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Environments. Actions of Adaptation in Architecture

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Abstract

The 1960s Environments emerged as artistic practices to question our modern relationship to objects perceived as isolated entities and as products within a market logic; to context, initiative, authority, ethics, and aesthetics. As open, process-based situations, they should allow for a praxis of reappraising demarcations, roles, and concepts in the art, social, and natural world. Environments had an early, but only short influence. To this day, art and architecture continue to be widely shaped by objectifying and reifying processes, even though the limits of the systems they belong to have become obvious in confrontation with a global climate crisis.

In this article, the authors re-connect to the earlier artistic and architectural practices with the aim to develop a conceptual approach to adaptive architecture. This architecture is conceived as part of open "Environments," able to dynamically react with their users to social and environmental challenges, to mediate and reframe the relations between subjects, objects, and the natural world.

Keywords

Environments, holistic actions, adaptation, process-based, architecture, art

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Environments. Actions of Adaptation in Architecture

As early spatial installations, the 1960s Environments marked a fundamental shift in the conception of modern artwork that expanded on the idea of a completed object or Closed Form (Hansens) into a more open process. Indeed, Environments were open from a spatial as well as a conceptual perspective: they could be entered in order to enable immersive experiences (not just a perception from an object-distance), and the Environments could transform when entered. Thus, they included the idea of other potential ways of becoming. Following a neo-avant-gardist agenda, Environments were set up to blur the borders between the production and perception of art, between the artist and viewer, and ultimately between art and life. Their development, especially in the work of Allan Kaprow, marked a transition in the art world. With the Environments, clearly defined and limited roles of artwork, artists, viewers, and institutions should and would become much more fluid and flexible.

In today's architecture, a similar spatial and relational shift is necessary to re-frame buildings as part of open processes of adaptation and challenging modernist forms of spatial production and aesthetics, that is, of the formation, appearance, and perception of space. Based on processes of reification, described by Karl Marx and Georg Lukács (2015, pp. 13–16) modern buildings have been produced as objects and commodity forms that are hardly adaptable after completion and are disconnected from their location, as well as separated from their inhabitants and other actors. With the intended shift, significant alterations in the relation between buildings, architects, residents, and the social and natural world can become possible.

In this paper, we aim to discuss the conception of adaptive architecture in open "Environments," which are able to dynamically react – to change over time – together with their users in relation to social and environmental challenges. They thus provide an alternative to buildings that are mostly perceived as inflexible or that perform a limited set of predetermined (technical) reactions. Environments, consisting of life forms as well as architectural and technological forms, are characterised by continuously changing states that result from situational adaptations of all actors. They consist of open and collective development processes and significantly expand the dimensions of adaptation in architecture that have been mainly treated in technical terms (Schnädelbach, 2010, pp. 447–542).

By tracing the developments in art and architecture of the 1960s, we conceptualise Environments through their shifted emphasis from object-based to process-based production, with remarkable consequences regarding questions of spatial conception and perception, inclusion, and agency of

all actors. Since Environments unite and significantly expand disciplinary developments in both architecture and technology, we see them as agents for a future in which spatial, social, technological, and natural demarcations and differences can be reformulated. Therefore, we argue that Environments are constituted insofar as they address spatially manifold entanglements between inside and outside, allow for social and aesthetic differences and heterogeneity, and foster bodily participation and reflection. We conclude that if the "preparatory work" of Allan Kaprow and of Zofia and Oskar Hansen is taken seriously, Environments have the potential to challenge our ways of acting and becoming, not just in architecture but also in relation to the social and natural world.

Objects and Processes

To understand the scope of the early Environments as developed by Kaprow and the Hansens, it is helpful to contextualise them within, or better, towards the modernist art conception. Therefore, we cannot avoid reducing and simplifying exemplary works of modernist art and architecture by focusing on a discussion of objects in relation to processes. The sculpture *Cube* by Alberto Giacometti (1901–1966) embodies the concept of modernist artwork at the beginning of the 20th century. The Swiss sculptor, painter, draftsman, and printmaker completed the plaster sculpture in 1934 (Alberto Giacometti, Stiftung, n.d.); two bronze castings were produced in 1959 and 1962. The twelve-sided polyhedron has irregular sides, some are slightly curved, and the surfaces are partially rough and have scratches. Only the first bronze shows drawings of a self-portrait and of the atelier (Alberto Giacometti, Stiftung, n.d.). The line drawings were sealed in the plaster sculpture by the artist before the second casting. With the two casts of one plaster object, the three sculptures share one development process. Giacometti made the first sculpture and decided on the different surfaces of the bronzes that remain unchanged to this day.

Le Corbusier's chapel, *Notre-Dame du Haut*, in Ronchamp, France, is a pilgrimage church from 1955 standing isolated atop a hill, as if on a natural pedestal. With its upturned roof, the architect created the chapel as an irregular, expressive sculpture with thick solid "curved walls [that] simultaneously gather and open to the landscape" (Le Corbusier, as cited in Gans, 1987, p. 74). Le Corbusier completed the sculptural building with three ancillary chapels beneath the tower, two entrances, and an open-air altar underneath the overhanging curved roof. Although Ronchamp's external appearance implies a complicated layout, the interior is simple in plan. It is oriented towards the altar, which is accentuated by a sloping floor and raised roof, the curved west wall, and a series of benches. His

concept envisioned: "Inside, a little talk with oneself. Outside, 10,000 pilgrims before the altar" (Le Corbusier, as cited in Gans, 1987, p. 76).

In museums, Giacometti's art objects are displayed free-standing in the exhibition space, sometimes on a low plinth. Visitors perceive the almost one-meter tall sculpture from a certain distance and may walk around it. The vis-à-vis experience of the exhibited sculpture occurs in relation to other displayed art objects and the surrounding space, and may include historical references. *Cube* is interpreted as an artistic self-reflection with reference to a polyhedron in Albrecht Dürer's *Melencolia I* from 1514 (Guggenheim, 2018a) and to a drawing by Giacometti himself, in which he holds such an object in his hand (Guggenheim, 2018b).

In the design of the chapel, Le Corbusier drew on various personal memories, including the nearby Jura Mountains. The hollow roof shape refers to a crab shell found on a Long Island beach. Furthermore, the Swiss architect drew on his experiences in Athens: "As on the Acropolis, the procession is orchestrated by a sequence of axial perspectives defined but not enclosed by the built forms of ziggurat, chapel, and youth hostel" (Gans, 1987, p. 74). In containing the rubble of the previous but destroyed church, Ronchamp seems to reference history as a continuity. However, Le Corbusier hid the old stones within the thick walls that were plastered and painted white. The iconic building, thus, seems to claim timelessness, even eternity, where "There are presences: the eternal aspect of that which is permanent" (Le Corbusier & Zaknic, 1997, p. 83). The chapel of Ronchamp has been preserved in its form and appearance to this day; since 1967, both the building and the hill are listed. Le Corbusier spoke out against extension buildings in 1959 (Ingersoll, 2001, p. 13), turning it into a Closed Form (Hansen, 2005, p. 43), a monument passive towards the changes occurring over time. Therefore, in 2011, the monastery's extension with a visitor centre was dug into the sloped ground leading up to the chapel. The design by Renzo Piano is intended to keep the view of the chapel Notre-Dame-du-Haut clear.

The use of *Cube* included private owners and galleries before it was purchased by the Alberto Giacometti Foundation in Zurich. Apart from the careful estate management, the foundation encourages interest and research in the artist and collaborates with institutions on shows and new projects. It reproduces the oeuvre, based on objects as collectibles (their mobility and capability of being exhibited), implying and relying on the artist's exceptional reputation (his genius and vocation) (Kinsella, 2017). Early on, the massive *Cube* sculpture had become a celebrated object of the international art world, preferably exhibited even when the artist had already focused on smaller sculptures depicting human and animal figures. Jean-Paul Sartre (1999, p. 12) posed the question that Giacometti ultimately

focused on: "How to make a man out of stone without petrifying him?" As long as he could not answer this question, Giacometti was said to have destroyed his figural attempts and to have started all over. Those sculptures that were rescued by friends later entered the art market as completed works, although actually belonging to an ongoing artistic process. With its fixed conception, aesthetics, and demarcations between the artist and audience, process, and products, the art market has to this day ignored the interest in process even though it has been a major aspect of art production since the 1950s.

Environments

During the late 1950s and early 1960s, Allan Kaprow introduced the concept of Environments and their potential permutations into the American art scene as an alternative to classical modern artwork. Formerly a painter, Kaprow arranged everyday objects such as newspapers, plastic film, broken mirrors, lights, and sounds spatially both inside and outside of art galleries. As a result, the artwork as such was no longer identifiable, even less so as it exited the art space and entered everyday life environments. The artist prepared unfinished settings or open-ended situations that were only completed through the interaction with participants. Kaprow (1958, pp. 11–12) defined this art form "as open and fluid as the shapes of our everyday experience" with "a much greater responsibility on visitors"; these "have differently coloured clothing; can move, feel, speak, and observe others variously; and will constantly change the 'meaning' of the work by so doing." Thus, the artwork literally included the viewers as actors in a process where the so-called Environments continuously changed.

For the *Yard* Environment, Kaprow filled the backyard and sculpture garden of the Martha Jackson Gallery in New York with old car tires. *Yard* is an extension of painting into space, as it draws on the large-format works of Jackson Pollock but transcends the limitations of the canvas. According to the artist: "Environments tended to fill […] their entire containing areas, obliterating the ruled definition of the rooms" (Kaprow, 1968, p. 92). Instead of standing vis-à-vis a sculpture, visitors could actively climb over the tire piles. Following Kaprow (1958, p. 11), visitors "do not come to look at things," instead they "simply enter, are surrounded, and become part of what surrounds [them], passively or actively." In his theory, he mentioned that it was about a self-reflexive engagement with the Environments, focusing on "the very materials, the environment, the activity of people in that environment" (Kaprow & Schechner, 1968, p. 154). He therefore invited visitors into immersive experiences – like being inside a work of art, not opposite of it. Just as Kaprow himself threw an old tire, visitors

were welcome to play and rearrange. In this way, participants actualised their relation to and their perspective on the Environments by being part and actors of the artwork.

"[Kaprow's] Environments offered choices to visitors, like selecting between a fake and a real apple, moving furniture around a room, throwing tires, aligning words on walls to make sense or nonsense" (Hauser & Wirth, n.d.). Thus, Environments included the idea that there were other potential ways to construct them, and arguably, us through them. In particular, art production, regarded as a completable process under the absolute control of the artist, was challenged; with Environments we "cannot possibly see the finished work, extended as it is over time and space. There may not even be a finished work in the traditional sense" (Kaprow & Schechner, 1968, p. 156). In *Fluids* from 1967, Kaprow, together with the participants, built several rectangular cubes from blocks of ice and left them to melt at various locations in California. This work emphasised not only the active participation in the production process of art outside the museum, but also its fragile temporal dimension. In so doing, Kaprow turned against the conception of art as a durable, aesthetically fixed object, prepared to be exhibited, collected, and dealt. By extending the spatial and conceptual borders of an artwork, Environments question the idea of the modernist (art) object and the role of artists and viewers in its production. The emphasis of "process over product" was part of a wider discourse at that time that included Umberto Eco's *The Open Work* (Ital. original 1962) and Zofia and Oskar Hansen's Open Form (French original 1961) developed together with students and colleagues at the Academy of Fine Arts in Warsaw during the 1960s and early 70s. In its interdisciplinary and processual approach, the Hansen's Open Form can be seen as an important link to today's renewed interest in radically opening up artistic and architectural processes.

Similar to Environments, Open Forms include diverse actors and practices to explore the dynamics of art/architecture and audiences within fluid situations and adaptable spaces. Their "permeability to social and technological forces" (Scott, 2005, p. 35), as along with their openness to diverse contributions (by artists, architects, viewers, etc.), make them an important reference for today's approaches to adaptive architecture. The Hansens' first Environment was realised through the combination of polychrome graphics and mirrors in an immersive space that they called a "coloristic, integrative chain of background events" (Hansen, 2005, p. 140). This installation evolved as part of a pavilion in Sao Paulo in 1959 that would be responsive to the wind on site. The Hansens' semi-open house Szumin, with blurred boundaries between inside and outside spaces, natural and artificial elements, public and private spheres, invited villagers, visitors, and students, as well as plants, trees, and birds to become part

of a shared Environment. By playfully engaging with aesthetic apparatuses and adaptable furniture, by collectively caring for the garden and house maintenance, Szumin would constantly change, adapt, and re-create. Over time, it evolved according to needs, desires, and ideas of all involved human and non-human actors.

While the Hansens' design for the Museum of Modern Art in Skopje, a hydraulically powered, transformable Environment with shifting floors and walls allowing for situational changes and aesthetic experiments, was not and probably could not be realised at that time, recent attempts at adaptive architecture solved technological challenges, but most often exclude the social and aesthetic questions addressed by the Hansens.

Techno-spatial Relations in Adaptive Architecture

The notion of adaptive architecture, in its current use, refers to technology-based developments in an interdisciplinary field, even though built structures have been adapted since the first tents were erected (Schmid III & Austin, 2016, p. 11). Today, all adaptive buildings are equipped with technology and computer control based on data collection to obtain energy-efficient or user-adapted solutions; often with the focus on just one way of adaptation, for instance, automated shading, user-adapted heating or light control, voice-controlled doors (Hinte et al., 2003; Kolarevic & Parlac, 2015).

The adaptive Demonstrator high-rise building that is currently under construction in Stuttgart, Germany, serves as a case study (SFB, n.d.). The design includes a variety of adaptive dimensions, for example, concerning the supporting structure of the experimental building which reacts dynamically to wind loads and earthquakes. This is realised with integrated actuators in concrete beams and steel supports (SFB, n.d.). Various façade systems on the different floors of the high-rise react adaptively to sunlight, rainwater, energy demand and surplus animal and plant needs, users' interactions, and others (see Figure 1). The designs convey internal and external desires, such as the façade Wind Veil, which displays passing trains and invisible winds with gentle waves of movement while creating shade and providing ventilation (Ned Kahn Studios, 2000). In the interior of the high-rise, adaptive indoor climates, spatial structures and furniture allow for flexible use and quick change, for instance, residents are able to adapt their homes from living to office space. For the high-rise building, an interactive interior structure that adapts in real time is being developed, among other things. An example of flexible living space design on the part of the residents was shown by Shigeru Ban (2000) with the *Naked House* with its rolling, semi-open cubes used for various functions in a large two-story space. In addition, the appearance in and of the high-

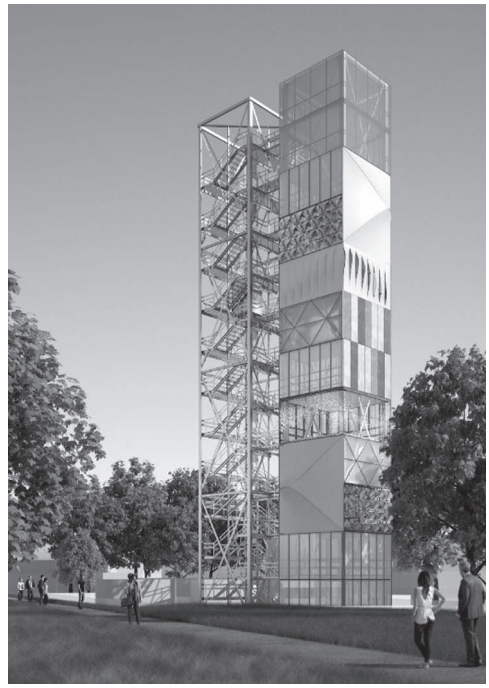

Figure 1

Adaptive high-rise of Collaborative Research Center 1244 of the University of Stuttgart. © ILEK, Institute for Lightweight Structures and Conceptual Design

rise is individually adjustable, for example, through light, sound, and scent control, as well as digital surfaces. The effect of colour-flooded rooms can already be experienced in many works by the artist James Turrell (n.d.), for example, in the *Skyspaces* with an opening to the sky and hidden LED ceilings, that are composed of changing colours. Thus, the formal, spatial, and aesthetic conditions of adaptive architecture change continuously. They are subject to situational adaptations in which the building transforms on the short and long term through extensions, displacements, foldings, and shrinkages. The house for and by Truus Schröder, designed together with Gerrit Rietveld, is an early example (1924) of how users can adapt spatial settings by transforming an open floor plan into subdivided spaces or dissolving the boundary between the inside and the outside by opening the frameless corner window and with overlapping colour-contrasting façade elements. Similarly, slow processes of transformation occur in and around the building that bring on new relationships with nature in the form of green façades and roof gardens, including shelters for bees and bats. Boeri Studio (2014) shows how ecologically and sustainably well this cohabitation of people, plants, and birds in high-rise buildings can work with the

Vertical Forest in Milan. The temporary appearances have an immediate effect on the surrounding and the urban space, as the spatial structure also changes throughout the course of one day, as well as steadily over the years. Apartment and room sizes are adaptable to different needs and uses through flexible spatial boundaries on the inside and in relation to the outside space that thereby shifts temporarily or permanently. Manuel Herz Architects (2017) realised a possibility for temporary spatial extensions of the building via the façade with fold-out balconies for a residential building in Zurich. As a result, spatial perception happens in a transforming environment: not only can rooms be resized, separated, and combined, but the atmosphere in the adaptive high-rise can also be turned from a focused work situation into an open, communicative space in the evening or on the weekend that helps connect to the natural surroundings (Ulber et al., 2020a, p. 123). Thus, space and form of adaptive buildings are conceived, designed, and experienced dynamically.

However, the question initially posed by the Hansens remains: How can diverse actors be enabled to co-design their Environments and co-decide over aesthetic qualities? The discussed adaptive dimensions of the high-rise building in Stuttgart are to become increasingly adaptive to further completion and use over the years (SFB, n.d.). In fact, the design and production process has to be set up to never end and to turn into an adaptation process when use begins (Maierhofer et al., 2020, p. 583), so that adaptive buildings become part of an Environment of change over time and associated with processual relationships and interactions.

Socio-spatial Relations in Adaptive Architecture

In art and architecture, open approaches are part of a large-scale development associated with extended spatial and contextual relations and significant changes in the design authority and agency of all involved actors (see Figure 2).

With the open development of artistic Environments, artists give up control. Simultaneously, artworks are used and perceived through an extended frame of reference. Instead of being limited to artistic expressions in certain traditions (i.e., modernity), they occur at new exhibition sites outside of museums (Land Art) and in social contexts close to everyday life (Happenings). Environments (re)connect with the surrounding, blurring (conceptual) boundaries of art and life, nature and culture (artistic), subjects, and objects; for example, Dan Graham's Mirror Pavilions. With processual art, observers turn into participants with increasing agency; beginning with perception, art experience becomes increasingly accompanied by "active" processes of moving, interacting, participating, and co-creating. This devel-

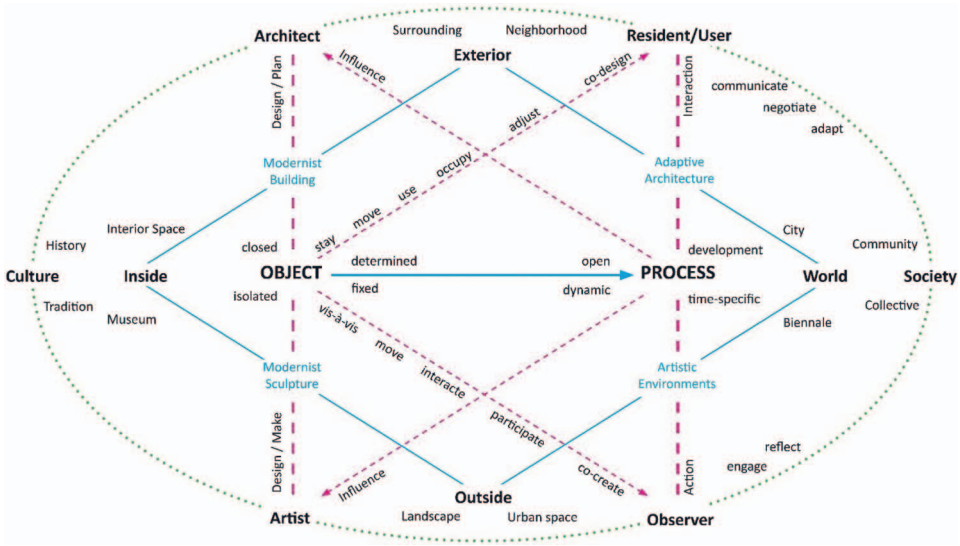

Figure 2

Transition from object-based to process-based art and architecture. © Marie Ulber, Mona Mahall, Alsi Serbest

opment reflects the desire for comprehensive engagement with the natural and social world; for example, at Biennials today.

For a long time, architects thought of themselves as absolute design authorities in the planning of a building, even though they already collaborated with engineers and planners on increasingly complex buildings. For just as long, buildings were considered and designed as completed "eternal" objects, with church buildings being particular examples. While modernist buildings are primarily regarded as "hermetic compositions," such as the Sydney Opera House or the New National Gallery in Berlin, sitting on a distinctive plinth, there have been early projects closely connected to their surroundings (Fallingwater House). In addition to reconnecting with nature, the social dimensions of space were considered by Alison and Peter Smithson in their attempt of "streets-in-the-sky" in residential buildings, such as Robin Hood Gardens in East London, to create new spaces for pedestrians, neighbourhoods, and potential (inter)actions with the surroundings. Following Smithson's idea, Denise Scott Brown established a socioplastic praxis that considers a site-specific analysis of social, functional, and activity patterns, for example, in the design of the University of Michigan's new life sciences complex (Brown, 2010, p. 47). In addition to a particular social architecture, early adaptable buildings emerged which share flexible borders with their surroundings, such as the Rietveld Schröder in Utrecht, Netherlands or Walker Guest House in Sani-

bel, Florida, US. Both allow their residents to adjust the building within certain preconceived states to their current uses, changing between open and subdivided rooms or between open and closed façades.

How do we conceive an adaptive architecture in Environments, which imply an open and collective development process and show constantly changing states in terms of appearance, attributes, material or form and space? How will (human and non-human) inhabitants have an increased agency in and with them, while architects will not necessarily be involved in the further development process? What is necessary to overcome (destructive) modernist demarcations and differences of roles and agencies in the production and use of art and architecture? How is the sustained opening and integration of natural and social dimensions into artworks and buildings possible?

To answer these questions, we argue that Environments have to be dedicated to the deconstruction of fundamental (modernist) differences: between the natural, technological, and social sphere (Morton, 2010, p. 278). By enabling collective, open and, at the same time, dynamic development processes of all involved actors – beyond the timeframe of the first completion, Environments allow the necessary perception, reflection, and adaptation processes which will be crucial in the confrontation of current global and local challenges affecting our nature, society, and cities.

Discussion of Adaptations in Architectural Environments

Artistic Environments have emerged as an alternative to and critique of existing art concepts that were regarded as bound up with the logics of the art market, its object fetish, and, more generally, modern capitalism. Proposing different forms of practice, beyond art institutions and markets, they embodied ideas of process and openness, enabling new relations with their everyday life contexts and allowing viewers to actively participate. People were invited to share new perspectives on life and ideas to initiate change in the existing system.

Adaptive architecture performs the adaptation of buildings. Nevertheless, a change of perspective, exchange, and "negotiation" with and between people on practices, lifestyle, and culture appear equally decisive. The concept of architectural Environments allows us to interrelate (built) surroundings, technologies, perceptions, and uses to perform necessary adaptations but also to initiate and mediate socio-cultural change, as interdependent processes. On the one hand, architectural Environments denote new interrelations and collaborations emerging between actors and adaptive architecture. They address the close entanglement of space, technology, and

cultural practices; architects develop open processes and possible adaptation scenarios for buildings that are inhabited and constantly are adapting in an ongoing development together with inhabitants and interrelated with social and natural surroundings. Specifically, the dimensions of experience and action for all inhabitants of architecture expand as they gain access to active participation and collective co-creation. All actors gain a broader scope of action but also have increased responsibility in the view of current social and global challenges. On the other hand, architectural Environments react to ongoing changes in the surroundings and the world. Considered as experimental labs, Environments embody open-ended design processes that enable contextual flexibility and situational responses to natural, climatic, social, or cultural changes.

For the conception of an open adaptation process, we have to think of adaptive architecture as part of Environments that span the built structures and their technology, as well as inhabitants and their experiences in relation to the local and global surroundings across time (see Figure 3). These new spatial and processual relationships imply paradigmatic shifts. The building cannot be conceived any longer as a passive object, but is regarded as active spatial states, which together with inhabitants, enable situational reactions. The design, formerly conceptualised as a completed project, turns into a multidisciplinary process that is jointly developed by architects, engineers, planners, and users (Ulber et al., 2020b, p. 24). Inhabitation alters from secondary or subsequent use to active participation, illustrating the open approach to adaptation that Environments promote. Their situational processes allow for new forms of communication and collaboration between all involved actors, including buildings, users, and surroundings (Ulber & Mahall, 2019, p. 103). Yet, to communicate and to realise interdependence and entanglement on all levels, be that ecological, social, political, and aesthetic, Environments have to commit to a spatio-political agenda that we tentatively formulate in three main points

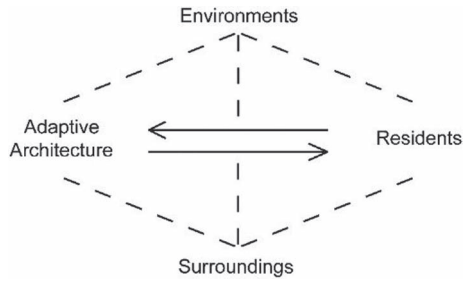

Figure 3

Scheme for Environments in the context of actors and surroundings. © Marie Ulber, Mona Mahall, Alsi Serbest

or "Environmental performances." To ensure open and joint adaptations in Environments with current and upcoming challenges, these focus on three dimensions: (1) How can all actors be involved in the design and further development; (2) How can heterogeneity and diversity be lived; and (3) How can the previously excluded (e.g., things, living beings, processes) be integrated into Environments.

First

In Environments, adaptations include habits and actions, collective ideas, and social-cultural practices, as well as architectural and technological elements and spaces. Adaptation processes are interdependent and address multiple dimensions of action and reaction. They can occur spontaneously, but also during a day to a lifetime. Adaptation is realised spatially and aesthetically, through shifting boundaries within and beyond an apartment where adaptive structures, space, furnishings, surfaces, light, and sound are able to respond to different situations, users, conditions (Ulber et al., 2020a, p. 124). It addresses various uses or social qualities; for instance, the common activities with a building, including stairwell, roof terrace, courtyard, and front garden. Thereby, bodily participation of inhabitants in a collective, communication-oriented production and re-production process, including care, work and adjustments to the seasons, allows them to directly and concretely relate to their built surroundings, to have particular social experiences, for instance by being hands-on, having agency, and being part of a collective, negotiating conflicts, and compromises; and to reflect changing spatial and environmental affordances as well as to test new ideas. Environments – being based on open processes – are fundamentally constituted by the bodily participation of all actors (those overlooked by and those estranged in an industrial production process, e.g. tenants, homeless people, animals), including human and nonhuman inhabitants such as plants; for example, in the open-air staircase in summer and with a winter garden atmosphere in the cold season. The co-existence on this community level might also affect the relationship with nature and with each other on a more general level and open up new forms of dialogue and interaction. In particular, residents and users could be more actively included in the initial planning process and in the ongoing adaptation processes. Thus, being bodily involved means taking part in more experimental design processes (e.g., practices in spatial perception, workshops on site, model or mock-up construction, etc.), "physically" and experientially testing the shared Environment. A new aesthetic might emerge through situational events, dissolving the boundaries between human and nonhuman, built and natural actors, things, and volatiles.

Second

As interdependencies multiply differences everywhere, new forms of exchange and negotiation between human and nonhuman actors, buildings, and natural and social surroundings are necessary. Yet, inhabitants of Environments consciously choose co-existence as a balancing of different (human and nonhuman) needs and as a new form of a co-constitutive community, where all are invited to shape their Environments together, enriched by the diversity and responsibility for the wellbeing of this heterogeneous community. Environments maintain a praxis of differences that helps communicate and negotiate heterogeneity.

Making many and diverse interests visible, including those of nonhumans, Environments allow inhabitants to participate directly or indirectly in decision processes. They provide means and media that make all voices audible as a basis for a more just and inclusive community. They could, for example, turn city halls into open spaces that support participation through communicative and mediating means beyond age, language, or citizenship, thus strengthening inclusive democratic processes. In Environments, digital change of society and life might become easier, but also more differentiated; for instance, in schools which require flexible learning formats of cross-class and free learning. New forms of schools can be conceived, developed, tested, and further adapted together with students, teachers, and the general school community, to more actively include minorities and to get in contact with other life forms, such as animals and plants. Environments, thus, might actually and rightly be regarded as continuous schools of life.

Third

The world is currently affected by a variety of changes, including a climate crisis, which leads to overheating or flooding of land and urban areas. While societies respond with enormous technical answers that aim at controlling or excluding "nature", Environments are built up of techno-cultural adaptations that support a fundamental rethinking of the manifold that discriminates between the inside and the outside. By concretely shifting and dissolving established boundaries, or by keeping them flexible, the fundamental conceptual (metaphysical) separations of nature and culture, building and surroundings, human and nonhuman can be exposed as conventional, historical, and cultural positings. As such, these separations come with inclusion and exclusion, with acts of distancing (from the *Umwelt*) typical to modernity and destructive to the planet. Environments, by contrast, constitute interdependently through the re-inclusion of previously excluded agents. They rely on the urban re-entry of things, beings, and processes, such as forests, agriculture, industry, and waste and thus help

scale down global problems to a level where they become tangible and affective. Citizens may opt for more green spaces instead of commercial areas; streets might be redistributed in Environments after the necessary mobility turnaround. With the temporary dissolution of concreted boundaries, plants, animals, and entire ecosystems can also find a habitat in the city and form new co-existences and alliances.

Conclusions

The "marvelous potentials of transformation and interactivity between art, the public, and nature" that Kaprow (1965, p. 182) saw in Environments depends on mutual interactions and interdependence. In Environments, "the name given to an art that one enters, submits to, and is – in turn – influenced by" (Kaprow, 1962, p. 14), an interplay between adaptive buildings, residents, and surroundings is part of open-ended processes. Unlike permanent objects, the situations in Kaprow's Environments were often "fragile and unstable," where "only the changing is really enduring" (Kaprow, 1958, p. 12). Oskar and Zofia Hansen (2014, original 1961) maintained that the Open Form allows for new spatial dimensions and necessary interactions between all actors; a condition to meet the demands for a more collective and sustainable architecture production and use. The changing relationships and dynamics between human and nonhuman participants, addressed by the Hansens, have lately found resonance in actor-network-theory. Bruno Latour's framework aims to overcome predetermined distinctions by emphasising collaborative actions and shared agencies between things and humans in complex design and use networks. This can be referred back to Environments that offer both a suitable theoretical approach and a practical model based on ongoing processes of change and adaptation during use. Three main aspects have to be addressed to realise the potentialities of Environments: the dissolution of a strict manifold that separates inside and outside (including questions of nonhuman co-habitants and plants); the communication of heterogeneity; and the bodily participation of actors in the development process.

In this sense, Environments span the material, technological, social, and cultural dimensions of adaptation to and for social, climatic, architectural, local and global change. They open up new dimensions of adaptation in architecture and offer an open framework for future design and use, as they involve all actors, including residents, buildings, and the surroundings in the adaptation processes. This is urgently needed in view of global, climatic, and social challenrges.

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