LIVING AFTER THE DISASTER, THE CASE OF POST-EARTHQUAKE EMERGENCY HOUSING IN CENTRAL ITALY (2016)/

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Abstract. This contribution focuses on architectural resilience in extreme conditions, particularly through the lens of self-sufficient refugee settlements and emergency architecture. The 2016 earthquake in Central Italy caused extensive damage and numerous casualties, especially in towns such as Amatrice-almost completely destroyed-Accumoli, and Arquata del Tronto.

One of the most pressing issues in the aftermath was the urgent need to provide housing for displaced residents who wished to remain in their native areas, rejecting relocation to distant hotels.

The aspect I would like to discuss, however, concerns the depth of design and the quality of the interior spaces, which in the cited case appears to be minimal or entirely absent. The same can be said for the aggregation of housing units and the quality of the urban space that is created-an element that should help restore the sense of community torn apart by the earthquake.

Through the analysis of high-quality interventions in similar emergency contexts-characterized by comparable cost constraints and tight execution timelines-it is possible to identify the qualities that emergency housing units must possess, both individually and as part of a larger aggregation. While maintaining the goal of creating affordable, emergency housing for all, the concept of home held by the inhabitants of a region-shaped by their culture and history-must be the starting point. Lastly, particular attention should be given to the issue of the reversibility of the intervention, as well as the potential for repurposing and reusing materials-features that were planned but remained merely theoretical due to the rapid deterioration of components and illogical choices, such as building on concrete platforms that are difficult and costly to remove once the housing units are dismantled.

Introduction.

"Cities, like dreams, are built of desires and fears..." (*Calvino, 1972*)

An earthquake can destroy entire cities or damage them severely, forcing inhabitants to abandon their homes temporarily or permanently, as has already happened many times in the past.

Similarly, other climate-related natural phenomena-now increasingly frequent in recent years and in an ever-growing number of countries-can cause devastation, (Piccardo, 2006).

Looking at the photo of the red zone of Amatrice, or of any other affected town - the 2016 earthquake caused immense damage and numerous casualties, especially in the municipalities of Amatrice, which was razed to the ground, Accumoli, and Arquata del Tronto, along with many other consequences that were extremely complex to manage - it is possible to grasp the scale of destruction produced by the quake as it devastated both the built fabric and the human relationships of the population that inhabited the town and nearby villages .

Complexity. The topic of the post-earthquake phase has often been addressed from multiple angles: from the architectural and urban-planning perspective, but also from the sociological standpoint and that of the psycho-physical well-being of the surviving victims of the disaster (Artoni, 2018 and Grappasonni, 2019).

Time becomes a decisive factor: on the one hand, there is the will to clear the areas covered by rubble, initiate the design and authorization procedures - different for public and private works - and eventually rebuild the structures; on the other hand, there is the need to comply with complex Italian regulations, whose lengthy processes have, even now, almost ten years later, made it impossible to complete the reconstruction.

Once the immediate emergency phase has passed, and before considering the stages that will ultimately lead to reconstruction in its various forms, arises the need to find housing for those who have lost their homes.

The total number of SAE requested in the Amatrice municipality is 499 (Lazio Reconstruction Special Office data), a huge number compared to the number of residents before the earthquake (approximately 2,500, ISTAT data). Refusing relocation to hotels far from the area devastated by the earthquake, they wish to continue living where they were born and where they work.

The intervention of the Civil Protection Department, assisted by the army and other law-enforcement agencies, dictates that the very first post-earthquake response relies on available and still usable public facilities, supplemented by temporary structures such as tents or containers; the same occurs worldwide in response to all types of disaster.

Subsequently, less precarious yet still temporary structures are set up.

We must reflect on the adjective "temporary". Can we call something temporary if it lasts more than ten years? Can we consider the emergency phase and the removal of rubble to last more than two or three years?

These time frames match the reality, and thus the notion of a short-term duration-something unstable, non-lasting, or non-definitive-blurs into the idea of a long-term provisional state, a semi-definitive temporary condition that persists until further notice.

My contribution aims to address the theme of "Architectural resilience in extreme conditions", and in particular "Self-sufficient refugee settlements and emergency architecture", with specific reference to the events that followed the 2016 Central Italy earthquake.

Analyzing and comparing the emergency housing solutions built in Italy after the latest earthquakes, Colfiorito 1997, L'Aquila 2009, Emilia Romagna 2012, is very difficult.

Each intervention differs from the other due to different political and

procedural choices, The Civil Protection and the reconstruction commissioners, under the enormous pressure of politics and public opinion, have made different choices, often contradicting the good things done in the previous case, (Gatti, 2016).

In this case, following a design approach, I want to identify the foundations that must be placed at the basis of the process that defines the response; I want to identify the virtuous common elements of design strategies implemented in different contexts.

Distressing conditions. When considering the temporary housing to be built for inhabitants left without a home, there should be two main concerns for promoters, designers, and builders: constructing well-built dwellings with resistant, durable, and thermally efficient materials (firmitas), and re-establishing the idea of a domestic space-a refuge, a home, a community-which was lost when the houses collapsed (utilitas); aesthetics, in this case, can be considered less important even if it always influences the inhabitants.

In the analyses and studies carried out on this topic, the focus generally tends to be placed on technical and construction-related aspects.

One of the most distressing conditions observed in the lives of those who have experienced an earthquake is the persistence of trauma, or rather, the reactivation of trauma. Various problems-endless waiting times for reconstruction, bureaucratic contradictions-generate negative feelings and a desire for retaliation, adding further emotional strain to what has already been triggered .

Nevertheless, signs of resilience emerge: a sometimes-surprising resistance to adversity, influenced by many factors, and a desire to revive the community that makes it essential to ask certain questions and to consider the role of time as perceived by the victims (Pino et al., 2021).

One of the fundamental premises in the construction of emergency housing is precisely time: very little is available to provide shelter to the displaced, yet a great deal is what the displaced will have to wait before they can return to their rebuilt or repaired homes.

Design choices appear to be dictated by time. In the case under discussion, the choices conditioned by time seem oriented exclusively toward solving regulatory, technical, and engineering problems .

Drawing on the experience of previous seismic events, and to avoid yet another impasse, in 2014 the Civil Protection Department launched a tender for the supply, transport, and assembly of Emergency Housing Solutions (E.H.S.), soluzioni abitative di emergenza (S.A.E.), figure 1. The call for tenders served to establish a Framework Agreement, with a ranking of suppliers to be made available to Civil Protection in the event of natural disasters.

The E.H.S. were intended to be essentially earthquake-proof, suitable for all climatic conditions, designed to limit energy consumption, and to have a maximum lifespan of ten years. At the end of their use, they were to be dismantled and repurposed. (Figure 1)

CNS (Consorzio Nazionale Servizi / National Services Consortium), which in 2015 ranked first in the tender held by Consip S.p.A. on behalf of the Civil Protection Department, is the official supplier of the E.H.S. by virtue of the framework agreement signed with Civil Protection during the awarding procedure of the 2014 contract. The framework agreement has a duration of four years; in 2022 the call for the third framework agreement, AQ 03, was published, awarded, and is currently in force.

The ordinance signed on 19 September 2016 by the Head of the Department, Fabrizio Curcio, for the management of the emergency following the 24 August earthquake, established the procedures for implementing the “Emergency Housing Solutions”: implementing bodies, execution of preliminary activities and urbanisation works, identification of areas, and assessment of the needs of the affected territories.

Intervention imposed from above. The aspect that nevertheless requires deeper examination is the design development and the quality of interior space, which in the case of temporary solutions seems minimal or altogether absent. The same can be said for the aggregation of units and the quality of the urban space that is formed-one of the elements that should contribute to restoring the sense of community shattered by the earthquake.

In the case studies of the E.H.S. in Amatrice and Accumoli, and more generally in similar post-earthquake interventions, no reflection was made on the needs of the new settlement or on the inhabited space of the displaced.

It was an intervention imposed from above, almost forced, (Piccardo, 2018).

The design process was not addressed because the E.H.S., in their definitional phase, had no definite location-intended broadly for central Italy, though they could also be required in the south or the north-across a wide range of climatic conditions, from coastal areas to the Apennines above one thousand meters, as in Amatrice and Accumoli. The Technical Specifications refer to the unforeseeability of a calamitous event (which triggers activation of the Framework Agreement) and the consequent impossibility of knowing in advance where E.H.S. settlements would need to be built.

In similar cases, performance requirements are typically based on the most severe winter and summer conditions, yet there are no references for designing the aggregation of units.

The technical specifications state that an analysis of market alternatives had been carried out, and that given the variability of available solutions, suppliers would be allowed to propose different materials and construction techniques. However, the market does not offer models for aggregated settlements. The market offers only single-family or multi-family houses-never complex clusters forming an organic whole.

The aggregation concept is therefore delegated to the contractor, who must provide at least two possible planivolumetric layouts, characterized by isolated distribution, courtyard distribution, or row/terraced distribution.

In general, studying the vast number of design proposals for emergency housing, (Kahvecioğlu & Arslan Selçuk, 2025), it becomes evident that the work of the involved parties is strongly skewed toward engineering and technical–construction solutions. There is a latent yet unmistakable sense that compliance with regulations is the only truly important and necessary element for resolving the emergency, alongside cost containment.

The engineer-designer seems to prevail over the architect-designer-reiterating a dualism that is absurd, yet now present in nearly every building in Italy.

This may seem an obvious observation, but considering similar examples and the in-depth studies carried out in various research projects, it becomes clear that the architect's role is what makes the difference, (Mazlum et al. 2023). The will to seek solutions that take into account all factors-technical, economic, social, anthropological, political, and so on-is what should guide anyone proposing emergency-management projects. The dominant criterion cannot be solely economic and technical, while almost entirely neglecting everything else.

In the pre-production phase, the designers' work should focus on better understanding how interior spaces will be used and on defining the mode of dwelling most suited to the population affected by the catastrophic event.

In the post-event phase, once the areas designated for settlement construction have been identified, efforts should be directed toward creating an aggregate capable of fostering interaction among inhabitants. The characteristics of the small settlement should be able-despite the inevitable disadvantage of using modern materials instead of stone-to evoke the same emotions that the destroyed town once evoked in its residents.

In the E.H.S. of Amatrice, the decision not to include biomass-based heating systems-wood fireplaces or stoves-was harshly criticized by the population, who accused the designers of not understanding the lifestyle of Apennine communities. The same criticisms were directed at the housing modules for the little attention given to climatic challenges posed by altitude and for other questionable decisions that, with a minimum of care and consultation, could have been avoided.

Lastly, the many technical problems reported by assigned residents and documented in several journalistic investigations must be noted: issues emerging after a very short period of use and not attributable to normal wear and tear. Among the various problems were the use of inappropriate materials that were not moisture-resistant, unsuitable heating systems, poor thermal protection, and materials with low durability .

Reflecting on what was done after the 2016 earthquake, the idea of committing to higher-quality spaces, better study of aggregations, and a higher-quality product in general seems almost utopian-nearly impossible to achieve, at least in Italy.

Yet, there are experiences that show the feasibility of a longer and more difficult, but still possible, path.

Special sensitivity and attention. In an interview published in Domus in 2013, (Didero, 2013), Toyo Ito - curator of the Japanese Pavilion at the 13th Venice Architecture Biennale, figure 2 - explains the key points of the theme through the Home-for-All project, a lightweight format of emergency architecture conceived for those left homeless in the provinces devastated by the great 2011 earthquake and tsunami.

The Japanese architect speaks of the attitude one must adopt, of a "special sensitivity and attention" necessary when designing a new home for someone who has lost their own in a violent and traumatic way; of thinking about an architecture capable of alleviating suffering and offering positive sensations to those who have forever lost their cherished objects and a part of their own personal history.

The tragedy represented an epochal trauma for Japan-another blow to an economy already struggling since the 1990s-which pushed the Land of the Rising Sun into a clear and marked decline. A decline that caused the country to lose numerous positions in the ranking of industrialized nations, to the benefit especially of China, its historical rival, which had transformed itself from an agricultural country into an industrialized one, highly advanced in the production of new technologies.

It was an almost impossible challenge, founded on dialogue-on the relationship between the architect and the displaced people of the areas affected by the catastrophe. During the meetings, filled with questions, exchanges, and mutual understanding, a process unfolded through which the inhabitants' expectations were transformed into design choices: a collective effort that materialized through the architect's abilities. (Figure 2)

Construction of Home-for-All began on 13 September 2011, among the temporary houses of Miyagino-ku, Sendai, in the prefecture of Miyagi, and proceeded successfully until its completion, which was celebrated with a true community festival one month later, on 26 October 2011.

Ito explains that rather than assuming the role of the architect who simply responds to the needs of those living in the disaster area, he preferred to see things from the victims' perspective. By adopting this position, he reflected both on what could be done immediately and on a long-term vision-at least spanning a decade.

The architect emphasizes that, in order to build the first Home-for-All, he started with dialogue with those residing in the temporary dwellings. He met them several times to understand their ideas and what they felt was missing from their current living environment. He then formulated the proposal for a small "common living space" that would respond as closely as possible to their requests.

He further clarifies that, as an architect, he made every effort to listen closely to the voices of the citizens and to integrate their ideas into the project.

At the conclusion of this process of exchange and mutual enrichment-which led to full sharing of the project with its intended users-Toyo Ito highlights a truth so obvious that it often goes unnoticed: when a reconstruction project drafted by a local administration does not reflect the ideas of its citizens, it remains devoid of humanity.

The experience makes it clear that inhabitants desire architecture that allows them to maintain relationships; to experience the same feelings they had in their destroyed homes. Architects-the true protagonists of the process-should have the humility to engage in dialogue, as Ito has demonstrated is possible. It is striking that such humility, shown by a world-renowned, multi-award-winning architect like Ito, is rare, while the attitude more frequently observed is one of arrogant and unbearable detachment. Too many people believe that the knowledge and value of an architect are demonstrated by a lack of empathy, by treating future users as ignorant, unaware, passive subjects in the mysterious creative act.

Architecture is a ministerium, a service. The result depends on interpreting the full set of factors that shape it, as well as the needs of the future user. Humanity makes the difference, together with dialogue, inspiring both the quality and the motivation of the designer.

The same humanity can be seen in other emergency interventions: Aravena's work in the Chilean city of Constitución after the earthquake; Shigeru Ban's Paper-Log Houses, figure 3, and Glen Murcutt's Marika Alderton House in Yirrkala, Australia;

This latest project obviously does not concern emergency homes for earthquakes but provides a valuable lesson.

In the 2016, Murcutt was the jury member of Pritzker that awarded Aravena. Murcutt recognizes in Aravena its approach aimed at the needs of the inhabitants. Alejandro Aravena epitomizes the revival of a more socially engaged architect, we can read on the website Prizker, because The role of the architect is now being challenged to serve greater social and humanitarian needs, (Franco, 2016, and Allen, 2018).

In all the cases cited, dialogue prevails, the desire to understand the other, even when the other is very different from oneself, and even when they are not living in conditions of extreme emergency. In all, the high design quality of architects awarded the Pritzker Prize is evident.

Murcutt explains that Aboriginal culture influences those who know how to listen to it-but the same could be said of all cultures-and he then reframes his most famous project, not as a manifesto of a particular architectural vision, but simply as a house; a simple house, yet clearly designed with great attention to the desires and expectations expressing a community's way of life, with deep respect for the local climate and with remarkable constructional skill (Corda, 2014).

The Australian architect devotes much of his design time to detailing choices and considers environmental sustainability a fundamental principle. His buildings are often passive and conceived to provide comfort to inhabitants living in extreme conditions in the Australian territories.

The designer's attitude. Reflecting on the methods used to construct emergency residential buildings, one cannot help but reiterate that, beyond the technical refinement - which should take shape through highly detailed design and careful material selection - the success of such interventions depends on the designer's attitude: on understanding how the inhabitants live and on understanding their culture. (Figure 3)

Although it is not possible to design a personalized home for each individual or family, it is necessary to begin from the living space-from how a homogeneous group of people who have lost their homes experiences domestic life and relates to other inhabitants.

Many requested the inclusion of a fireplace, an age-old presence in every dwelling and, for centuries, the only source of heat during the long winter months. A fireplace evokes an atmosphere of shared domestic space and of preparing food-a reward at the end of long days spent in the freezing cold-the symbolic heart of the home.

It is, however, an element incompatible with safety standards and emission-reduction requirements, and it is highly inefficient, though difficult to replace.

A similar level of consideration should have been given to the use of passive systems-greenhouses and ventilation chimneys for summer cooling-capable of exploiting natural air currents.

Indoor comfort must be a priority, just as the provision of spaces for meeting and social interaction outside the home must be. The sense of community is achieved through communal space. As Toyo Ito highlighted in his experience, an outdoor public place for shared activities is perhaps the most frequent request made by the inhabitants of temporary homes.

The search for public spaces to share and interact in had already emerged in L'Aquila during the reconstruction phases after the 2009 earthquake (Pollice 2012), when the shopping mall's gallery took on the role of the city's new social centre, a new public space replacing the destroyed historic squares and gathering places.

The restrictions imposed during the COVID-19 pandemic showed how the absence of interpersonal relationships, prolonged over varying periods of time, causes significant psychological distress, with particularly negative effects on vulnerable groups such as young people and the elderly (Yilmaz & Erdem, 2025).

Some interventions have recently been completed that propose an approach in line with what was previously stated. In particular two pavillions for cultural activities built in Amandola, one of villages damaged during the 2016-2017 earthquake. Based on a collaboration with University of Camerino and Keio Japan University, project propose an important contribution of local student and an interesting use of a new construction method by architect Hiroto Kobayashi, veneer system, (Ruggiero et al., 2021).

Kobayashi, professor at Keio University, after 2011 earthquake, searched recovery solutions with a sensitivity similar to that shown by other Japanese designers. He proposed with the help of his students a new construction system based on the work of people and non expensive materials available on site.

This experience offers hope for a future change in the strategies of the Civil Protection and for the involvement of university departments in designing solutions for post-earthquake emergencies.

Conclusion. In conclusion, in evaluating the limits and objectives of emergency architecture through the analysis of interventions in analogous contexts - triggered by catastrophic events and subject to similar cost and time constraints - it is possible to establish several priorities that emergency units must meet, both individually and as an aggregate settlement, (Zahra et al., 2022).

While maintaining the goal of creating an economical intervention, with a ten - year lifespan and full regulatory compliance, the proposal must also satisfy the inhabitants' idea of "home", shaped by their culture and history - an idea that must be verified through direct dialogue between the designer and future users.

The detailed definition of the project must allow for effective reuse of the materials composing the main elements of the intervention - excluding only those components subject to wear - and must include site reconver-

sion, with rapid and economical removal of all foundation structures.

The lack of precise information about the future site of intervention, and the temporary nature of the installation, cannot serve as an alibi for the lack of settlement quality.

The very purpose of the Framework Agreement is to ensure a ready response in cases of sudden and unpredictable housing emergencies in any area of Italy; the residences must be able to perform their intended function until the definitive homes are restored or rebuilt.

Design work, in addition to defining the housing and technical characteristics of the prefabricated module, should be dedicated to adapting the settlement to the specific site chosen by local administrations - an adaptation that must go beyond simply combining standardized units according to predetermined schemes, (Kizilova, 2023).

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Figures.

Figure 1 - Emergency Housing Solutions built in 2016. (Soluzioni abitaative in emergenza SAE). Photography by Campus27. https://it.wikipedia.org/wiki/Soluzione_abitativa_in_emergenza#/media/File:Soluzioni_abitative_in_emergenza.jpg. CC BY-SA 4.0. Modified.

Figure 2 - The exhibit "Architecture. Possible here? Home-for-all", curated by Toyo Ito in The Japan Pavilion for the Venice Biennal 2012. Photography by Nico Saie. https://www.flickr.com/photos/eager/8570926994/in/photostream/. CC BY 2.0. Modified.

Figure 3 - Paper Log House, Shigeru Ban, 2000, Turkey. https://www.flickr.com/photos/eager/13389716785. CC BY 2.0. Modified.


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THE NUCLEAR FACTORY AS A REGENERATIVE PARADIGM OF INDUSTRIAL ABANDONMENT /

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Abstract. An analysis of contemporary cities' satellite images reveals large industrial agglomerations within and near urban centers. The traditional industrial antinomy between operational structures and abandoned sites has led to the clear separation between productive functionality and urban "waste". The current climate emergency necessitates an evaluation of this active-passive distinction as a potentially high-risk factor, while also presenting a strategic opportunity for reconfiguring industrial heritage. From this second scenario, the research analyses a borderline case of this possibility within the panorama of industrial heritage: nuclear power plants. From this perspective, nuclear factories are plants that incorporate the principle of planned obsolescence from the outset, necessitating an inherently circular design and meticulous end-of-life planning. The highly significant environmental and infrastructural impact of the plants, combined with the inherent dangers of the sector, prevents their uncontrolled abandonment, which is widespread and marginally controlled by other types of production. Through a comparative analysis, the research identifies case studies of practical application of these strategies to outline best practices and replicable design models. Examples such as those of the Yankee Rowe NPP (USA) and the HDR Großwelzheim NPP (Germany) emerge as representative of post-production environmental recovery processes – "greenfield" regeneration – while cases as the NPP of Fort St. Vrain and Rancho Seco 1 (USA), are exemplary for the post-production reconversion project, where power plants continued to maintain their energy production function trough different technologies. The analysis of the mandatory post-operational planning applied to this architectural typology demonstrates the possibilities of transforming the fate of abandoned factories, even in the case of highly complex industries. These strategies applied to nuclear power plants suggest a project replicability oriented towards the circular management of industrial space, excluding the possibility of abandonment.

Introduction. The analysis of contemporary cities reveals the presence of post-industrial reminiscences not only within their urban spaces, but also in their surroundings. The causes that led to industrial abandonment are well documented in the literature, from the oil crisis of the 1970s, the expulsion of factories from the city center to the outskirts, the relocation of production to emerging and more economical markets, to the reduction in demand for goods due to the economic crises of recent years (Aymonino, 1975; Spanedda, 2023; van Neuss, 2018).

This condition represents today the industrial antinomy between operational structures and abandoned sites, visible in contemporary geographies and identified by agglomerations that involve the urban, peri-urban and rural areas, extending up to the territorial scale (Dansero & Vanolo, 2006). Large available spaces, the distance from settlements and the better economic conditions have led to the concentration of the largest, most complex and impactful industrial architecture in the area outside the city. The landscape and territory that host them are therefore altered, and with them their relationship with the people who inhabit them:

> [...] *It seems that human action is no longer possible in the face of the industry's primary and prevailing concern, which is to produce, to transform nature, to which end it introduces into the territory, without regard for the resulting effects, its smoke screens, its foul-smelling debris, its anonymous scenery, producing the machine instead of man.* (*Turri, 1998, p. 110*)

While much attention has been paid to abandoned buildings within urban areas, the focus on extensive industrial plants outside them offers further opportunities to meet sustainability goals and stringent international policies – e.g., Agenda 2030 and the European Green Deal – through understanding and implementing their revaluation and redevelopment.

To analyze these possibilities, this paper focuses on one exemplary case study of complexity and impact, but also with a predetermined fate: the nuclear power plant. Unlike other industries, the nuclear power plant possesses two closely related and relevant characteristics: 1) the causes leading to the end of its operating cycle are primarily determined by the plant's obsolescence, not by reasons of production relocation or declining demand; 2) complex and restrictive safety requirements today require nuclear plants at the end of their life to plan and realize their decommissioning, thus avoiding the possibility of uncontrolled abandonment.

Based on these considerations, this paper aims to analyze the elements that identify the peculiarities and grades of complexity of nuclear power plants, highlighting post-operational needs and alternative solutions to abandonment. Six case studies are used to compare different possible outcomes for nuclear power plants at the end of their life cycle, which are helpful for investigating the possibility of scaling up and replicating these practices – whether mandatory and/or possible for nuclear power plants – in other complex, extensive industries.

The potential of end-of-life: avoiding abandonment. Literature and professional practice offer a wide range of projects that have interrogated abandoned urban industrial architectures/sites – e.g., the FIAT Lingotto industry in Turin (IT) and the Bankside Power Station in London (UK) – extending the scope to examples on a territorial scale, such as the Ruhr industrial area in Germany. These examples, although different from each other, are linked by the cessation of production activities and the activation of reuse, regeneration, and redevelopment processes that have transformed them over time: the Lingotto factory, designed by engineer Giacomo Matté-Trucco, was transformed into a multifunctional center in Renzo Piano's celebrated project; the Bankside Power Station was redesigned by Herzog & De Meuron to become the current Tate Modern; a full-fledged plan was developed for the Ruhr industrial district – the International Building Exhibition Emscher Park – with the aim of comprehensively transforming the area and featuring several flagship projects such as Peter Latz's Duisburg Nord Landscape Park.

The examples presented, however, also highlight some specific and sig-