towers, reservoirs), and indirectly, through the transformations produced within the local economic structure (Briffaud and Ferrario, 2015).

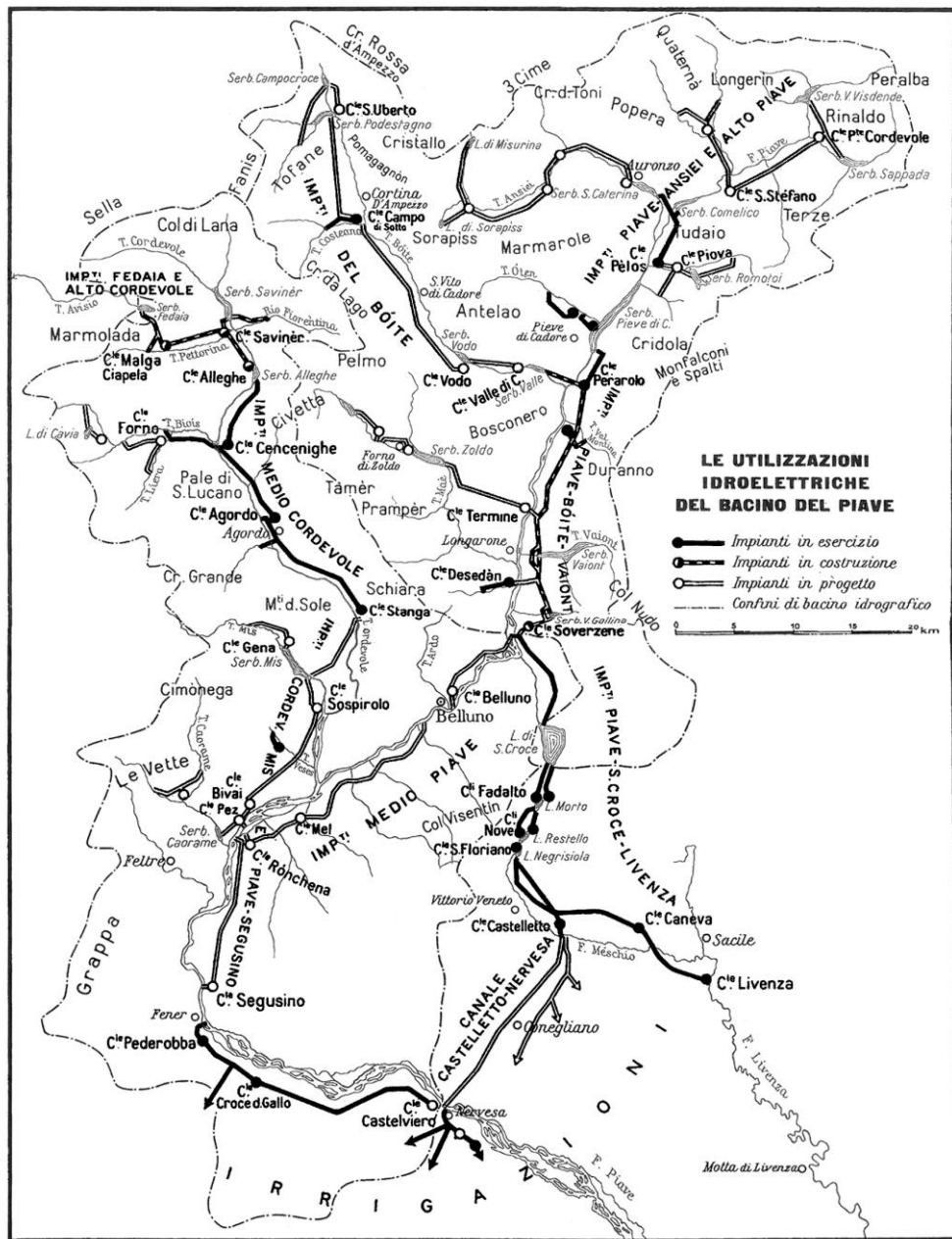


Fig. 1 - The hydroelectric system of the Piave in the vision of its founder, Ing. Carlo Semenza, director of the Projects Section of SADE. This scheme, which includes both the systems made and those in progress, is accompanied by an essay by Semenza that opens the new edition of the Alpine guide by Antonio Berti dedicated to Eastern Dolomites, published by Club Alpino Italiano-Touring Club Italiano, (Semenza, 1950).

The apparent stillness that followed the Vajont catastrophe was finally broken in the XXI century as a result of incentives for and policies regarding the production of electricity from renewable sources (Directive 2001/77 / EC, Legislative Decree 387/2003), which attracted private and public investors.

At first sight, the development of mini-hydroelectric power may seem very sustainable because of the small scale of installations and their wide distribution over the territory. In fact, their effect is not negligible in environmental terms: Subtracting water from long stretches of rivers and streams, the so-called ‘control units’ alter the natural habitats of the secondary valleys (often of great natural and scenic beauty) (CIPRA, 2005 Alpine Convention, 2011).

In a short period of time, small-scale hydropower has spread very quickly, superimposing a new layer on the hydroelectric landscape of the 20th century. The incentives have allowed us to overcome what has seemed to be the maximum exploitation of the Piave River basin. However, as can be seen from the data of the Energy Plan of the Veneto Region (Veneto Region, 2014), the total production of energy from micro hydro is negligible compared to the regional energy balance of the renewables.

The story just told is not linear. A closer examination of the events that have taken place and the consequent territorial transformations reveals numerous opacities, which we will try to unveil in the following paragraphs.

4. Invisible landscapes: a classification

On the basis of investigations carried out in the study area³ in this section, we will identify and present, with the aid of some examples, four types of invisible landscapes of hydropower: the hidden landscapes, the erased landscapes, the never-built landscapes and the ‘reciprocal’ landscapes.

4.1 Hidden landscapes

The reach of the most typical and the most basic invisibility of the hydroelectric landscape is certainly underground: Most of the hydroelectric systems go into the ground, and only some of the network’s elements come to the surface. Many power plants built in the 1950s and 1960s, including the Soverzene plant, in which the waters of the Vajont should have been channelled, are in caves and are therefore almost completely invisible. Surface waters are swallowed by derivations and pipelines kilometres away, often following paths that lead to other valleys in other sub-basins. A typical case is that of the waters of the river Boite collected in the artificial lake of Vodo, which are carried to the valley of another tributary of the Piave, the Mae, to be turbinated there. In the case of the Piave River basin, the network of underground pipes of this large hydroelectric system has a total length of 200 km. On the other hand, the process of bringing underground long stretches of surface water, thus removing it from its normal course, is anything but an innocent operation in environmental terms. Also, in smaller rivers, the simplification of habitats resulting from a drastic reduction in the amount of water in

³The Italian research group within the ‘Ressources’ project worked with different methods and tools: field work, archive work (municipal archives, the General ENEL Archive, Istituto Luce, etc.), policy and norm analysis, and interviews with the main stakeholders.

the river beds, which are generally very rich in biodiversity, are today at the centre of disputes that oppose the companies promoting micro hydro and the environmental groups.

If in many cases the hidden hydroelectric landscape is invisible simply because it is underground, in other cases, the choice is not exclusively a technical one—that is, determined by the availability of a particular technology or the unavailability of space. Sometimes, especially in the case of some plants built in caves, (such as the third-generation ones in Val Lapisina, built after the Vajont disaster), the choice seems to be influenced by a desire to hide an installation, essentially making it invisible in order to increase its acceptability (Ferrario and Maris, 2014).

A similar desire to hide is also found in another strategy used to increase the acceptability of the installations, which is based on the idea of masking, both in the sense of disguising and to camouflage. The dam of Santa Caterina in Auronzo is masked, as we shall see later. However, the recent finishes of the small hydropower plants with ‘local stone’ or with *beton brut* follows the same strategy of camouflage, understood in a purely aesthetic view (see par. 5.3).

Finally, in the Piave River basin are hidden landscapes that are simply withdrawn from view and made inaccessible. This has been done for technical reasons (in the case of the Comelico dam, bypassed in the 1980s with the tunnel of the same name, now accessible only to the National electric company workers) but also, much less innocently, for political reasons, as that which happened after the Vajont catastrophe. In the small villages of Erto and Casso, there was a precautionary uninhabitableness statement and consequently forced evictions. This may reflect a desire to disperse a potentially awkward testimony of survivors.

4.2 Erased landscapes

Other invisible landscapes typically related to hydropower are those that hydropower development itself has deleted: villages, mills and sawmills, meadows, pastures, huts, roads and trails, and whole valleys flooded by an artificial lake. Again, this is not a simple stroke of a pen without friction and without consequences: around each of these erased landscapes, there is a conflict with the owners of the land, there is an economy that needs to be restructured, there are new economies—sometimes tourism—who are born, and there are new players entering the game. The cancellation, however, is never perfect and leaves traces, tangible or intangible. The first are those that Corboz (1998) mentions as being left by the inhabitants of a territory, when ‘they erase and rewrite incessantly the old incunabula of the ground’; the second remain imprisoned in archives and old photographs, with which we often make comparisons, inevitably substantiating each time damage was done to the territory, or the embellishment that the artificial lake produced.

The idea that man knows how to make the best of nature, sometimes explicitly and sometimes less so, traverses the history and geography of hydropower. This idea is often used to legitimise those changes that are considered acceptable and indeed all the more desirable, as they are able to improve the aesthetic of the existing natural landscape.

‘To the hydroelectric plants is often directed the accusation of bringing harm to the economy and to the landscape of the mountain: this is largely unfounded and always exaggerated in comparison to the reality (...). From the point of view of the landscape, in the face of undeniable disfigurements, yet usually non-important and largely curable over time (such as landfill material from the tunnels), new elements are of considerable touristic interest, such as reservoirs, dams, new roads etc. Care should be taken by the builders, for the respect and affection that we have for the mountains, to harmonize with the landscape, to the any possible extent, the new buildings. As for myself, I think I feel strongly this duty since within me, the two natures of technician and mountaineer coexist. I humbly ask forgiveness to our mountains if sometimes I could or knew not how to get a satisfactory result’ (Semenza, 1950, pp. 15-16).

We are talking about expected deletions and calculated losses, at least by the main actors of these territorial transformations. Uncountable are instead the landscapes erased by hydroelectric disasters, such as the Longarone area after Vajont.

4.3 Never-built Landscapes

A third type of invisible landscape is represented by the many conceived and never-realized hydropower projects. In the Piave River basin, many projects have been shelved since the shock of the Vajont disaster, others for their lack of feasibility or convenience. Almost all plants that Carlo Semenza indicates as unrealized (map in Fig. 1) are still in draft form, but as a whole, they embody what at that time seemed to be the maximum exploitation of the Piave River. These landscapes never became visible and often remain an expression of a tough battle that those who were opposed to the project won. The unrealized reservoirs of the high Piave—Val Visdende Romotoi, Campo Croce and Botestagno—have been at the centre of harsh disputes that have managed to slow things down until a different course of history removes the ‘danger’.

‘Invisible’ refers not only to never-built-projects but also to ones that are not yet built but are already under concession. In Italy the concession of water-branching for hydropower is given by the public authority: at the time of the development of a large hydroelectric plant, whoever got the concession—often the same freelance engineer who designed it—could resell it and even speculate about it to large corporations, such as SADE. The engineers, the real protagonists of the hydropower epic, relying on their ‘technical look’, roamed the mountain valleys in search of those geographies that

could result in more favorable exploitation (Selvafolta, 1998, p.42, p. 60). A trained eye could imagine the new landscape before it was built. The elegant landscape simulations of the SADE publications (Fig. 2) were intended to also give greater acceptability to the new hydroelectric landscapes by displaying them.

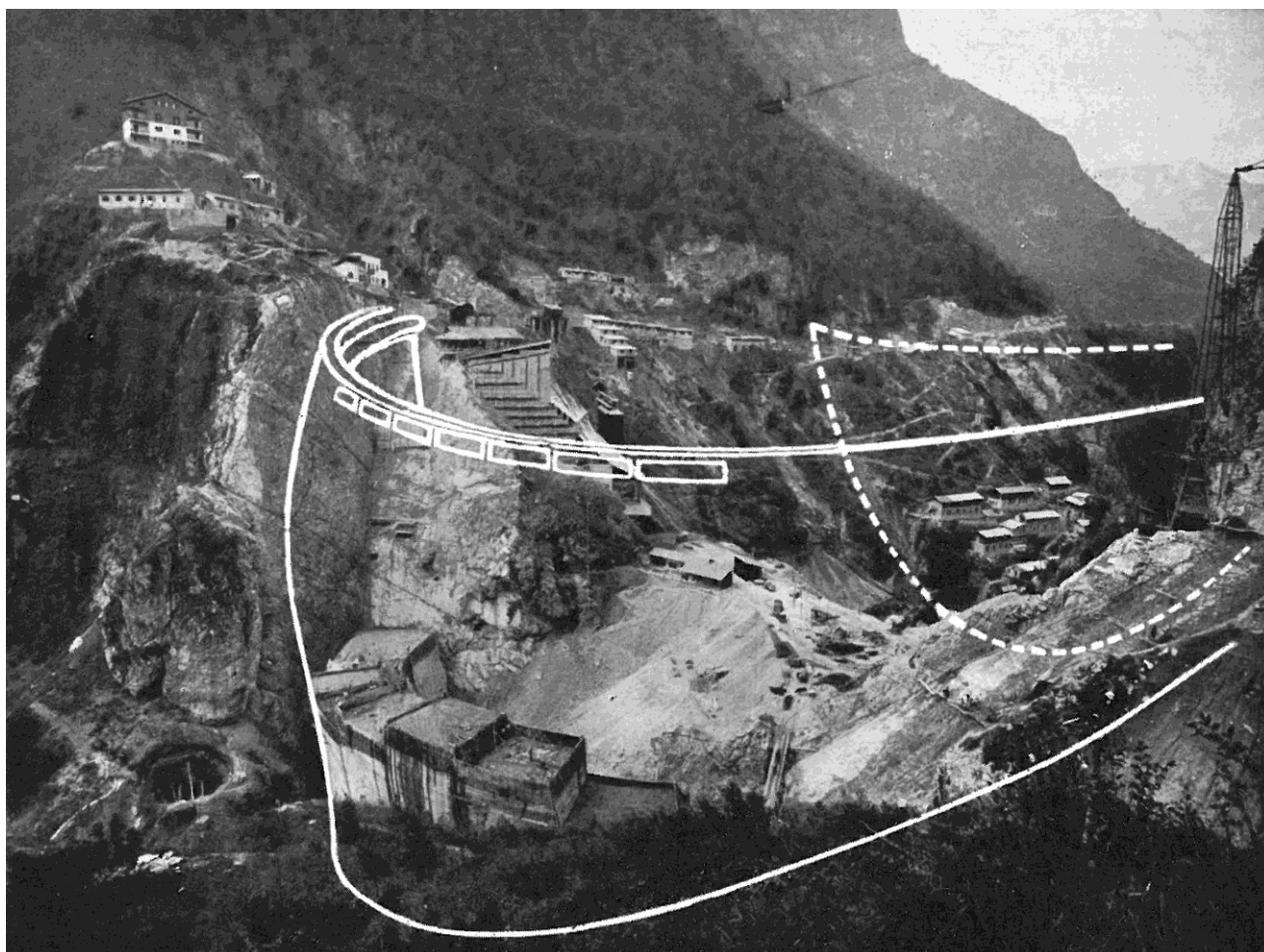


Fig. 2 - Simulation of the Val Gallina dam (from Semenza, 1962, p. 292)

In the wake of its battle for the protection of small waterways, the ‘water common good’ committee (a coordination of citizens, movements and associations for the defence of water as a common good) a few years ago produced, a cartography of micro-hydroelectric plants of the Piave River basin, including those not yet realized, thus making visible the geographical distribution and the overall amount (<http://www.acquabenecomunebelluno.it/idroelettrico/richieste-derivazione-idroelettrica>). The fact that such a tool did not exist at the official level seems particularly serious, as it would allow the authorities to better consider the overall impact of micro-hydroelectric exploitation in the area and assess cumulative impacts.

4.4 Reciprocal landscapes

The term ‘reciprocal landscapes’ has recently indicated those places, even those very far from each other, that are bound by ‘reciprocal relationships of production and consumption in terms of material displacement, ecological change and labour’ (Hutton 2013)⁴. Between the ‘hydroelectric power producer’ mountain and the ‘urban and industrial consumer of electricity’ plain, it is easy to recognize different reciprocal landscapes. Analysing them will allow us to describe, by concretely visualizing it, the asymmetrical relationship between the mountain—which sells its resources without adequate compensation—and the industrialised and urbanised plain, as long reported (Franzin 2006; Flowers, Franzin, Reolon, 2009). The hydroelectric landscapes of the Piave River are in a documented, both historically and geographically, relationship of reciprocity, first of all with the industrial area of Porto Marghera, whose electrochemical industries were largely fuelled by the energy produced and transported from the Veneto and Friuli mountainous areas to the Venetian lagoon (Reberschak, 2004). Also, the landscape of land reclamation in eastern Veneto—an area located entirely below sea level, and the subject of one of the largest operations of land reclamation of the Fascist period—was only possible thanks to the availability of abundant electricity generated by the plants of the Belluno area (Ferrario and Maris, 2014).

These reciprocal relationships are, of course, invisible. By disclosing them, we can make the interdependence between energy and territory more transparent for technicians, decision makers and the public⁵. This interdependence is still too often hidden, invisible and therefore unable to guide choices in the direction of greater sustainability⁶.

5. Unveil the invisible: four examples

5.1 The masked dam: Santa Caterina in Auronzo di Cadore

The reservoir of Santa Caterina lies below the village of Auronzo di Cadore, along the Ansiei River, one of the first right tributaries of the Piave. At the end of the 1920s, the Compagnia Forze Idrauliche Alto Cadore, thanks to funding granted by the fascist government, built the hydropower plant formed by the dam of Santa Caterina, the Comelico dam and the Pelos power station (Niccolai,

⁴This concept has been used in the field of landscape architecture to indicate the relationships between some urban landscapes with the places of origin of building materials. One example that Hutton studied is the High Line in New York City: The park of this American city would be reciprocal to the Amazon forest, from which timber was derived for its flooring.

⁵In this perspective, we cannot ignore the electric blackout of December 2013 caused by a heavy snowfall, which affected the high Piave basin for several days, causing extremely serious inconvenience for the population and damages for the area’s entire economy. Paradoxically, the mountain was deprived of the energy produced on its own territory (yet bearing much of the impact of energy production), while the *reciprocal* Perialpine lowland suffered no damage at all.

⁶See the example of the East Veneto coast reclamations, where climate change (increasingly heavy rainfall and exceptionally high tides) makes it extremely resource-intensive to keep dry lands for farming: The sustainability of this system should be seriously questioned on a regional scale including the Alps, overcoming the normal sectoral logic adopted in infrastructure projects and agricultural policies.

1933. La Provincia di Belluno in Regime Fascista, 1934). The entire plant was purchased by the SADE in 1934.

Santa Caterina is the first huge dam of the Piave river basin, generating here the first *deleted* landscape, with the loss of the meadows and arable land at the bottom of the valley. However, a new landscape emerged: The Lake of Auronzo, very attractive from the tourist's point of view, in the opinion of most, *improved* the landscape.

'The construction of the Santa Caterina dam had a great importance for Auronzo, as it formed the lake of Auronzo, profoundly changing the landscape. (...) Part of the Auronzo country was submerged by the waters, but the landscape gained a lot, and the summer holiday remarkably increased' (Fabbiani, 1972, p. 178).

Auronzo had already been the scene of several tourism investments since the late 19th century, and in 1927, it obtained the status of a health resort. Auronzo asked to be guaranteed against the lake drainage during the tourist season and was thus able to take advantage of the new situation. The tourist development (established afterwards with a new beach and the world speedboat competition launched in 1952) probably silenced any opposition. It was difficult to openly express an opposition in the Fascist period, in front of a dictatorship strongly supporting hydropower development within autarky policies (Zanetti et al., 1996).

Tourism/hydroelectricity works as long as the technical element is made to disappear. Generally, the beauty of a dam lies in its power and elegance technique. However, this is a gravity dam, a conventional and squat structure: when buying and raising it up in order to increase the capacity of the basin, SADE decided to embellish it with street lamps and sculptures, creating on the summit a promenade for tourists (Fig. 3). In short, the dam has been *masked*. Even the control booth is *disguised* as a medieval church, imitating the style of a nearby chapel.

The removal—physical or ideological—of the hydropower character of the reservoirs continues to this day in this region: a recent brochure published on the official website of regional tourism⁷ identifies seven lakes of tourist value in the Belluno province, but they are in effect seven hydroelectric reservoirs (five dams, including the Auronzo Lake and two reservoirs of natural origin). In the text and in the images, their hydropower character is carefully hidden.

In the case of Santa Caterina, there is therefore more than one invisible landscape. First, typically, there is cleared and flooded farmland that has been expropriated as well as underground piping between the dam and the power station. Secondly, there is a specific (but not isolated in Europe) case of a technical artifact disguised to make changes acceptable, as explained above.

⁷ <http://www.veneto.eu/resource/resolver?resourceId=c60d8189-2b7c-47c0-8570-192d9581552a/belluno-laghi-bellunese> (last access 21 January 2015).



Fig. 3 – The Santa Caterina dam in Auronzo

If conflicts close to the Santa Caterina reservoir are masked or muffled by the success of tourism, problems occur not far away. When obliged in the 1930s to host the Pelos power station and the start of high-voltage lines, the municipality of Vigo di Cadore expressed its willingness to compensate its citizens for the damage. When the citizens asked for the independent distribution of electricity to which they were entitled as a riparian community, they received fierce opposition from the SADE (Baratto, 1947). The ‘beautified’ landscape of the Auronzo reservoir corresponds to the reciprocal landscapes ‘degraded’ by power lines, invisible from the reservoir itself. The territorial change related to energy transitions features advantages and disadvantages and has often become a source of spatial injustices.

5.2 The invisible lake: Visdende valley in Comelico

Visdende is a secondary valley, run through by a tributary of the Piave, the Silvella river. Famous for the beauty of its landscape, the valley attracts thousands of tourists and hikers every year. The valley is not permanently inhabited: Only during the summer are pastures still used for pasturing and are old rural houses used for temporarily hosting tourists. Beautiful forests of spruce produce excellent wood for building.

At the centre of the valley, near a rest area for campers, is a long wire fence that isolates and makes inaccessible a large area along the river, where lush hygrophilous vegetation is clearly different from that surrounding it. Along the fence, some signs of general danger invite you to stay away. This is the only visible trace of a hydroelectric story that involved the Visdende valley after World War II.

In the 1940s, on the basis of a public concession dating back to the 1920s, a new SADE project would have been submerged under a hydroelectric reservoir encompassing 170 hectares of precious woods and pastures.

Local people, kept for years unaware of the ongoing hydropower project and threatened in their primary resources, opposed the SADE. One could notice the soft-spoken yet firm character of this opposition in the various petitions sent to the Italian Ministry of Public Works, including one signed by 833 heads of families⁸. Amidst the insensitivity of the authorities and the inflexibility of the electricity company, in the following years, the inhabitants first appealed an ancient measure of the *Serenissima*, granting special water rights to mountain territory, and they later tried to ask for a national landscape bond. The bond was actually imposed in 1958⁹ but would not stop the project, which in 1956 had been started with the first surveys. This was precisely when the unexpected happened: at borehole no. 15, through the drilling column exited a violent surge of water mixed with silts, and the surrounding soil collapsed to form a crater. This crater in a short time reached 50 meters in diameter and 40 meters in depth¹⁰.

For three years, the SADE tried to fill the cavity first with gravel and then with straw and clay. The mishap slowed the work at a time when the company was already strongly engaged in several problematic: the landslide of the Pontesei reservoir (22 March 1959), the first landslide in the Vajont reservoir (4 November 1960) and a campaign against the construction of hydroelectric reservoirs above Cortina. In short, the SADE shelved the project, which ENEL abandoned in the years after nationalisation.

Val Visdende is therefore a clear example of an invisible hydroelectric landscape, as it was designed but not built. However, the invisible dimension is far more articulate. The angry surge reported in borehole No. 15 came from an underground aquifer that was unseen and unexpected.

The mysterious fence still there serves as the only physical evidence of the area of borehole No. 15 (and of the crater that was laboriously filled), now inaccessible and therefore invisible. However, at the same time, it reveals its presence in the form of a clue (Fig. 4), a clue that would be incomprehensible without a cross-reading of the current landscape and archival sources concerning it. Recognising the clue, however, is what drives men to seek and to question those sources. Finally, this case shows the deep dimension of values, invisible inasmuch immaterial, pushing the inhabitants of the valley to defend with all means available the valley landscape. Last but not least, regarding the landscape bond, in the mayor's words:

⁸ Santo Stefano di Cadore municipal archive, X, 58a.

⁹ 1958 June 18: Visdende valley is declared an outstanding public value under the law on 29 June 1939, n. 1497.

¹⁰ From a report dated 2 August 1957, written by the SADE technical office of Tai di Cadore (General ENEL Archive in Naples, archive group ENEL-SADE, b. 99). See also Capra and Destro, 1959.

‘ (...) We must associate these brief economic statement with the sentimental value that native citizens admit to their valley Visdende; this is a rare example in Italy of beauty and pasture that would be transformed into a sort of swamp and there would be no bonuses that might compensate for the value lost’¹¹.



Fig. 4 – Visdende valley: the inaccessible area of borehole No. 15

5.3 The camouflaged plant: the Mis micro-power station in the Belluno Dolomites

The project of the power station of Mis developed along a minor tributary of the Piave, in the lower part of its mountain basin¹². The micro-hydropower plant was designed in 2006 by a private company on a site on the border of the National Park of the Belluno Dolomites (the intake is just outside of the area of the park, and the power station is inside), but its construction was definitively halted in 2012 after a long legal battle brought by environmental associations.

Although the environmental plan of the park prohibits ‘any further offshoot of surface and ground water for irrigation and hydroelectric purposes’, all relevant authorities (the park itself, the

¹¹ Mail from the mayor of Santo Stefano di Cadore to the Ministry of Public Works, 19 April 1949 (Santo Stefano di Cadore municipal archive, X, 58/a).

¹² The new plant is located upstream of the large homonymous hydroelectric reservoir built in the 1950s of the 20th century. It is interesting to note that this first plant was in a certain sense ‘metabolised’, although it has definitely impacted the territory more macroscopically than the project of the small present plant has. Inside this disproportion, we can recognise the contradictions, the rhetoric and the changing sensitivities underlying the complexity involved in these events.

Italian Ministry of Cultural Heritage, the regional administration, the municipalities) have in a first stage authorized the project. They justified their decision with the consideration that a small hydroelectric plant would be comparable to a 'traditional productive activity' and therefore allowed inside the protected area¹³. However, the World Wildlife Fund, the Italian Alpine Club and some other local actors (in particular, the committee *Acqua Bene Comune*) appealed the decision, arguing that the values of the protected area could not be sacrificed for private profit. After a long judicial procedure, on 9 November 2012, the Corte di Cassazione ruled in favor of the applicants.

It is interesting to observe how the various parties involved treated the question. In particular, the behaviour of the authorisation agencies strikes. They argued that the impact on the landscape could be 'mitigated' simply 'using building typologies that can *camouflage* as much as possible the artefacts and, for the visible parts, inserting elements in continuity with the surrounding environment', covering the emerging parts of the power station building 'that will be in part buried in the slope behind' 'in local stone laid as *opus incertum*, thus recalling the rural architecture typical of the area' (BURV 9 February 2010 n. 12). Basically, the hydropower-led transformation seems to have been deliberately made *non-visible* as if this operation corresponded to make it *non-existent*. This approach—so explicitly and exclusively mindful of aesthetics—ended up contradicting the principles of the protection of the environmental, territorial and landscape values that the park would have to secure. At that time, these principles had just been confirmed via the area's inclusion in the World Heritage List¹⁴. The rhetoric of sustainability underlying the implementation of renewable energies failed to be inconsistent when it clashed with reasons for the protection of the natural environment in local contexts, promoted by the presence of the park.

On the other hand, the protest group that opposed the construction of the plant gradually gained strength and relevance beyond the local scale, outside of the borders of the little valley, not only through speeches and documents but also thanks to a communication enriched with visual tools (through photo galleries and videos that showed the area and the protests, shared on websites)¹⁵. The protest namely used as a stage the very place of the hydropower station and *visibility* of the work in progress. However, at the same time, the protest unveiled issues and arguments adopted much more importantly from an environmental perspective than simply from an aesthetic-impact perspective: They highlighted the importance of the collective interests of enjoying environmental goods in comparison with private economic interest.

¹³ See the Framework Law on protected areas, n° 394/91; the park plan refers necessarily to it.

¹⁴ The Dolomites in the 2009 were included in the World Heritage list as a natural heritage site.

¹⁵ <http://www.acquabenecomunebelluno.it/>; <http://bellunopiu.it/> (last visit 21 January 2015).

The judgment requires returning the affected section of the valley to its previous state, with an intent to remove all visible signs of the event. A contradiction related to the visibility of the work comes to light here, too. If, as it seems, the environmental quality is not significantly damaged by the mere presence of the remains of the unfinished work, is it really necessary to have such an intervention—which is likely to be extremely expensive and challenging and relevant only in terms of aesthetics?



Fig. 5 – The abandoned construction site of the micro-hydroelectric plant of Mis, already partially covered with "local stone"

5.4 The village removed: Vallesella on the Centre Cadore Lake

The Centro Cadore Lake is the largest artificial lake in the basin of the Piave River. Created in 1949 through the construction of the dam of Sottocastello (near Pieve di Cadore), the lake extends in the valley for about 8 km, reaching lands in the municipalities of Pieve, Calalzo and Domegge and nearly up to Lozzo. Most of the original portions of the inhabited centres are located at a certain altitude over the bottom of the valley. In effect, therefore, the creation of the lake has directly affected only meadow areas and crops. The only village situated at a low altitude is Vallesella, in the municipality of Domegge; here, the maximum level of the lake would have to lick the village in order to become a lake center with tourism development.

Near this village, the presence of collapse dolines—shaft shaped—(locally called *ciare*) was long known due to the development of karst in gypsum layers underlying the conglomerate rocks that cropped up here (Marinelli, 1910, 1917; Meneghel and Sauro, 2003). Active processes worthy of special note were not yet recorded. From 1949 onwards, the filling of the reservoir has very likely influenced the levels of ground water in the gypsum layers, activating in some ways karst processes (Comune di Domegge di Cadore, p.111). For this reason, after a short time, several episodes of local earthquakes, mudslides, collapses and the opening of new cavities have occurred, seriously damaging the buildings (including the church) of the village (p. 39). The causal relationship between the filling of the lake and these collapses was admitted only with serious delay and in a completely partial way. Only after 1963 — due also to the emotional wave generated by the tragedy of Vajont (see the article by Tina Merlin on the newspaper *L'Unità* of 19 October 1963) — an avenue for a restoration intervention and compensation was opened. Because of the damage incurred, in fact, most of the buildings had to be abandoned: their inhabitants were forced to move into new houses — with financial compensation not sufficient to fully cover the costs — in an upper part of the slope. In practice, the entire village of Vallesella was transferred elsewhere one piece at a time¹⁶. Afterwards, in the late 1980s and the 1990s, an intervention by ENEL in agreement with the municipality 'reclaimed' the area, knocking down almost all precarious buildings. Once at the centre of the square, only the fountain survived and is now surrounded by a lawn with trees (Fig. 5).

Different invisible landscapes can be recognised in Vallesella, too. The first is that of the underground layers of gypsum, where karst cavities developed and caused the collapses. They are not visible on the surface, but their presence has long been well known; nevertheless they remained invisible to those who did not want to admit the causes and responsibilities of the collapses in Vallesella.

Also, the village that no longer exists—that has been physically removed—is invisible. Together with the houses, the affective references and social lives of the inhabitants of Vallesella were removed; for these, no compensation will ever be possible. The fountain is practically the only witness of a deleted landscape (Fig. 6).

However, there is also the invisibility of what has been little or not at all told and made known; the memory has been removed, and the story, known almost exclusively to the local community, has never found large echoes outside of the valley. Indeed, there is a strong risk that the new generations will never acknowledged it.

¹⁶ The total number of families involved in this affair was about 160 (Coffen Marcolin, 1966). For a complete report of the story see Genova, 2003.

It is therefore particularly interesting that an educational project was promoted during the school year of 2012-13 by a teacher at a local secondary school; she embarked with a group of school children on the path of knowledge of the Vallesella story, based both on documents and on interviews with witnesses (the elders of the village). At the end, the children promoted a public presentation of the results of their work and a small exhibition, in which not only the information on the transformation of the places emerged but also the experiences of the people; in particular the sense of frustration emerged due to the lack of acknowledgment (even through compensation) of their right to live in their own homes, in their own village (Gasperin, 2014).

With this educational project, the invisible landscapes of Vallesella were somehow unveiled and discovered. A plastic prepared by the children and photographic reconstruction made it possible to trace the canceled physiognomy of the places, and, most importantly, the value that the inhabitants attributed to these places has been expressed. The power relations underlying the facts have been quietly but clearly highlighted.



Fig. 6 – The fountain, the only evidence of the old Vallesella

6. Conclusions

The activity implemented by the school children of Domegge di Cadore, in its apparent simplicity, shows how many opaque aspects of events related to hydropower may actually find clarity

when viewed over their visible appearance, both when the conflict is evident and when it is not strong enough to come through. The attention to what is deleted, buried, disguised, hidden or removed—from the not-immediate causal links, to what remained only a project, or to the relationship between reciprocal landscapes—allows for the redefinition of the boundaries and structure of the problem. It also allows for the identification of the territorial conflicts associated with the development of hydropower in their multidimensionality (issues and environmental conflicts, economic, socio-cultural and political).

In other words, making a landscape transparent can be useful for grasping the different challenges underlying the principles of sustainability and for democratising energy development, highlighting its contradictions, even in a diachronic and multiscale perspective.

Studying hydropower development in the Piave River basin through the categories of invisible landscapes therefore becomes a non-rhetorical exercise of territorial analysis. The expression *landscaping* can take on a new meaning that goes beyond the mere aesthetic coherence of an artifact in the context: It highlights the need to build no more plans of *integral* exploitation but rather sustainable policies and practices integrated into the local context.

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