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A Dialectics of Ecology and Design in the Reform of Contemporary Landscapes

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Abstract: In the face of the impending crisis of the biosphere, the debate in the design disciplines has been attracted to the disciplinary precincts of ecology and its dynamics, while the notion of landscape continuum tends to englobe that of territory. The intention to contaminate traditional land transformation approaches with sustainable approaches derived from landscape ecology has been recorded. At the same time, a particular focus on the study of the metabolism of territorial entities has emerged beside the traditional interest in the study of their morphology. This paper tackles the theme of the special issue on 'Constructed Natures: Shaping Ecologies through Landscape Design' by adopting the recurrent method of human sciences, via discursive analysis of literature and case-studies. First, the paper characterizes the origins and reasons for the ecological crisis. Secondly, we review the recently growing interest developed in the landscape design disciplines for the ecological/metabolic aspects vis-à-vis the traditional focus on morphological/compositive aspects. Finally, we review three case-studies representative of distinct contemporary approaches to landscape reform responding in distinct manners to the impending ecological crisis. The compared analysis of the case-studies identifies strengths and weaknesses of the different approaches. The paper's conclusions summarize the profile of a virtuous approach to the reform landscape apparatuses and draw possible lines of further research and experimentation in the field of landscape design and its relationship to ecology.

Keywords: biosphere crisis; landscape continuum; landscape ecology; territorial metabolism; landscape design

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1. Introduction

In the last two decades, the debate in the design disciplines has been overwhelmed by the aspiration of shaping our contemporary space through ecology. The realization of the hybrid nature of our contemporary space, apparatuses made of inextricable artificial structures and natural systems [1], the parallel emergence of the idea of a landscape continuum, or built landscape, englobing the traditional territory made of discrete, urban and non-urban areas [2], and the sudden perception of an impending ecological catastrophe at the planetary scale [3–5] have prompted generations of designers to drop the traditional tools of architecture and urbanism in favor of new tools derived from the fields of ecology [6].

On the one hand, a vast movement in the field of the design disciplines has interpreted such a change as a transition from an ethos of architecture (colonizing, linear-growth model) to an ethos of landscape (symbiotic, circular model) [7–9], and exerted a broad influence in academia and generally the design disciplines, globally. In some cases, such change of ethos has represented a rhetorical livery to carry on large spatial transformations following the same principles of conventional development informed by the linear-growth model [10]. While claiming the intention of counter-colonizing the field of architecture and urbanism by overriding its principles with the principles of landscape, architecture and urbanism have expanded over the realm of landscape [11].

On the other hand, landscape ecology (see Section 2.2.2) has been embraced as a thaumaturgical recipe capable of solving any landscape design problems as attested to by

landscape ecology manuals for landscape architects produced at the Harvard Graduate School of Design and similar initiatives [12]. At the same time, a broad interest in the study of territorial metabolism has stemmed from the field of industrial ecology to invest the study of territorial entities, combining natural and humanmade systems through various methods and approaches under the names of MFA, SFA, and LCA [13]. Such approaches have so far failed in capturing relevant morpho-spatial information layers.

The theme of the special issue on 'Constructed Natures: Shaping Ecologies through Landscape Design' can be interpreted as an understated provocation that rings the bell of a new stream reversing the terms of the question again. We have aspired to transform our built environments by incorporating the logics of natural ecology, creating parts of nature, and, by that, making ourselves lesser gods. We ought to realize now that our actions touch parts of nature through design practices and convert them into artificial systems. This is particularly true for the design of today's landscape continuum. The debate is called on two planes. First, large parts of nature have become inadvertently artificial. Second, large parts of the global ecology are shaped by design actions. While the involvement of articulate sociopolitical systems in the determination of contemporary space exceeds the scope of this paper, we are summoned to reevaluate the opportunity of shaping ecology through the design of landscape in the contemporary production of space (see Section 3).

The paper adopts the method of discursive/descriptive analysis on literature and case-studies recurrent in human sciences, in coherence with lines 1 and 2 of the call ('Description of relevant recent or past study cases' and 'Landscape architecture and global changes'). The paper contributes to the stated main aim of the special issue, that is, to overcome the dichotomy between human transformations and environmental systems connecting the small scale to planetary logics. Following the Introduction, Sections 2 and 3 collect materials for the analysis: literature review on ecological context and premises; growing interest in territorial/landscape metabolism within the design disciplines; and selection and analysis of three case studies, globally distributed and representative of different design approaches towards nature (further details below). Section 4 identifies strengths and weaknesses of the characterized approaches through a compared analysis of the case studies in relationship to ecological premises and relevance of metabolic aspects. In the conclusions, we delineate the profile of a virtuous approach to the transformation of landscape apparatuses and suggest possible lines of further research and experimentation in the field of landscape design capable of establishing a non-deferential relationship to ecology.

2. A Discursive Analysis on Literature: Ecological Crisis, Centrality of the Metabolism

Through discursive analysis on literature, the first subsection characterizes the impending ecological crisis, its origins and its tendencies, with the aim of introducing the relevance of metabolic circumstances. The second subsection reviews the recent interest of the design disciplines applied to the territory and landscape for metabolic aspects in association with, or as an alternative to, the traditional morphological aspects. The review articulates metabolism/territory perspectives, where either metabolic or morphological aspects prevail on the other, and an ecology/landscape perspective where physiology and morphology establish a correspondence. In Section 3 that follows, three globally distributed case studies will be selected as representative of distinct approaches to the transformation of contemporary landscapes in response to the ecological crisis and in relation to nature and metabolism.

2.1. Planetary Crisis

According to a broad range of literature, there exists an impending planetary catastrophe [14]. Our planet can be regarded as a closed ecosystem powered by solar energy [13]. Prior to the proliferation of human societies assuming a prevailing weight, living populations were subject to self-regulating laws, floating on the long term. Humans have intended to free themselves from the uncertainties of the natural state by adapting their environment for inhabitation. According to both Freudian and Jungian psychoanalytical schools, the pri-

mordial modification of the surrounding space exceeding natural self-regulation coincides with the appearance of a rational mind engendered by an act of violence, either consumed or suffered [15] (pp. 94, 99–100) [16] (pp. 120–128). The transition from nomadism to sedentarism, the creation of more complex social systems involving institutions administering power, the beginning of agricultural societies and, with these, the rise of urban civilization build upon that act of violence. While the sphere of rationality rises from the realm of instincts, humans separate themselves from nature, its cycles, its dynamic equilibrium, and pristine platform. Through technique, the flows of natural metabolism have been redirected to the service of human societies. The expansion of the anthroposphere, the sphere of life and human activities, has colonized to a large extent the natural biosphere [13], to the point of breaking the thermodynamic equilibrium of the geo-bio-sphere ecosystem. Formal procedures are, in fact, underway for the adoption of the Anthropocene in the geological time scale as the epoch of the manifestation of prevalent human impacts on the metabolism of the Earth. Anthropocene society is characterized by a high technological capacity to extract, consume, and produce, and a consequent demographic proliferation. Soaring indicators relative to human activities, on the one hand, and plummeting indicators relative to the planet's ecological metabolism, on the other, intersect in a time segment captured by Will Steffen in a series of graphs as the Post-World-War-II Great Acceleration [17].

For millennia, humans have defined nature in reference to their needs, recognizing the stocks of organic and inorganic components that meet our material needs, such as food, minerals, and the energy stored in geological deposits or flowing in natural processes. Humans have also recognized the intangible qualities of some natural formations that promote their psychological well-being, such as a landscape or the sound of waves. Such natural benefits are referred to as ecosystem services [18,19] (p. 40) [20,21] (p. 24). The most authoritative assessments picture a largely compromised planetary metabolism, where all the ecosystem-service parameters show a marked tendency to decline [22]. The vital force that crosses the planet, which we could summarize in the term of 'biodiversity' [23], is endangered with an impending collapse. The present state of the planet is so impaired that only relics of the twenty-six pristine biomes that composed the original landscape of the Holocene survive [24,25] (pp. 207–210, 218) [26]. Surviving fragments are so directly or indirectly impacted that the notion of 'biome' can now be considered only theoretical, replaced in practice by that of 'anthrome', the product of human activities on an ecosystem [27,28].

These considerations highlight the growing relevance of the metabolic aspects involved in humanmade transformations of land. There emerges the necessity of elaborating both an overall conceptual system for dealing with multiple human operations within a society and tools capable of calculating their metabolic implications. Such urgence has influenced the approaches of the design disciplines in reference to ecology.

2.2. A Matter of Metabolism in Territories and Landscapes

The redesign of the anthropospheric metabolism has been described as a colossal, collective enterprise, which can be conceptualized through a pyramid rising on the four vertices of 'geo+bio-sphere' (natural resources), 'built infrastructure' (anthropogenic resources), and 'business' and 'institutions' (social resources) [13] (pp. 283–285). Collective reformative actions negotiate the existing metabolic regime on the pyramid's faces and along its edges taking on: air-water-soil policies; management of structures; materials and energy; science and environment; transformation of the landscape and territorial development; and economy. Such a model implies a sharing and a redistribution of responsibilities in the transformation of our environment among different technical expertises. New challenges have emerged, new competences are required, and new priorities lie ahead for territorial and landscape designers.

The present state of the biosphere is a matter of planetary metabolism, i.e., the ecology of a comprehensive ecosystem. The United Nations Environment Program reports a clear picture of global metabolic dynamics. The total amount of material consumed by human activities on the planet is calculated and then related to human demographics and values of

global economies. The concurrent demographic increase and rise in welfare and consumption standards through history indicate a spontaneous decoupling of material consumption and economic growth. [29] However, the entity of such decoupling appears as a fraction of the consumption increase and clearly incapable of tilting the trend, as confirmed by alternative models comparing consumption with regenerative capacity [30,31]. Projected to 2050, an estimated human population of nearly 9 billion individuals [32], a metabolic rate of material per-capita consumption in many developing countries aligned upwards with that of developed countries, the global material consumption will be three times what it is today.

Technocratic orientations propose non-catastrophic theses: the destruction of nature advances parallel to the technological capacity to govern the perturbations that derive from it [28]. Substantial literature, on the other hand, interprets the manifestations of climate change as harbingers of a sixth mass extinction [4,14,17,22]. Between divergent positions, the idea promoted by the United Nations Environment Program is that the understanding of the planet's urban metabolisms might represent a decisive tool for substantially reducing consumption by circularizing activities, and thus transforming waste into resources [29,33]. Although encumbered by the logics of conventional economic growth, UNEP's position is tempered by programs introducing alternative indexes centered on wellbeing along with the promise of greater wealth distribution equity (e.g., Sustainable Development Goals Action). It seems clear, however, that metabolic efficiency will have to be accompanied by policies for the decrease of material needs, including demographic awareness, and the introduction of alternative indicators of prosperity.

Scaling down our scope from the planetary to the geographic, territorial, and local dimension, our considerations on ecosystem-services assessment and management, on the one hand, and resource-consumption/work-production decoupling, on the other hand, translate to the practical notions of sustainability and circularity populating today's disciplinary debate and setting the notion of metabolism, i.e., ecology, at the center of the study of the territory and the extended landscape.

2.2.1. Metabolism and Territory

In this context, the urgency of an analysis of anthropospheric metabolisms has become evident, starting from the planetary scale, the national and regional macro-scale, the meso-scale of the urban region and the regional city, down to the micro-scale of town, neighborhood, and residential unit. This has entailed englobing, from various parts, forms of metabolic analysis in the practice of planning and designing our surrounding space at various scales. The study of territorial metabolism through methods such as MFA, SFA, or LCA has become a major perspective of territorial analysis [13]. In the light of the crisis of the biosphere's functioning, the radical redesign of the metabolisms of human societies, i.e., territorial metabolisms, seems an obligatory way to ensure a possible future. As for urban ecology, territorial metabolism studies, however, mainly quantify incoming and outgoing flows, while the technical and social circumstances within the system boundary are not investigated [34,35]. Only recent LCA experiences aim to 'open the black box of metabolism', involving issues of social well-being, behavioral evolution, and work pressure concerning individuals and the community immersed in the system. Among others, LCA analyses conducted by Eléonore Loiseau on the territorial metabolism of the Bassin de Thau in the Languedoc-Rousillon region, France, are representative of such approaches [36–38]. Sources of degradation of ecosystem services and human well-being are identified to propose improvement policies. Processes of participatory construction of the models of analysis of urban and territorial metabolisms have been widely experimented with the involvement of all the holders of legitimate interests on the territory. Analysis and technical skills are combined with vivifying bottom-up contributions. However, to date, even the most advanced approaches fail in capturing the formal, morphological, and spatial characters of the territory.

2.2.2. Ecology and Landscape Design

The inextricable relation between physiological metabolism and spatial morphology of a region [39] is instead central to landscape ecology, a discipline stemming from ecology in the late 1970s with the substantial contribution of Richard Forman. The assemblage of natural and built systems in our contemporary space is more than ever inextricable. Landscape ecology analyzes the behavior of natural areas under the interference of human activities. It is the specular correspondent of urban ecology, studying the physiological functioning of artificial systems in connection with the natural stocks, flows, and dynamics. Its first and founding principle stands in the overall correspondence between the morpho-spatial configuration of the mosaic and its functional metabolism, that is, the ecosystem composed of flows of energy, material, individuals, and information. A certain spatial structure is the product of metabolic processes that have occurred over time, but, at once, metabolic processes are induced by specific spatial structures [40] (p. 5).

The methods and principles of landscape ecology contribute to the study of the metabolism of a territory along with its spatial characterizations and distributions. Landscape designers have largely resorted to the methods of landscape ecology to gain a grasp on the physiological dynamics of a region, along with its more familiar morpho-spatial characters. Landscape ecology has been felt as a twin discipline of landscape design to the point that its disciplinary principles have even been reduced into applied manuals for landscape designers [12].

3. Materials and Methods, Case Studies: An Assessment of Contemporary Space Production as Landscape

Today's space is then primarily characterized by a double correspondence, nature/artefact and morphology/physiology, or form/process, where the idea of landscape continuum tends to override that of territory [10] (pp. 51–76). The landscape continuum is the subject of a vast interdisciplinary debate for its potential to combine in an overall vision the metabolic analysis and the morphologic capture of the natural/handmade assemblage of contemporary space. The divide between the physiologic and the figurative, the processual and the formal, the cognitive and the cultural exploration of the world has characterized the formation of European modernity and transferred to western culture. Since the age of the great explorations, this verge crossing the intellectual topography of the European continent has grounded itself over the geography of the planet. At the pace of colonial geography, it has been drawn with great violence along with the relocation of floral species and agricultural productions [10] (pp. 97–138, 159–182).

The same metabolic/figurative divide brought forth by this modern geography crosses the post-colonial era and the subsequent globalization, whereby every city becomes global [41] or the world becomes one city [42]. The reconsideration of the metabolic/figurative verge is, as much as the city/countryside and built/natural binaries, a crucial issue in the collective effort at recovering a sense for space-making operations today. Spatial planning and design, and in more general terms space production, are being called from more sides to adopt the modalities of landscape over tectonics by dropping the colonial attitude towards nature in favor of a symbiotic approach. By the term 'space production' we generally refer to the grounding of intangible socioeconomic structures onto the physical environment. Direct reference is due to the homonymous capital book of 1974 by Henri Lefebvre, ascertaining a science of space [43]. The background of such a notion is however anchored to the urban realm and to his Parisian watchtower. In 1967 [44], Lefebvre captures an urban world launched at full speed towards its thorough restructuration led by the capital and, alone, predicts the inadvertent clash against the 1968 irruption. Further developed by David Harvey, the idea of the possible more equal and diverse alternatives will be still bound to the urban ambit [45] until Neil Brenner unfolds the narrative over to the immense hinterlands of the Capitalocene [46,47]. The notion of space production, then, addresses the urban agglomerations where humankind surges as well as the infrastructured, operational

landscapes that cover most of the globe, to support its anthropospheric metabolism by providing ecosystem-services.

Three approaches to the redesign of space tackling the combination of metabolic/figurative and natural/handmade, identified in the case-studies that follow, are representative for their modalities and geographic distribution. The first case is representative of a family of actions tending to reincorporate parts of nature and ecosystem services in cities in the process of metropolitanization. Public parks in London, New York, Paris, Berlin, and everywhere after the Volksgarten of Magdeburg, are implemented to provide natural resources to the benefit of urbanites. The second case is linked to the technocratic approach condensed in the Geddesian formula of 'geotechnics as applied geography' [48], although mitigated by the notion of a spatial assemblage made of nature and culture. From there, the paradigms of both positivistic planning and cultural landscape will stem. The third case represents a more complex attitude, reading the expanded space as a landscape continuum, composed by natural and artificial systems as well as a semantic text capable of embedding a renovated sense in space.

3.1. A Linear Park, United States

The decade-long conversion of the derelict elevated rail line crossing Chelsea, from the Meatpacking District south to the Hudson Yards north, into a piece hanging nature on designs led by James Corner has become a model worldwide. Designed in the period 2004–2009, it was implemented in three successive segments 2009, 2011, and 2014. The rehabilitation of this metropolitan corridor in the heart of Manhattan proposes to reincorporate nature and its ecosystem services onto the artificial platform of the metropolis. A sequence of sophisticated, herbaceous-to-arbustive landscape transitions exhibits an autochthonous, sustainable character, while providing a long recreational corridor for residents and tourists. Over 110,000 plants are consociated by Piet Oudolf with subtle art and skillful technique to form meadowlands, shrublands, and woodlands, where natural base elements create artificial living compositions unprecedented in nature [49]. These are further combined with built components, such as ramps, slopes, pits, seating steps, flyovers, and other installations to generate a varied, ever surprising and engaging environment, informed by sophisticated and delightful inventions. It is a combinatory play of natural and artificial elements in synergy (Figures 1 and 2). The High Line operation, started by a grassroots movement of environmentalist residents, was animated by the intention of preserving the spontaneous vegetation that had developed on the derelict infrastructure of the elevated railways alongside 10th Av. [50]. It is a complex apparatus with a machinic metabolism alimented by substantial water supply, dependent on constant maintenance, and discharging tons of liquid and solid emissions per year. Very little remains today of that poor, spontaneous original vegetation, still in place only in the 'Northern Spur Preserve', a short segment on 16th St. and requiring gardeners' efforts. The operation has been managed since the beginning through a no-profit organization exclusively running on voluntary donations. However, it has eventually resulted in one of the most prestigious city corridors in the world [51]. On both sides of the park, a sequence of speculative developments flanks the park, such as the XI, the IAC, the HL23, the 520 West, the Lantern House, the 10–55 Hudson towers, housing condominiums, offices, and venues of extreme luxury and exclusivity has built up. Despite its virtuous inception, the High Line can be considered an exemplary representation of the landscape urbanism approach [7–9] where forms of environmental sustainability produce a refined aesthetic effect while perpetuating the economic model of unlimited growth. Here, sophisticated designs disguise anthropocentric provisions of natural resources, i.e., ecosystem services.

Figure 1. High Line Park, Manhattan, United States: view of a central segment of the linear park sided by new developments. (PD).

Figure 2. High Line Park, Manhattan, United States: masterplan of the linear park crossing Chelsea from the Meatpacking District, left, to the Hudson Yards, right. (PD).

3.2. Two Wetland Parks, China

The enormous apparatuses of geographic scale implemented in China by the environmental engineering group Turenscape have put in place the 'applied geographies' preconized by Patrick Geddes at the beginning of the 20th century [48]. Entire segments of river basins and lagoons are redesigned as artificial hydrogeological and vegetational systems meant to emend the condition of heavily polluted aquifers, absorb flush waters from the infinite expansions of impervious surfaces, and provide the multitudes of new conurbations with ecosystem services.

In the Minghu Wetland Park, Liupanshui, Guizhou Province, a large segment of the Shuicheng fluvial corridor was in a state of grave contamination due to agricultural, industrial, and residential uses. Concrete banks canalizing the river, put in place in the 1960s, had altered the natural corridor to provide space open to cultivations and constructions. Incoherent littering of gray structures fragmenting the hydro-geological system, and heavy pollution from informal residential drainages and illegal industrial emissions from the

recent urban and industrial diffusion, had produced a derelict, devitalized environment. Interventions of a regional scale led by the environmental engineering firm Turenscape were intended to recreate integrity and life on a reinvented natural platform. Designed in the period 2009–2011, the wetland was implemented by 2018. The concrete banks are removed, the fluvial waters flood the valley according to an artificial design and form wetlands intended for phytoremediation. Again, a product of art and technique, this new piece of constructed nature includes a redesigned topography disencumbered by improper structures, equipped with natural habitats, and a system of wetlands capable of phyto-remediating surface and underground waters through successive steps [52,53] (Figures 3 and 4).

Figure 3. Minghu Wetland Park, Liupanshui, Guizhou Province, China: bird-eye view of the wetland area. (courtesy of: K. Yu/Turenscape; photo: K. Yu/Turenscape).

Figure 4. Minghu Wetland Park, Liupanshui, Guizhou Province, China: masterplan for the overall reformation of the hydrogeologic system. (courtesy of: K. Yu/Turenscape).

As for similar works by Turenscape, such as the Qunli Stormwater Park, the Houtan Park, or the Ningbo Eastern New Town Ecological Corridor, among others, in the Minghu Wetland Park, the design of landscape is shaped by ecology. Positivist geotechnics reestablishes an ecological equilibrium to gain further margins for new developments. In line with this approach, Turenscape's plan for China's National Ecological Security Pattern of 2010 envisions the enterprise of equipping an expanding society with ecological infrastructures on a subcontinental scale [54].

3.3. A Fluvial Corridor, Switzerland

A two-decade-long implementation conducted by Superpositions, a multidisciplinary group coordinated by George Descombes, to reform the Aire River corridor at the entrance of Geneva reinvents environmental cycles and processes of the region. The river becomes the framework of a territorial and landscape reorganization interfacing agricultural production of the plains south-east, urban developments north-west, and the natural platform (Figures 5 and 6). A complex operation involving engineering, financial management, and political dynamics results in a poetic action capable of grounding a new sense onto the land [55–57]. The operation combines scientific and technical know-how with the life of natural elements and their evolution, that is, traditional technical engineering with a new form of biological engineering [58]. A new corridor crossed by the forces of life revived through the plains corresponds to what Alberto Magnaghi defines as a structure with characteristic invariants, capable of generating wealth for a place upon the long duration [59] (p. 299) [60] (p. 7).

Figure 5. Aire River reform, Geneva, Switzerland: bird-eye view of the reform. (courtesy of: Superpositions, George Descombes, adr architects; photo: Fabio Chironi).

The plan redesigns the 19th-century artificial channel and its bridges, maintaining its artificial presence alongside the renaturalized course of the river, whose waters are free to rediscover ancient meanders. The work of humans on one side and the revived nature on the other are exposed as a landscape apparatus [55] (p. 12) that distributes human and natural history in a readable text. The water cycle that stands at the core of the project is not one characterized through hydrogeologic technique solely, but rather a construct that, as Daghini puts it, precipitates in the relationship mass/perspective [58] (p. 32). Mass is the substance of the underground aquifer, with a tectonic structure produced by a hydro-

geological section. Nevertheless, its processes involving in-depth materials and forces of the place coexist with its readability on the surface through perspective. In describing the project, Descombes' direct reference goes to the idea of the landscape as garden and Hunt's 'third nature' [61]. The landscape/garden resulting from the spatial transformations is a condensate of the world prodigiously combining emotions with knowledge [56] (p. 36).

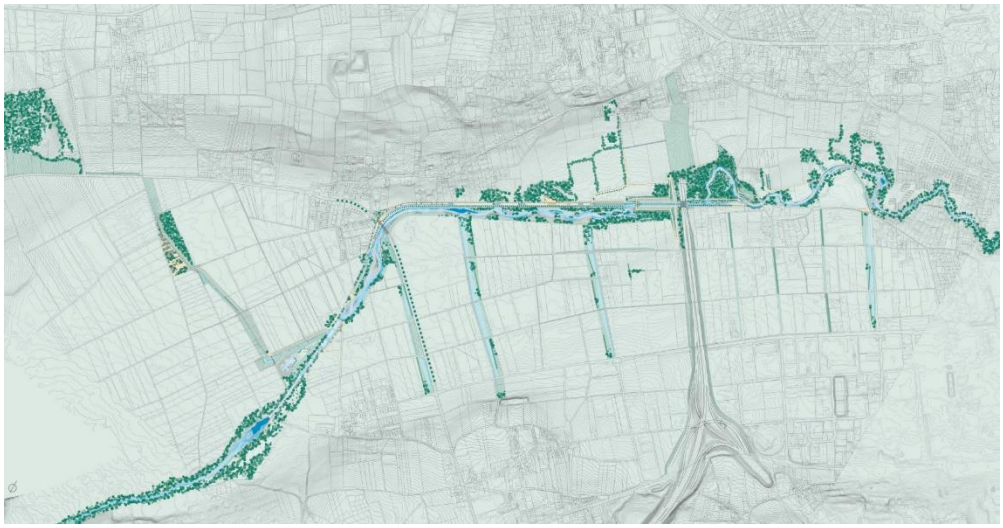

Figure 6. Aire River reform, Geneva, Switzerland: masterplan showing the reformation of the fluvial corridor with the natural spine of the river interfaces the urban fringe north and the agricultural fabric south. (courtesy of: Superpositions, George Descombes, adr architects).

4. Results and Discussion: A Compared Analysis

The case studies described above in North America, Asia, and Europe tackle the coexistence of ecology and design instances in the reform of landscape apparatuses made up of natural and constructed systems. They share the engagement with a more general underlying divide defined by the metabolic/figurative capture of the world; process and form, morphology and physiology, cognition and culture coexist in the exploration and reform of space. However, the three interventions reviewed are exemplary of clearly distinct, and even contrasting, design approaches towards ecology.

The High Line incorporates a sophisticated piece of landscape design, cloaked with the aspect of a sustainable ecosystem, into the heart of the metropolis. Far from shaping ecology through design, it installs a high-maintenance facility delivering ecosystem services to metropolitanites and tourists. Its extraordinary attractiveness and convenience have entailed the development of a massive corridor of speculation following the linear-growth model and the logics of exclusivity, heavily bearing on the overall metabolism, while exploiting resources from public facilities. Neither ecology nor landscape design are shaped through the other, but together conjure up a joint simulacrum under which the traditional logics of metropolitan development perpetuate themselves.

The Minghu Wetland Park, as the Qunli Stormwater Park, the Houtan Park, or the Ningbo Ecological Corridor are implemented pieces of applied geography. The design of the landscape is adapted to the necessity of reconfiguring great hydrogeological apparatuses. Ecology structures the reinvented platform upon which the design is articulated on a hierarchically subordinate level. The overall intervention provides basic ecological services for the inclusion of masses of the newly urbanized citizens by expanding existing agglomerations or diffusing settlements in the territory, and eventually perpetuates the expansion of the megacity model. There, undoubtedly landscape design is shaped through ecology.

The reform of the Aire River combines an action of scientific and technical precision over the natural processes with an action of cultural bearing over the deep figures, forms,

and things of the land. To revive the morphology of a river and its valley, it emends the interrupted cycles of an impacted environment while embedding a new sense over a layered, culturally charged land. The fixed determination of the technical design is to be counter-colonized by the exposition to the temporality of nature, its sinusoidal movement following the fast cycles of seasons, and the slow fluctuations of natural succession. To anchor the discourse to the terms of this special issue, we could identify the embedding of a new sense with the very heart of 'landscape design', while the reform of the hydrogeological system falls under the category of 'ecology'. The intervention, therefore, brings forth a reciprocal determination between ecology and landscape design, where each term shapes itself through the other.

5. Conclusions

The catastrophic impacts of the anthropic proliferation on the planet that we are witnessing, due to unsustainable resource mining and discharged emissions, exact the urgent reconsideration of space production approaches from both a technical and philosophical stance. In the production of contemporary space, fundamentally redefined as landscape continuum, the terms of 'landscape design' and 'ecology' can be identified with the 'forces of sentiments and intellect' summoned by Alexander von Humboldt to combine in one effort, simultaneously seeking figurative capture and metabolic *entendement* of the world [62].

This special issue questions the current trend of subjecting landscape design to the imperative of ecologies, as an aesthetic, formal superstructure vs. a bearing platform. Far from such assumptions, our compared analysis prompts a reconsideration of the vital force and potentials of design laid out in synergy with ecology. The convergence of design and ecology is fundamental in sustainably shaping future urban agglomerations as well as the built landscapes of humankind. The convergence of design and ecology is obviously just one element contributing to an urgent, much broader scheme of action: a substantial retreat of the anthroposphere, i.e., of humans, to ensure a future to the present form of life on Earth [63,64]. This implies an overall, collective redesign of the Anthropospheric pyramid we have described above, defined by the vertices of nature, artifacts, business, and institutions [13]. Opportunities for further research stand in the experimentation of methods of parallel control of both morphological and physiological levels in the analysis and design of landscape apparatuses. Finally, the embedding of a new sense over the territory through operations of land reform on the geographical scale seems to yield most effective results when ecology and design develop symbiotically, consolidating upon the reconciling notion of long duration.

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