Shaped by Power. The Machine-Territory of the Piave River

Elena Longhin

Abstract
As a piece of larger research which focuses on the relation between the exercise of power over water resources, the contribution examines the current environmental exhaustion of the north-Italian mountain landscape resources exploring the interplay of ecological transformation of the alpine area with the multiplicity of processes of rationalization of the territory. The essay questions the territorial implications of the politics of exploitation of water, focusing on the capitalocene landscapes of the Piave river. Bisecting the region through a valley-section, it describes how its embedded dynamics of production are closely entangled, and consequently dependent upon, the ecologies of specific spaces, often seemingly disconnected or remote. In the current frame of increasingly worsen climate conditions, this contribution attempts to question the socio-political and ecological dynamics that the machinic landscape entails across the territory, would it be urbanised or rural.

Affiliation:
Università IUAV di Venezia, Dipartimento di Culture del Progetto.

Contacts:
elonghin1 [at] iuav [dot] it

Received:
1 September 2020

Accepted:
02 April 2021

DOI:
10.17454/ARDETH08.13

ARDETH #08

The Piave vast hydrological basin has been ultimately exhausted as a hydro-electric laboratory which regulates the 90% of its waters.

If it is no doubt that the territory is the measurement of human phenomena, the case of the Piave's hydro-social landscapes proves highly explicative of how water technologies entwine ecology and society in a distinctive mode of social-spatial organization (Boelens et al., 2016). The plain the river cuts through is today one of the most extensive inhabited and economically competitive urban landscapes in Europe: part of the wider Padana Valley, its geographical limits are the Alps to the north and the Adriatic Sea to the south. Originally called *la Piave* – before the First World War changed its feminine name into a masculine denomination, believed to better suit its successful contribution in defending the country at war – is a 222 kilometres long river which exemplifies a fundamental space-time continuum of the Italian identity (Marzo Magno, 2010). It is the only river that, albeit having both two sources and two mouths, completes a long list of actions through different tools and mechanisms, but does not flow, nor gush nor gush or swell anymore. Having for centuries encouraged human tinkering to exploit its inherent powers, the Piave vast hydrological basin has been ultimately exhausted as a hydro-electric laboratory which regulates the 90% of its waters. The machine which makes it the most engineered river in Europe, is composed of 13 dams, 12 artificial lakes, 335 intakes, 30 electric power plants, 200 km of underground and over ground pipes and an infinite number of barrages, sluices and weirs. This *technological apparatus* (Swyngedouw, 2015) generates the 6% of the Italian energy demand and the 60% of the Veneto region one. The remaining water quantity, which counts for the 10% of its original natural state, once reached the plain is eventually imbibed by cultivated fields at the rhythm of 99 cm/s.
Uses of the river are multifunctional and, inevitably, management issues surrounding the river are complex. The long array of attempts to transform its watershed into a tractable "organic machine" (White, 1996), managing water extraction, dispossession and distribution, had in fact played a contributing role in unleashing a far wider set of relations across the region, whose outcomes entangles the mountain-plain infrastructural flows in a diffused and complex system of territorial interactions (Figure 1).

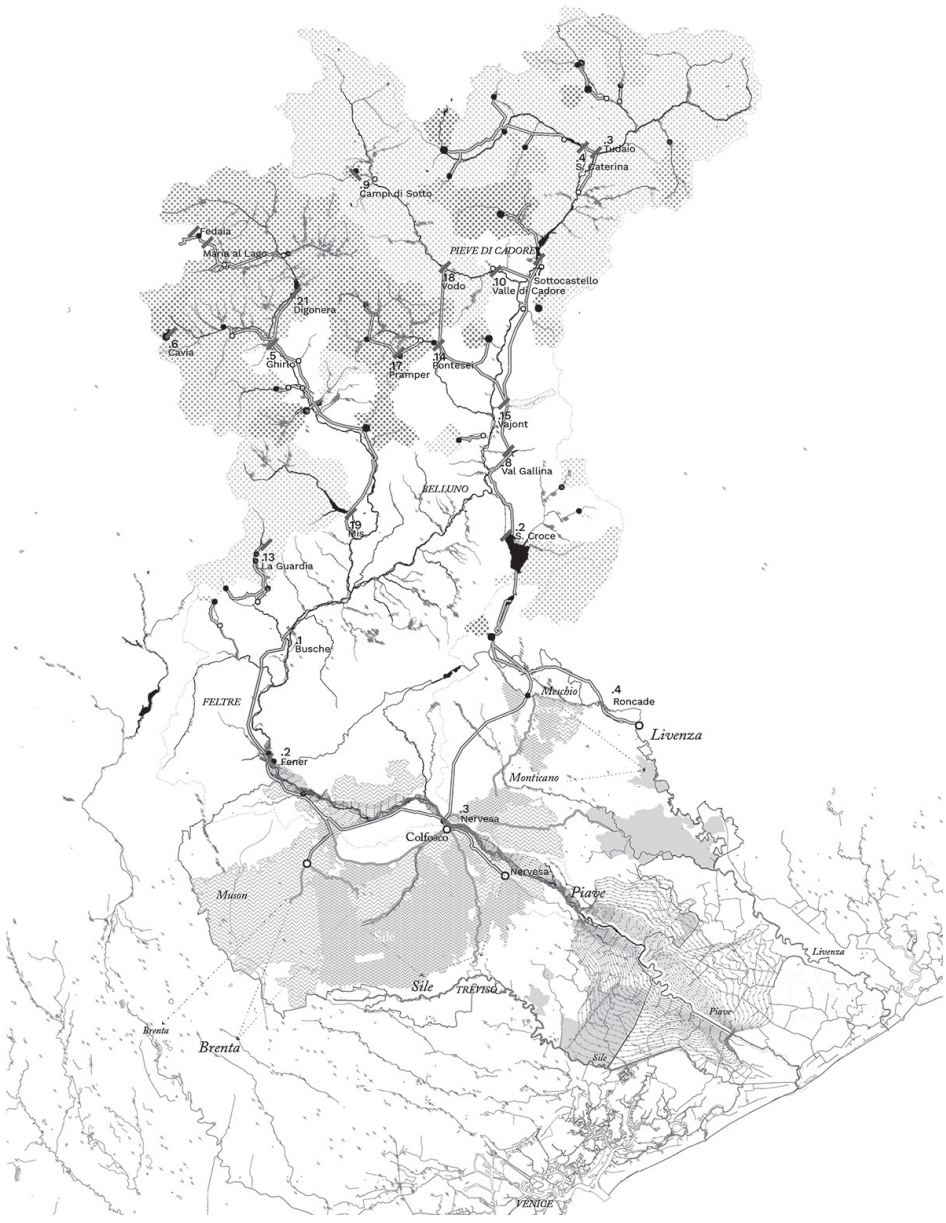

Fig. 1 - Map of the Piave hydro-basin showing paths of water diversion for hydro-power production and fields' irrigation. Author's elaboration.

The river basin has been for centuries a vital resourceful element. It served as an infrastructure for the transportation of goods from the Dolomites to the Venetian lagoon, as a water highway connecting the Peralba Mount, at 1832 meters above sea level, to the Adriatic Sea. Above all, however, Piave served the most as an indispensable nature capital, that once turned into energy boosted the electric industry, and contributed to the technological acceleration that sustained territorial transformations and social progress of the past century. The reclamation of a piece of the venetian

lagoon fringe and the establishment of Porto Marghera is intertwined with the exploitation of the river within an entrepreneurial project operated by SADE (Adriatic Society of Energy) since the early 1900s to establish an energy thriving hub constituting the most relevant industrial platform. In fact, hydro-electric infrastructures and land reclamation techniques are the most visible facets of the late modernization process of Italy, Geographic-scale engineering interventions characterized the policies of the Fascist government. In the process of subduing nature, it advocated for an idea of human amelioration through nature exploitation endorsed by an array of newly proclaimed laws and used as an instrumental engine both of national development and political propaganda.

Nevertheless, the investment in fixed capital works, such as locks, dams and weirs (and the associated infrastructure installed along the Piave) was such as to begin to make the river a work of metabolized "second nature". The current process of exploitation of water seems more than ever accelerated in territories of the Veneto region. Even if the vast range of effects water has on society and social relations are very visible in the conditions of scarcity or abundance, such as droughts and floods (Menga, Swyngedouw, 2018), however it is not as much when water gets commodified through concealed systems of production. A series of questions therefore stem from the materiality of water and its political implications: who and what defines landscape? Which practices are employed as landscapes are formed? How do we frame political justice from the ground of architecture and urbanism?

The current process of exploitation of water seems more than ever accelerated in territories of the Veneto region.

Who and what defines landscape? Which practices are employed as landscapes are formed? How do we frame political justice from the ground of architecture and urbanism?

The machine-territory

By the late nineteenth century, man approached the river largely through machines. Although also in earlier times machines technology was applied to rivers, the power deployed remained organic. Modernity projected a different future, involving the first use of energy other than man and animal's one. Transforming the meaning of our contact with nature (Polanyi, 1983), modernity initiated two groups of events of different scales: the age of the machine, implying a radical development, and the market system, an initial adaptation to that same development. The alterations to the environment and human domestic life

made possible in the Machine Age were enacted by new possibilities to access almost unlimited resources and supplies and an unprecedented transformation of science and technology, of which mains electricity played a crucial decisive role. Machines became so entrenched in our daily lives that we have entered a Second Machine Age, the age of power and the reduction of machines to human scale (Banham, 1960). The use of machines has been instrumental in the transformation of the venetian waterscape in the lowlands as much as in the mountains.

The construction of the hydro-power machine across the north Italian mountains signified de facto a radical alteration of nature into a mechanized system of production. The condition of *second nature* composed a complex multi-layered apparatus of uneven power relations, which turned the basin into a socio-political territorial machine. Von Foster (1984; 2010) clarified that a machine is to be understood as a conceptual *tool* (an abstract entity that is constructed from conceptual components that function as gears) which, when characterised by an invariable one-to-one relationship between its input and its output, can be called a "trivial-machine". Looking at "water trivial machines", dams, turbines and their related infrastructure, we start understanding how they have reshaped the river to sustain vertically the horizontal urban phenomena and its multi-scalar development. The understanding of the machinic condition of the river implies a deconstruction of its second-nature, and in this perspective, it implies a deconstruction of modernity. This is here intended as the disassemble of what Jurgen Habermas (1980) called *the project of modernity*, that scientific domination of nature which – exercised through an extraordinary intellectual effort during the Enlightenment – brought "human emancipation […] freedom from scarcity, want, and the arbitrariness of natural calamity" (Harvey, 1989: 12). In doing so we must come to terms with the river as a whole, and to do so, we have to come to terms with the palimpsest of matters, values, theories and rationalities laid across the larger territory implied. Framing the current *climate regime* (Latour, 2018) and this new epoch of geologic time in which we humans are forced to realise that our actions define us as direct drivers of the environment, has not a geological

The condition of *second nature* composed a complex multi-layered apparatus of uneven power relations, which turned the basin into a socio-political territorial machine.

The understanding of the machinic condition of the river implies a deconstruction of its second-nature, and in this perspective, it implies a deconstruction of modernity.

concern, but an environmental, social and political one. In these precarious times – variously referred to as the Anthropocene (Crutzen, Stoermer, 2000), the Great Acceleration (Steffen et al., 2004), Capitalocene (Moore, 2015), Chthulucene (Haraway, 2016), – being required to face and respond to the multiplicities of the current systemic crises means facing a daunting set of challenges. The current crystallization of this concept in contemporary thought, as Moore argues (2017), side-lines a more critical thinking which should focus over who – rather how – created the environmental crisis in the first place. If we pose the assumption that there is no environment in general, but only an environment for specific mode of existence (Lahoud, 2018), we therefore need to acknowledge a more specific credit, a shorter list of agents implied in the environmental modification, that are both propellers and gainers within this process (Moore, 2017).
In the past decades what has prevailed is a neglectful approach to the responsible part played by the requirements of the urban development: the ever-expanding impermeabilization of the soil together with the endless piping of streams and creeks, an expansion of methods of water abstraction now pervading also the low plain, with result of a growing pressure over the landscape and raising conflicts around water scarcity. Currently water concessions for irrigation practices exceed the river water capacity, causing rising conflicts between the mountain and the plain around the use of water accumulated into large artificial reservoirs, ultimately involving energy providers, agricultural irrigation consortia, and local inhabitants. In order to understand how machines operate, to see if and how they work and progress, or whether they fail, in constructing inhabitable and sustainable environments, means to question how, and by who, nature has become increasingly operationalised. As Malm puts it (2018, 11), “postmodernity seems to be visited by its antithesis: a condition of time and nature conquering ever more space”. The artificial condition of the territory now paradoxically seems to be more in need of further artifice, extra engineering rather than wider-nature, in a sort of higher-machinic approach.

Currently water concessions for irrigation practices exceed the river water capacity, causing rising conflicts between the mountain and the plain around the use of water accumulated into large artificial reservoirs, ultimately involving energy providers, agricultural irrigation consortia, and local inhabitants.

A Capitalocene river

The Piave second-nature is exemplary of the capital use of landscape, as well as testimony of its crisis within the ongoing environmental one. Among the many ongoing processes it entails, the warming condition has the capacity to cloud the horizon, representing "history and nature falling down on society" (Malm, 2018: 15). Warming temperatures affect the Mediterranean Sea air flow balances causing extreme weather events: across days 27-30 October 2019 the storm Vaia hit north-eastern Italy with peak winds of 200 km/h and an exceptional rain that inundated vast territories and breached Piave embankments.

As the place where consequential dynamics of socio-economic development emerge primarily, the alpine territory is a litmus test for the current climate regime. Exemplified through scarcity of resources, and unexpected weather extreme events, the environmental crisis is particularly challenging in the Alps, where it is occurring at a faster pace. The increase of temperature has reached almost two degrees in the past 150 years, more than double of the rest of the world (Permanent Secretariat of the Alpine Convention, 2019). In this human induced warming condition glaciers are the most reactive elements: differently from other ecosystems, like forests or marine environments, which could require decades to be recognized and related to the warming environment, glaciers instantly register changes in the climate. They are synchronous to the warming condition, as much as extraordinary human induced archives. Besides encapsulating historical Earth temperatures through to the oxygen isotopes O16 and O18 entrapped in-between the ice crystals, within the glaciers it is possible to recognize when Romans started lead mining in the annexed territories of Spain, traces of the first atomic experiments in the atmosphere, the moment in which the use of unleaded petrol were introduced to run vehicles, and recently the presence of microplastics[24]. Current scenarios foresee that the Alpine glaciers will be extinct in 25-30 years, however at the current pace they will disappear by 2030-2035. The Antermoia Glacier, marked on many cartographies of the beginning of the twentieth century, used to drain into the Piave basin and is now extinct. In the Marmolada massif, the Veneto Region's iconic highest peak, the glacier

Exemplified through scarcity of resources, and unexpected weather extreme events, the environmental crisis is particularly challenging in the Alps, where it is occurring at a faster pace. The increase of temperature has reached almost two degrees in the past 150 years, more than double of the rest of the world

The Antermoia Glacier, marked on many cartographies of the beginning of the twentieth century, used to drain into the Piave basin and is now extinct.

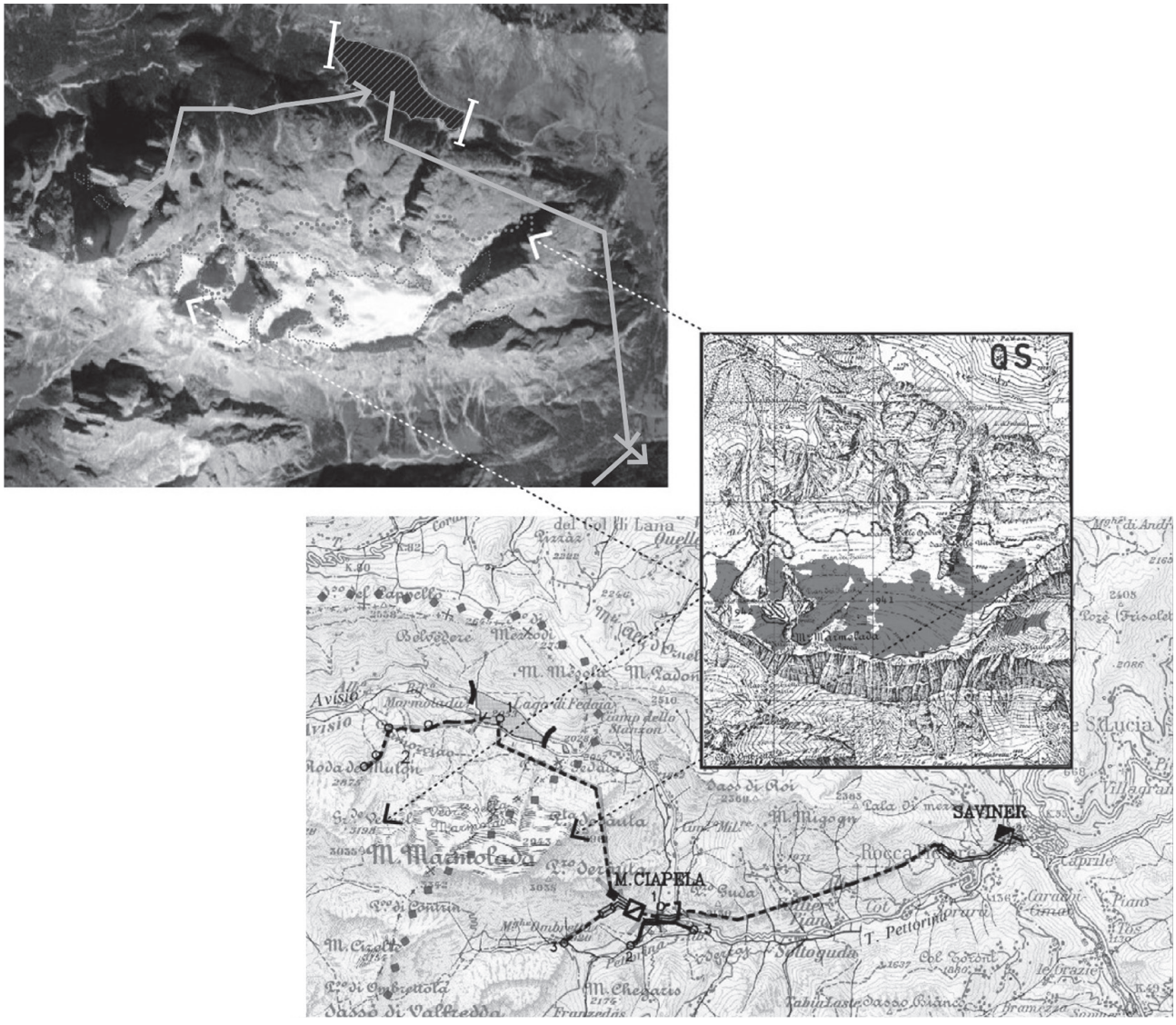

Fig. 2 - Comparison of cartographies of Marmolada Principal and Western Glaciers in 1932 (in Porro,Labus. 1927. *Atlante Dei Ghiacciai Italiani*. Firenze: Istituto Geografico Militare), with SADE's (in Enel. 1992. *Atlante Degli Impianti Idroelettrici*, Venezia), and today aerial view (Google Earth). Author's elaboration.

has lost 80% of its volume over the past 70 years, 30% of which just in the last 10 years (Santin et al., 2019). Being measured every year since 1902 Marmolada is considered a "natural thermometer" of climatic change. In order to slow down ice loss and ablation, sheets of geotextile tarpaulins (which measure 70 by 5 m) are unrolled every summer in long strips. From covering around 30,000 square metres in 2008 when the project began, this year 100,000 sqm of glacier were covered under wraps.

Beyond affecting humanity, global warming poses a fundamental threat more immediately and directly to neoliberal capitalist processes of growth and accumulation. The majority of the water flowing from

Marmolada is stocked within the artificial lake located in the Pian of Fedaia, which also receives by means of gutter the waters of the westernmost part of the ice sheet. As part of the Alto Cordevole system, connected to the power plants of Malga Ciapela, Saviner and Alleghe (Figure 2), the reservoir was created by SADE with the construction of a gravity dam in 1955 (Figure 3), which discharges 17 millions of cubic metres the Piave basin. In the words of Carlo Semenza, SADE principal engineer, the reservoir resembles an extraordinary encounter that occurred between nature and man (Semenza, 1957). In order to estimate the glacier supply, this œuvre had indeed made remarkedly technological advancements with pioneering glaciological studies on the Marmolada. It is dramatically exemplary that much of the water of the Marmolada glacier, which descends from a very high altitude towards the tributaries of the Piave, once captured by grids, barrages and dams, moves through completely artificial paths as long as 200 kilometres, and never goes back to the river bed.

It is dramatically exemplary that much of the water of the Marmolada glacier, which descends from a very high altitude towards the tributaries of the Piave, once captured by grids, barrages and dams, moves through completely artificial paths as long as 200 kilometres, and never goes back to the river bed.

However, the vulnerability of the Alpine region is consequentially causing the lowering of the underground water level, and the decrease of water flow across rivers, with large-scale losses in agriculture and forestry and shortages in the generation of hydro-power electricity (Gobiet et al., 2014). Given that glaciers have constituted the unique replenishment of fresh water for millennia, it is alarming to acknowledge that they are expected to disappear by the end of the current century. The result of an increase of temperature is also diminishing the amount of snow. The snow reliability line (SRL) is predicted to set upwards by 300 meters, reaching only altitude of 1,500-1,800 masl in alpine areas exposed to the Mediterranean influence (Permanent Secretariat of the Alpine Convention, 2019). The economic repercussions of this condition is mostly tangible on winter tourism infrastructures, which, in the Veneto region, represent 64% of the local income. Along the Piave, general issues involving the mountain basin (reservoirs' sedimentation, lack of water stock capacity, ageing of infrastructures, unproductive devices), are entangled with those in the valley (water scarcity and lack of sedimentation along the river course replenishing bed and coastlines). The relationships between critical agents involved in the water

The economic repercussions of this condition is mostly tangible on winter tourism infrastructures, which, in the Veneto region, represent 64% of the local income.

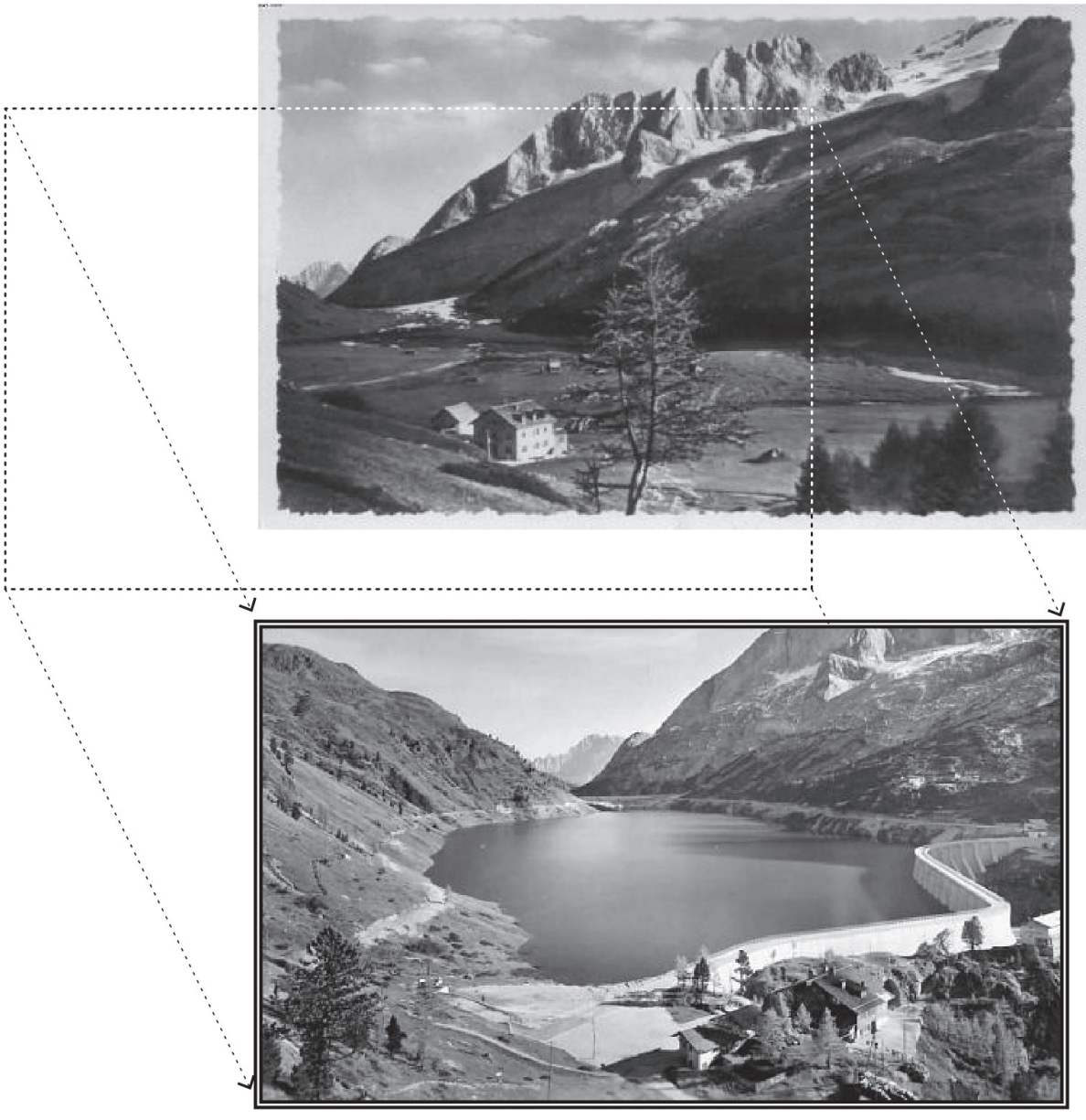

Fig. 3 - Comparison of photographs of the Pian di Fedaia in the 40s and just after the construction of the dam in 1955. Source: Progettodighe.it [Online]. Available at: https://www.progettodighe.it/forum/viewtopic.php?f=14&t=377&start=20 [Accessed: 20 August 2020].

management, energy and water providers, the state and local urbanisation processes, takes on new forms of conflict with the ascent of the neo-liberal paradigm. The outcome of these modes of governance, when examined at the local level, deepens rather than contains, the struggles over water accessibility. Therefore, the relations with nature get significantly re-casted when these agents take the lead in fostering the relationship between people and landscape, where the machine syntagms and modes of territorialisation cannot be reversed back.

This is why Piave hydro basin can be inferred as a sort of extensive palimpsest of the Veneto region, which embeds the region's historical and geological development embodying its Capitalocene landscape. The use of terms like Capitalocene, instead of (popular) Anthropocene, is useful in stressing out our current socio-ecological trajectory as that of which cannot be posed without questioning the processes and capitalism itself (Moore, 2015) and the growing number of territorial conflicts raised around source availability, its extraction and productive processes. As Povinelli put it, "the *Human* has exerted not a malignant force on the meteorological, geological, and biological dimension of the earth but only a specific formation of human sociality – capitalism or carbon-based capitalism – to the benefit of only specific subjects within this formation" (Id., 2017: 297). The recognition of capitalistic processes based on natural resource and fossil fuel exhaustion, as the upholder of the condensation of power, capital and nature, requires an intellectual state shift in order to revolutionize views and praxis (Fressoz, Bonneuil, 2016; Malm, 2018).

Capitalocene ultimately challenges certain assumptions that were deemed fundamental to the modern West. As explained by Bonneuil and Frezzos (2016) the first one implies an ontological break between the human as a subject of entitlement over nature considered as the object. What this entails practically is thus the interruption the expansion of what McNeill (2000) calls the human niche construction. What is at stake is the modern embedded definition of freedom, where humankind has the autonomy to operate in the search of higher achievements and its own benefit and the deletion of the illusory reassuring idea of the *sustainable project*. As Harvey affirmed (1989), the "flexibility" of capital proved also the ability of adaptation, in Fernand Braudel's words (1982): "the quality that seems […] to be an essential feature of the general history of capitalism: it's unlimited flexibility, its capacity for change and adaptation".

Thus, being able to recognize and identify a specific set of rationalities in economics, in science, in power means to expose a certain type of activities or infrastructures, such as mining, logging, the constructions

This is why Piave hydro basin can be inferred as a sort of extensive palimpsest of the Veneto region, which embeds the region's historical and geological development embodying its Capitalocene landscape.

of dams and energy plants, liable for consequential ecological conditions. The concept of the Anthropocene reaches far beyond the definition of a man-driven era, it expresses that the human-environment interactions are not bi-directional (Verburg et al., 2016), but reach across different space and time scales.

Reframing operational landscapes

In this case, Piave's machines progressed towards circulatory conduits that enable metabolic processes balanced in an apparent equilibrium of flows, where it is difficult to trace clear margins between natural and produced processes.

The interdependency of different and distant spaces across the region is made evident when one attempts to describe its landscape through a sectional drawing. Bisecting the region, following the river course through a line intersecting from the north-west alpine landscape to the south-east Adriatic seashore, it becomes clear how the hydro-basin is a planar surface which acts as a vast machine for the accumulation of energy, water, biota, humans and matter. In doing so, Patrick Geddes's Valley Section longitudinal drawings (1925), typically describing the course of a river from its source to the sea, remains a useful reference tool to understand how the distinct geography of the Piave river has long influenced patterns of production, industry and settlement:

The interdependency of different and distant spaces across the region is made evident when one attempts to describe its landscape through a sectional drawing.

First of all, then, this Valley Section, as we commonly call it, makes vivid to us the range of climate, with its corresponding vegetation and animal life. Not only snow on the mountains may be realized here, but their geologic nature and structure also. Then too the forests, the pastoral slopes, the minor hills, the plains, their uniting rivers; all things are here. This is no longer our mere school-book, with its image of a *country* as a coloured space on a flat map, with only *boundaries* and *capital*, and so on; it is first of all the essential outline of a geographer's *region*, ready to be studied. Next than it is an anthropologist's, and thence also an evolutionary economist's; in time we shall even work down to the modern urban view of the conventional economist, of the political and more. But first of all, we must proceed in natural order (Geddes, 1925: 289)

In Veneto, where ecological and political regions collide, the section has the ability to keep together and expose the peculiarity of this territory to comprehend an entire hydrological cycle within its administrative borders: in the space of 200 km it describes different environments, landscapes, climates, soil uses and an array of disparate urban settlements. The abstract outlines of the ideal profile of a complete mountain-and-river system – as suggested by Lewis Mumford in his consistent assimilation of Geddes's valley-plan exegesis – enables the understanding of reciprocal rationalities between the production of hydro-power, plain irrigation practices, mining extractions, sedimentation processes and land alteration, "in a figurative sense" illustrating how " civilization marches up and down the valley-section (Mumford, 1963: 61), exposing capital, labour and power.

In Veneto, where ecological and political regions collide, the section has the ability to keep together and expose the peculiarity of this territory to comprehend an entire hydrological cycle within its administrative borders: in the space of 200 km it describes different environments, landscapes, climates, soil uses and an array of disparate urban settlements.

However, what Geddes's representation of the valley-section doesn't return is the shift – in the history of European West – between the town marked heterotopic character and the countryside environment. Although being recognized in the twentieth-century urban studies as territories that were qualitatively specific "city-regions," "city-territories" and "conurbations", however were still considered separated from the erstwhile "non-urban" spaces lying beyond their boundaries (Brenner, Schmid, 2011). In the last forty years urbanization has been radically reconfigured. Therefore, the shift of historical demarcations between urban suburban and rural zones cannot remain distinct. In acknowledging the interdependencies between the built and the natural environment, it is anymore possible nor to consider a clear division between what's city and what's rural, nor to ignore the spatial relations which ties these spaces to their distant places of production. The urbanization process which has consolidated over time beyond the politically constructed city-border, consolidated the spatial relationship between energy capitals and energy peripheries (Cronon, 1991; Brosnan, 2002; Melosi, 2014). Oppositely, the linearity of Geddes's section returns an idea of fixity between relations, which, being at the same time geographical and social, are not that stable anymore. The reversal of the heterotopy character of

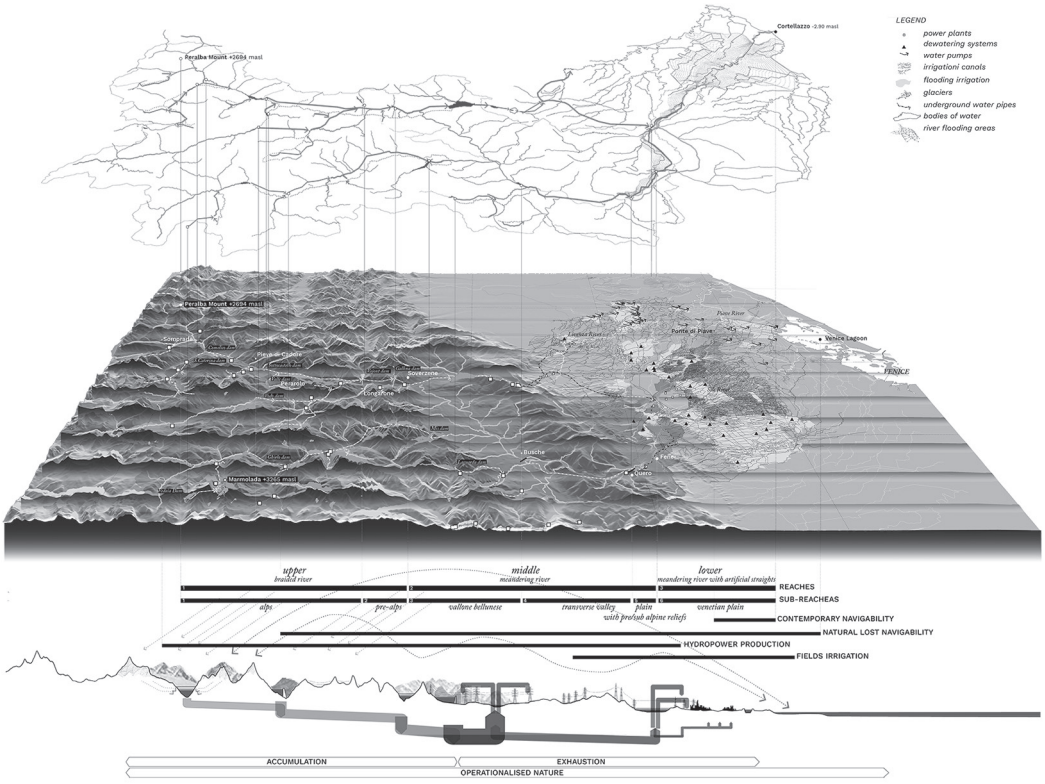

Fig. 4 - X-ray bird-view sectional cartography of the Piave hydro basin addressing the multiplicity of geo-political and productive processes entangled across the region. Author's elaboration.

the urban space, calls therefore into question inherited cartographies that have long represented the twenty-century urban-rural relations and the related theory and research (Schmid 2004; Brenner, Schmid, 2011). This is required on the valley section as well. Although remaining a fundamental tool, the valley section is the expression of a deterministic geography, that was imagined as a way to embed people and labour in a certain piece of land, as a sustaining background of the city evolution where movements in between are not envisaged. Geddes' section puts a strict hierarchy, raising questions on how we can display the ways in which different parts of the section relate to certain dynamics. Currently, the Piave riverine landscapes keep on inviting more productive processes, both of energy production, agro-industrial irrigation and extraction of gravel, that have deeply changed, requiring a multidirectional multifaceted representation of the operational landscapes of extended urbanization.

Understanding the river's mechanical application and its intentionally *infra-nature* in a thicker representation, helps to clarify how the river is technologized through overt human interventions, as well as in less overt ways. A sectional array-cartographical analysis (Figure 4) explores how its flow responds to assemblages of both large and small scales, to manifest yet also invisible interventions, occupying the river far up as much as down its course. In this, the attempt to describe their inherently intertwined and interdependent relationships is an attempt of deconstruction of modernity, as much as it is a deconstruction of the Geddes's valley-section. Ultimately, it embodies questions around new modes of representation capable of transcending unproductive dichotomies of society/nature and urban/rural environments and illustrate the multi-layered transcalar complexities entangled across the river.

The condition of the *machine in the mountain* is of a system relentlessly in an attempt to operate something which is untenable for the current historical time, where certain types of relations capital entails with nature are collapsing under the threats of the ongoing climate regime. In acknowledging how capitalist machines are incapable of addressing climate change, and in fact keep on acting in the same ways (Wainwright, Mann, 2018), we have yet to elaborate a systemic change that does produce *non-trivial machines*. As von Foerster argued, they "are quite different creatures", in fact "the input-output relationship is not invariant, but it is determined by the machine's previous output, [meaning that] its previous steps determine its present reactions" (2010: 208). Thus, if we accept the extraordinary variability of nature, we can therefore make an attempt to envision different states of the machine, as a description and definition of what kind of spaces we wish to inhabit. Paraphrasing Aldo Leopold's classic injunction to "think like a mountain" (1949), as to get closer to the land, we can make the attempt to redescribe the human inhabited territory to empower the natural once again in reciprocal beneficial ways. This means to try to move beyond outdated sociocultural conceptions of nature as being somewhere else and beyond consolidated systems of production, and activate new practices and behaviours, where reversibility and flexibility would have to come into play.

If we accept the extraordinary variability of nature, we can therefore make an attempt to envision different states of the machine, as a description and definition of what kind of spaces we wish to inhabit.

References

Banham, R. (1960), *Theory and Design in the First Machine Age*, New York - Washington, Praeger Publishers Inc.

Boelens, R. *et al.* (2016), *Hydrosocial Territories: A Political ecology Perspective*, "Water International", vol. 41, n. 1, pp. 1-14.

Braudel, F. (1982), *The Wheels of Commerce*, New York, Harper & Row.

Brenner, N., Schmid, C. (2011), *Planetary Urbanization*, in Brenner, N. (ed.), *Implosions / Explosions*, Berkley, Jovis.

Brosnan, K. A. (2002), *Uniting Mountain and Plain: Cities, Law and Environmental Change Along the Front Range*, Albuquerque, University of New Mexico Press.

Cronon, W. (1991), *Nature's Metropolis: Chicago and the Great West*, New York, Norton.

Crutzen, P. J., Stoermer, E. F. (2000), *The "Anthropocene"*, "Global Change Newsletter", n. 41, pp. 1-20.

Fressoz, J., Bonneuil, C. (2016), *The Shock of the Anthropocene: The Earth, History and Us*, London, Verso.

Geddes, P. (1925), *The Valley Plan of Civilization*, "The Survey", n. 1, pp. 288-291.

Gobiet, A. et al. (2014), *21st Century Climate Change in the European Alps - A Review*, "Science of the Total Environment", n. 493, pp. 1138-1151.

Habermas, J. (1981), *Modernity versus Postmodernity*, "New German Critique", n. 22, pp. 3-14.

Haraway, D. J. (2016), *Staying with the Trouble: Making Kin in the Chthulucene*, Durham, Duke University Press Books.

Lahoud, A. (2018), *Aestetics and Politics*, in F. Hertweck, N. Katsikis (eds), *Positions on Emancipation. Architecture Between Aesthetics and Politics*, Zurich, Lars Muller, pp. 112-121.

Latour, B. (2018), *Foreword to A Moving Border*, in M. Ferrari, E. Pasqual, A. Bagnato (eds), *A Moving Border. Alpine Cartographies of Climate Change*, New York, Columbia Books on Architecture and the City, pp. 12-24.

Leopold, L. (1949), *A Sand County Almanac*, New York, Oxford University Press.

Malm, A. (2018), *The Progress of This Storm*, London, Verso.

Marzo Magno, A. (2010), *Piave. Cronache di un fiume sacro*, Milano, il Saggiatore.

Melosi, M. V. (2014), *Huston. Energy Capitals*, "New Geographies", n. 6, pp. 97-102.

Menga, F., Swyngedouw, E. (2018), *States of water*, in *Water, Technology and the Nation-State*, London - New York, Routledge, pp. 1-18.

Moore, J. W. (2015), *Capitalism in the Web of Life: Ecology and the Accumulation of Capital*, London, Verso.

Moore, J. W. (2017), *Confronting the Popular Anthropocene: Toward an Ecology of Hope*, "New Geographies", n. 9, pp. 194-199.

Mumford, L. (1963), *Technics and Civilization*, New York, Harcourt.

Permanent Secretariat of the Alpine Convention (2019), *Natural Hazard Risk Governance. Report on the State of the Alps Alpine Signals - Special Edition 7, Water and Water Management Issues*.

Polanyi, K. (1983), *The Lovelihood of Man*, Torino, Einaudi.

Povinelli, A. E. (2017), *The Ends of Humans: Anthropocene, Autonomism, Antagonism, and the Illusions of Our Epoch*, "The South Atlantic Quarterly", n. 116, pp. 293-310.

Santin, I. et al. (2019), *Recent Evolution of Marmolada Glacier (Dolomites, Italy) by Means of Ground and Airborne GPR Surveys*, "Remote Sensing of Environment", n. 235, 111442.

Schmid C. (2004), *Nwtworks, Borders, Differences: Towards a Theory of the Urban*, in N. Brenner (ed.) *Implosions / Explosions*, Berlin, Jovis, pp. 67-80.

Semenza, C. (1957), *L'impianto Alto Cordevole di Malga Ciapela*, "Marmolada Full Running" [Online]. Available at: http://marmoladafullrunning.com/centrale-idroelettrica/ [Accessed: 29 June 2021].

Smith, N. (1990), *Uneven Development: Nature, Capital and the Production of Space*, Oxford, Blackwell.

Steffen, W. et al. (2015), *The Trajectory of the Anthropocene: The Great Acceleration*, "Anthropocene Review", vol. 2, n. 1, pp. 81-98.

Swyngedouw, E. (2015), *Liquid Power: Contested Hydro-Modernities in Twentieth-Century Spain*, Cambridge (MA), The MIT Press.

Verburg, P. H. et al. (2016), *Methods and Approaches to Modelling the Anthropocene*, "Global Environmental Change", n. 39, pp. 328-340.

Von Foerster, H. (1984), *Observing Systems*, Seaside (California), Intersystems Publications (Systems inquiry series).

Von Foerster, H. (2010), *Understanding Understanding: Essays on Cybernetics and Cognition*, New York, Springer.

Wainwright, J., Mann, G. (2018), *Climate Leviathan: A Political Theory of Our Planetary Future*, London - New York, Verso.

White, R. (1996), *The Organic Machine: The Remaking of The Columbia River*, New York, Farrar, Straus and Giroux.