A Tectonics of Ontogenetic Materialism: Three Projects

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ABSTRACT: *The effects of human activity at global scale are largely absent from tectonic discourse. This paper presents preliminary concepts and examples toward an expanded conception of what might constitute an architectural tectonics in the Anthropocene. Our habit of evaluating buildings as artifacts – as singular, autonomous objects, as 'articulations' of assembly, 'expressive details,' or 'transparencies' of program or assembly – too often limits building to representation, to mere significations of ecological, cultural, and political realities. Our recent collective focus on building systems 'performance' can also limit our understanding and responsibilities relative to larger systems: the assumed fuel of said systems, of material extraction, production, distribution, assembly, and disassembly. Further, our collective entanglement with dynamic, complex planetary systems is at odds with a dominate hylomorphic model of thinking, an ontology of separation: between human and non-human, organic and inorganic, matter and form, thing and idea.*
Using three recent student architectural thesis projects alongside concepts from recent 'materialist' scholars, the author argues that reframing of our epochal perspective from the Holocene to the Anthropocene productively alters our ontological biases. Repositioning our understanding to the human impact on terrestrial systems is crucial to an engaged practice of architecture. The paper addresses design strategies and materialist concepts within the presented works that can potentially shift our tectonic conceptions.

KEYWORDS: Tectonics, Anthropocene, Materialism

INTRODUCTION

The realization that we affect the earth on a geologic scale has transformed our planetary understanding from an epoch of the Holocene to that of the Anthropocene; this perspectival shift challenges our assumed human privilege. As Nigel Clark and Bronislaw Szerszynski write, "the Anthropocene offers incitements for thinking about our planet across a range of timescales, fields of vision and trajectories," (Clark 2021, 3). An architectural tectonic discourse that attempts to grasp the scale of the Anthropocene is imperative, one that provides new design strategies and conceptual frameworks for revised and expanded practices.

The dominant discourse of architectural tectonics has tended to relegate social, political, and material imports of construction to signification and representation. 'Articulation,' 'transparency,' and 'expressive detail' are generally deployed as cultural, political, ontological, and cosmological stand-ins. An influential example is Kenneth Frampton's *Studies in Tectonic Culture;* here, it is ultimately the structural frame and the climatic envelope that constitutes "poetic construction." Frampton states that tectonics is not "the mere revelation of constructional technique but rather its expressive potential," (Frampton 1995, 2). We are suggesting that Frampton's distinction between the representational and ontological aspects of tectonic form, "between the skin that re-presents the composite character of the construction and the core of the building that is simultaneously both its fundamental structure and its substance," does not go far enough, that such a conception of tectonic potential limits architecture's agency to representation and thus, to a solely human-centered ontology (Frampton 1995, 16).

Ecological dynamics also elude the discourse of tectonics. 'Site specificity' rarely extends to material networks and is seemingly limited to the singular artifact of building form. For example, even the Semperian category of mound, "earthwork" in Frampton's terms, is too often merely an inert foil to the 'framework' tectonic. The 'universal' categories of "framework" and "cladding" are also routinely decontextualized from their material realities in order to emphasize their formal and representational attributes.
Our tectonic thinking has also restricted its grasp of energy, eliding material processes and transformations. A materialist reframing of energy, such as Kiel Moe's use of H. T. Odum's ecosystem science method, "emergy analyses," would begin to account for the numerous interactions between energy and form beyond the symbolic. Moe states: "The emergy method forces consideration of myriad factors and dynamics otherwise externalized to the discipline of architecture" (Moe, 2020, p 106).

The problem is manifold, the absence, or marginalization at best, of Earth from the discourse of tectonics, systems of extraction, production and distribution as well as consideration of planetary processes. These absences obscure our ability to perceive the possibilities of a material, ecological tectonics at scale.

> "For materiality is always something more than 'mere' matter: an excess, force, vitality, relationality, or difference that renders matter active, self-creative, productive, unpredictable. In sum, new materialists are

> rediscovering a materiality that materializes, evincing immanent modes of self-transformation that compel us to think of causation in far more complex terms; to recognize that phenomena are caught in a multitude of interlocking systems and forces and to consider anew the location and nature of capacities for agency" (Coole and Frost, 9).

What might be a tectonics of ontogenetic materialism? Barry Bergdoll traces a shift away from the stylistic and anthropological debates of architectural form in the 19th century; in his essay, "Of Crystals, Cells, and Strata," he outlines investigations into the 'underlying structures and phenomena' of both geology and biology as they relate to architectural form (Bergdoll, 2007). Highlighting the works of René Binet, Violet-le-Duc and others, Bergdoll points to a nascent, vital materialism in architectural discourse, a search for an architecture "in resonance with the building blocks of the universe" (Ibid, p 26).

As Elizabeth Grosz writes in *The Incorporeal: Ontology, Ethics, and the Limits of Materialism*, the Stoic's (3rd century BCE) ontology includes not only all objects, forces and qualities, but also "the nonthings that frame things, put them in the same field and create a plane or context for their actions and being acted upon" (Grosz, p 28). Here, Grosz emphasizes the necessity of an incorporeal framework for the Stoics; it is the inclusion of the immaterial, the form or idea, as the condition and substance of the material itself and as the ontological and ethical basis of living consistently with nature. This monistic model of thinking stands in contrast to our deeply embedded hylomorphic disposition, where 'nature' is a reserve from which to draw and form and idea are imposed upon malleable matter. Tim Ingold summarizes the hylomorphic disposition succinctly: "Form came to be seen as imposed by an agent with a particular design in mind, while matter, thus rendered passive and inert, became that which was imposed upon" (Ingold, 2010, p 92).

Recent theories of materialism contribute to an adequate framing of problems that architecture might address. Overcoming the hylomorphic disposition is key to this reframing. Etienne Turpin, in *Architecture in the Anthropocene*, addresses the necessity of a shift in our thinking if we are to provide sufficient formations of the existential problems we face. He writes that it is "the act of *de-ontologizing* the separation between humans and nature [that] allows contemporary theorists, activists and designers to develop problem-formations adequate to the politics of hypercomplexity that accompany our postnatural inhabitations of the earth (Turpin, 2013, P 10).

An expanded accounting of material, energy, and time can enable a more meaningful and agentic architecture. Providing conceptual frameworks that capture the ecological, social and political within the discourse of tectonics is also critical to that endeavor. Kiel Moe borrows the conceptual term, "terrestrial," from Bruno Latour stating, "'terrestrial' describes all the human and nonhuman, organic and inorganic, 'natural' and 'unnatural' dynamics of entities on the surface of the planet" (Moe, 2020, p 30).

A tectonics of ontogenetic materialism is an attempt to rethink the hierarchy of idea and form over matter, to include and account for the agency and dynamics of material, of energy, of terrestrial systems; it is an effort to provide possible strategies and conceptual frameworks for an architectonics in the Anthropocene. Below are three recent student works, architecture thesis projects that attempt illustrate possible approaches. The first project proposes a tectonics of ameliorative infrastructure, of agentic, dynamic cores; it seeks 'emergent forms' of reciprocity between human, animal, plant, and material systems projected across an expanded timeline. The second looks for the 'edges and cracks' within a consumerist spatial order, proposing a folding of interstitial spaces into 'found' and constructed systems to explore an ecological tectonics at multiple scales. The third project speculates a tectonics of 'immanent materiality.' Rescaling away from representations of a resolved object, the project proposes a tectonics of material intensities and entropic dilations. The author, the thesis advisor for each of the three projects, provides a brief analysis of each and an overview of opportunities for expanding tectonic discourse and practice toward a tectonics of ontogenetic materialism

PROJECT 1: TRANSECT THROUGH TIME

The project site is a brownfield contaminated by the decades-long occupation of a fuel storage and transport business. Adjacent to a channelized river and at the edge of an urban core for a city of 250,000, the site is also bounded by Interstate 'connectors' to the north and south. The student sought 'emergent forms' of reciprocity between human, animal, plant, and material systems projected across an expanded timeline, ultimately resulting in a proposal for an ameliorative infrastructure that functions as the principal armature for future growth or decay.

The critical developments of this project are threefold: the understanding the site as a metabolic assemblage in distress, the programming of the site and architectural interventions as adaptive infrastructure, both remedial and productive, and a proposal of development and transformation over an expanded period of time. Ultimately, the project proposes a tectonics of dynamic core.

Understanding the site as a polyvalent organism, a hybrid of constructed and organic systems, enables the project to immediately formulate a problem outside of the constraints of a hylomorphic model. The initial analysis revealed that the site was formerly a wetland made buildable by channelizing the river. Modifying the riverbank and reintroducing seasonal flooding to the site is key to its amelioration.

Numerous site tactics follow. The reintroduction of a gradient of plant species, native aquatic - to wetland - to upland, stabilize the site, phytoremediative plantings, mechanical biosparging and bioventing remove toxins from the soil, and strategic intake of urban storm water at the top edge of the site all contribute to the formation of site and its conception of infrastructure (see Figures 1 and 2).

The project conceives infrastructure as a living, ecological commons. The biosparge machines function as the seven ‘cores’ of the project, the founding elements for building and site infrastructure. Over time, one of the cores transitions to drinking water infrastructure, another to water treatment, and the remaining five, to public/mechanical cores for mixed use buildings. Each core, then, becomes both mechanical and social infrastructure for future building formations as well as continuing ecological performers within the site.

The expanded timeline of the project, a 20-year buildout before all elements are even in place, allows for expanded considerations of design. In addition to the infrastructure discussed above, building façade elements are understood as modular and energy producing, disassembled, and reconfigured as necessary in response to future change of program, or need altogether. As Cristina Parreño Alonso points out, “architects must develop deep-time literacy to become true planetary stewards” (Alonso, p 3). The extended timeline of the project helps make clear the possibilities of fusing infrastructural site systems with larger, terrestrial systems, as well as building-scale systems toward the development of a complex building-site hybrid of dynamic cores. (see Figure 3).

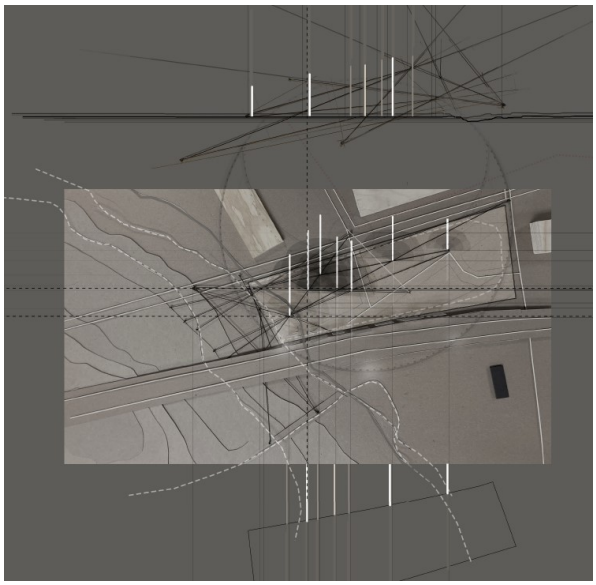

Figure 1: Transect through Time: Site systems diagram. Source: (Kayla Duclos, University of Idaho, 2021)

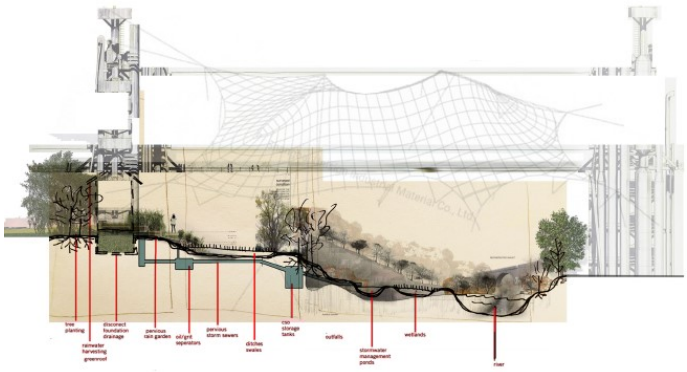

Figure 2: Transect through Time: Site section. Source: (Kayla Duclos, University of Idaho, 2021)

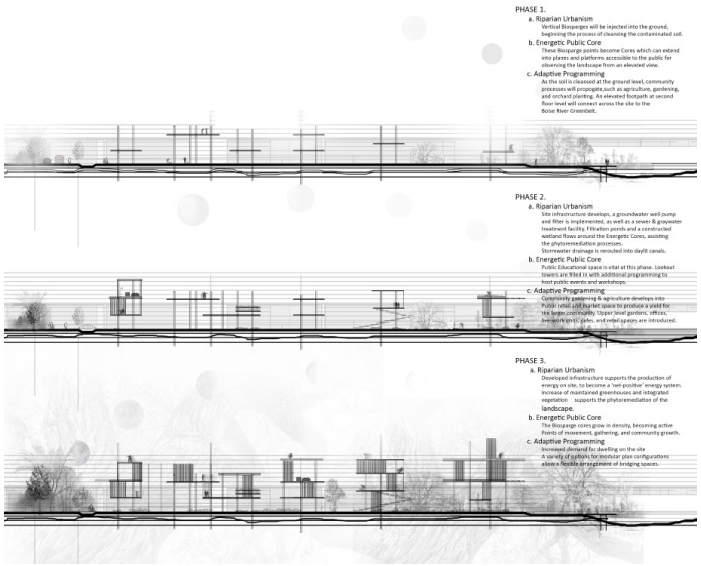

Figure 3: Transect through Time: Timeline of 'cores'. Source: (Kayla Duclos, University of Idaho, 2021)

PROJECT 2: ECOLOGICAL TECTONICS

The second project looks for the 'edges and cracks' within a consumerist spatial order, proposing a folding of interstitial spaces into 'found' and constructed systems to explore an ecological tectonics at building, urban, and territory scales. The project site is in a small city of 50,000 people. Agricultural and livestock ranching have been the principal activities since white settlement in the 1860s, accomplished by the irrigation of a sagebrush steppe. The city is bounded by two rivers, one at surface, where the city center resides, and the other at the base of a 500-foot-deep canyon that cuts through the geological plain running 400 miles east to west.

Strip development characterizes the more recent growth pattern of the city. Over the last 60 years, the city has spread north from the city center to the canyon edge. Here, one finds typical arterial strip development, 20,000-foot 'big box' stores surrounded by vast swaths of surface parking. Low-density, single-family residential neighborhoods surround the commercial zone. The project site is a portion of this commercial district, a principal vehicular intersection and its surrounds of approximately 100 acres.

From the point of view of our materialist discussion, the key attributes of this project are its attempt at an 'ecological tectonics' and what that might mean in the context of suburban development patterns; its proposed building figurations of thermal performance; its urban design elements as ecological performatives; and its resistance' or critical stance toward consumer culture via the development of new spatial and programmatic types toward an 'ecological commons.'

The project develops its urban-scale pattern and building form by way of mapping multiple natural and constructed systems: watershed, animal migrations, agricultural irrigation, land division, commodity networks, vehicular and rail. Daylighting a series of underground canals, the project reroutes contaminated agricultural run-off waters into an integrated network of public landscapes designed for surface water treatment. The reconfigured canal system functions as an open space network, in concert with a wetland park, organizing the new zone.

The canal network also organizes the building forms and programs. Indoor public spaces are created as interstitials, between layers of parking, shopping, and dwelling. These interstitials are proposed as continuous public flows that develop and nurture cultural space, potentially resistant to commodification. As Coole and Frost point out, political and economic materialists are attentive to the "production and consumption of goods, to the uneven effects of globalization on differently located citizens, to the management, distribution, and legitimization of unequal life chances" (Coole, p 28). The project conceives a revitalized public space adjacent to, beneath, and above, private capital (see Figures 4, 5 and 6).

Building forms, in addition to their development as part of the multiple systems listed above, are organized around atria. Formulated as vertical extensions of the continuous horizontal public network below, the atria enable cultural and ecological commons at multiple levels within and atop the structures. Additionally, each

atrium is designed as a public core and “thermal figure,” that is, a thermodynamic building form in the service of climatic performance (Moe, 2008).

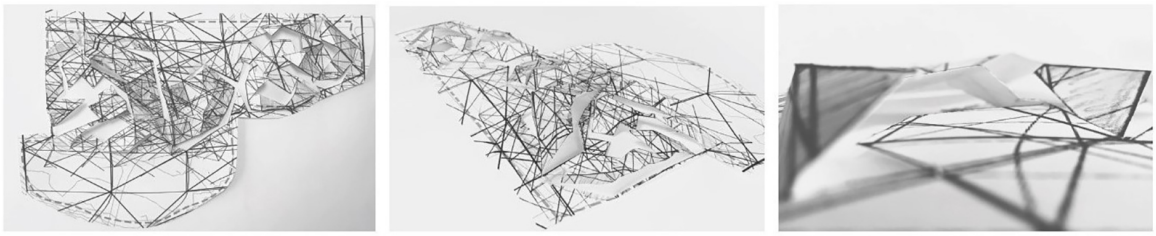

Figure 4: Ecological Tectonics: Site systems and morphologies. Source: (Samantha Jesser, University of Idaho, 2021)

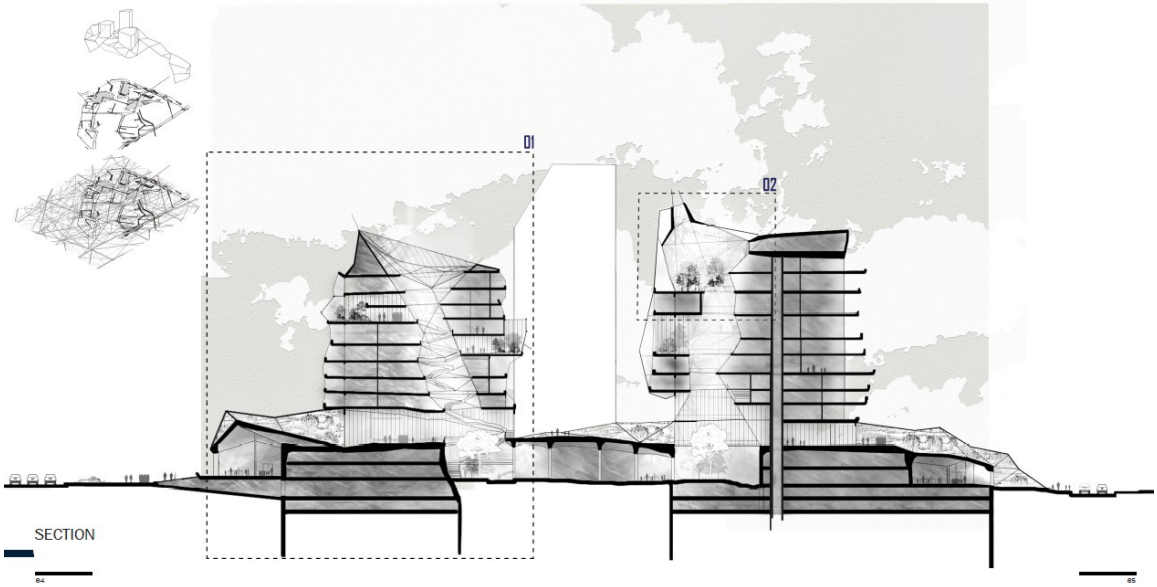

Figure 5: Ecological Tectonics: Site/Building Section. Source: (Samantha Jesser, University of Idaho, 2021)

PROJECT 3: ABSOLUTE UNCERTAINTY: AN INDUCTIVE APPROACH TO MATERIAL TECTONICS

The third project speculates a tectonics of ‘immanent materiality.’ Rescaling away from representation and the resolved object, the project proposes a tectonics of material intensities and entropic dilations. The project is in Butte, Montana engaging three sites: the Berkeley Pit, a former open pit copper mine operational from 1955 to 1982; the Montana Technical University campus; and a district of Butte, now mostly vanished into the southwestern edge of the mining pit, formerly known as Finn Town. The pit and its surrounds constitute one of the largest Superfund sites in the U.S.

The elements of the project pertinent to this discussion are the exploration of a tectonic based on immanent materiality and its possible relation to an emergent form; the proposal for an architecture situated within a geologic horizon; and, again, an infrastructure conceived as a commons, in this case, one of knowledge.

The project proceeds via a series of material studies seeking architectural form. Proposing that material potentials, their latent or immanent order and possible transformations, ought to reside at the root of an architectonic language, the student initiated a series of speculative experiments toward the discovery of a Simondonian architectural ‘individuation.’ Gilbert Simondon theorizes that the development of any individual entity is part of a metastable process of individuation in which formation is continuous. Tim Ingold summarizes, “Simondon's central postulate of individuation holds that the generation of things should be understood as a process of ontogenesis in which form is ever emergent rather than given in advance” (Ingold, 2012, p 433).

One of the material experiments revolved around the different states of the elemental metal, gallium. A trace element in the earth’s crust, gallium is produced as a by-product of mining operations. Because of its low melting point, 85F, the material’s process of crystallization around a foreign element can easily be observed. For the student, this site-specific element provides a demonstration of Simondon’s individuation process,

characterized by “self-organizing forces of the preindividual and the intrusion of a foreign ‘germ,’ an element that is introduced from outside to a metastable system” (Grosz, 174). The element also directly participates in the history of the site; it is entangled within the processes of mining, processing and global distributions; it is understood as a participant in its own ‘history’ of continuous, emergent qualities (Ingold, 434). The observed processes of gallium crystallization thus led to the exploration of an anisotropic tectonic, an assemblage of heterogeneous qualities seemingly at odds with one another (see Figure 6).

The geologic horizon of the project is literal and direct. The Berkeley Pit is 1800 feet-deep and a mile wide. The project, shifting away from quantitative measure and material ‘properties’ and, instead, toward the qualitative ‘life’ of materials and sites, attempts to reimagine what might constitute a geological architecture in the Anthropocene. In her “Notes on Architecture’s Lapidarium,” Amy Kulper cites Gottfried Semper’s characterization of stone as “lifeless” and “without external existence;” she states he “articulates a moment in which technique eclipses material possibility” (Kulper 95). It is this eclipse of material immanence, its geologic life, that the project seeks to regain.

The project maps and repurposes several of the hundreds of shafts, drifts, and stopes that characterize the site. Extensive mechanical water treatment, extraction of heavy metals, and a network of public programming, displays, overlooks, museums are proposed, a technological individuation of the site’s infrastructure. A university material science laboratory and new steam baths at the former location of ‘Finn Town,’ begin to establish an infrastructure of active knowledge, a loose physical network that might be, nonetheless, understood as a reclaimed commons (see Figure 7).

Figure 6: Absolute Uncertainty: Gallium study. Source: (Kelsey Ramsey, University of Idaho, 2022)

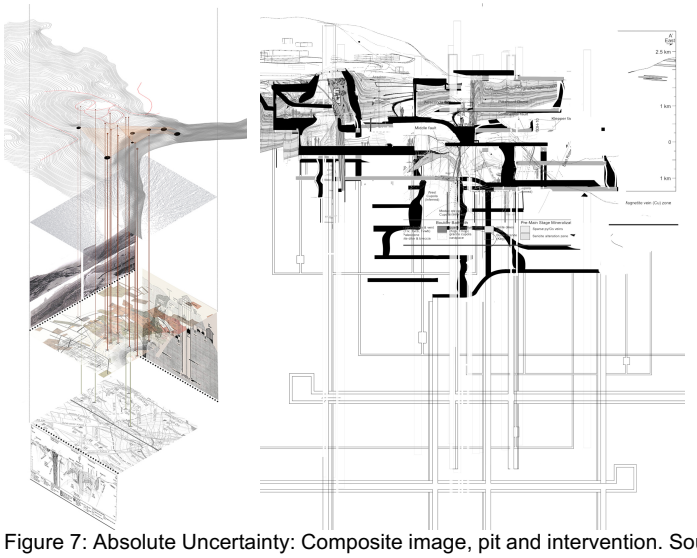

Figure 7: Absolute Uncertainty: Composite image, pit and intervention. Source: (Kelsey Ramsey, University of Idaho, 2022)

CONCLUSION

The above concepts and student design examples are an attempt to expand the conception of architectural tectonics toward material concerns. The projects are the result of a 3-credit course of preparation and research and a subsequent 6-credit course of individual design research work executed in a collective studio setting. The initial course challenges students to develop individual architectural research programs of study. To that end, students are introduced to critical readings in broad categories, material and tectonics among them. The three projects represented here are student works that engaged these particular topics for their individual design research endeavors. Taken together, the three projects seem to reveal an overlap of tectonic concepts and strategies that can be summarized as follows:

'Site' is an organism, a terrestrial system of 'natural' and 'unnatural' elements, continuous and without boundary. In all cases, the understanding of site as an animated complex of multiple systems, both 'living' and 'dead,' 'organic' and 'inorganic,' was crucial to the projects' development. Further, in each case, the strategy was to understand the site's effects beyond its boundaries, the systems and elements prior to their arrival on site, any outputs or effects after or exiting the site, and the transformation of elements or systems on site. All three projects develop an ecology of site that is, or substantially participates in, the development of the tectonic language of the project.

Infrastructure is a dynamic commons; social, ecological, adaptive, it is a shared network by which site, building and territory are fused. Each of the projects develops a shared network, a principal infrastructure, operating somewhere between public and private, whether a building core that provides water and energy for the inhabitants, a linear water treatment canal that navigates multiple zones, or an appropriation of an existing private work now made public.

Site and building are hybridized; a strategy of dismantling building as autonomous artifact is the integration of site systems into building systems and vice versa. Each of the projects blur distinctions between site and building. Site and infrastructure run through and organize building; buildings expand or dissolve into site.

Material and form are neither separate nor static; form is neither privileged nor a priori; material substance is the thing that connects all things. The three projects all seek tectonic form via an engagement of material and natural systems, whether those of site, watershed, or elemental material. Each of the projects rejects, if only implicitly, the hylomorphic model of thought.

Time is expanded. Each of the projects expands the timeframe and perspective of their proposal. This, too, potentially undermines the building as artifact, demanding a larger, ecological accounting of architecture in the epoch of the Anthropocene.

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