

## **ECO-SPIRIT: Sustainable development and environmental awareness in contemporary liturgical planning**

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### **Abstract:**

Today, the practice of energy efficient architecture has demanded not only a technical change in the building industry but also the acquiring of sustainable design methods and the development of a new architectural image based on a specifically ecological way of thinking. The aspects of environmental calculations are best presented by the examples of high standard public investments developed with respect for the environment, the use of renewable energy by minimising pollution and energy consumption. These criteria are not eligible to satisfy the socio-cultural compactness of an artificial environment which has communal or intellectual functions. Despite their integration into local topography, the difficulties of structure and insulation, or the use of industrial materials often reveal the contradictions between the unnatural facts and the clarity of the buildings' architectural language. Such contradictions are especially warning in contemporary liturgical architecture, however, the spiritual requirements of local communities are capable of encouraging an environmentally more conscious planning. The goal of this study is prospecting solutions for both a physically and culturally sustainable design in this very specific field.

**Keywords:** *Architectural theory, sustainable planning, contemporary sacred architecture*

### **General objective**

"Eco-spirit" comes from two words: ecology and spirituality. The *raison d'être* of our term is the wish to express the mutual dependence of sustainable design and liturgical function in a special type of contemporary sacred architecture. We describe it as mutual, because the buildings, selected to be shown here, claim more than a mere simultaneous use of sustainable planning and a sort of liturgical functionalism. From the very beginning, these buildings were designed with the purpose to connect environmental awareness to liturgical architecture through ethics, which was recognised to be the common field of religion and sustainability. With the present study, our objective is to shed light on some examples capable of setting the cornerstones of this 'constellation' – not quite definitively, but rather as an implication of a new phenomenon, an architecture devoted

essentially to ethics. This attempt does not approach sustainable development expansively, only through a segment of contemporary architecture extending the meaning of environmental awareness in a socio-cultural sense.

The subject of any liturgy is spiritual and dematerialized while technology demands just as much material today as it had at the time of the industrial revolution. Traditional building elements are rather material-like, but their use in construction has been dematerialized by craft over several centuries. Modernism needed at least forty years until it could find again the well understood harmony with building traditions and the environment at the chapel of Ronchamp by Le Corbusier (er.1950-55). It is hard to tell whether, since then, ecological architecture had enough time to become spiritual, to appear complexly in liturgical architecture as an inner claim instead of intruding into a field having a considerably different character. There are, however, some outstanding examples which can give us a convincing introduction to a new chapter of green design; the theory of which is also starting to crystallize within highly demanding public investments such as the architecture of religious communities.

#### **Architects in charge of eco-spirit**

It is not difficult to find architects famous for either their expertise in green design or their devotion to sacred architecture, but we need a time-consuming investigation to find a few gifted with both. We have chosen a simple method: a comparative analysis between the two sets of architects told us where the common section is. We selected works which significantly integrated both the ecological and the liturgical approaches composing an organic architectural message. Before the presentation of their lead projects verifying this concept, we need to examine their professional background briefly.

Alexandros Tombazis received the 1996 Gold Medallion Award at the World Renewable Energy Congress IV held in Denver. In 1998, he was awarded the PLEA (Passive and Low Energy Award) for his research in the field of energy efficient architecture. His first larger sustainable experiment was the construction of the Solar Village in Athens (er.1984-89), where the solar panels being installed on top of the panel-structured residential blocks in a terrace-like arrangement became stressed architectural tools. His most significant work, the complex of the Delphi Museum (er.1996-2000) uses natural architectural tools and is adjusted to the fine contours and the use of material characteristic of its historical environment. The mass of the complex built from white stone conceals exhibition halls with a stable climate and homogenous lighting. The key to climate balancing is the use of thick walls with good heat storage capacity, the construction of which is enabled by the topographic character and architectural tradition of the location (Tombazis, 1997). In today's museum architecture, the use of local conditions as resources is a continuously growing demand.

The Canadian architect Roberto Chiotti is another important result of our search. He is an architect based in Toronto, and an accredited member of LEED™, founder of the Larkin Architect studio. At the University of St. Michael's College he even graduated from theology in 1998. Two Canadian public buildings of Chiotti, the Kingsway College School in Etobicoke (er.2009), and in the same town the Dorothy Ley Hospice (er.2009), which

was awarded the Silver Medallion of LEED™, work as the demonstrative examples of these new ambitions. Both buildings have low heat loss but are open, they are air conditioned in a natural way (with green walls); their compactness has a moderate playfulness provided by the structural and formal rationalism of architectural quality.

Martin Rauch, an Austrian ceramicist and sculptor having an outstanding career in architecture, is the third person of our search who uses his skills in ecological design with great sensitiveness towards the spiritual needs of various local communities. From 1978 to 1983, he was a student of the University of Applied Arts Vienna, finished a master class in ceramics under Matteo Thun and Maria Bilger-Perz. His diploma work was titled “Loam Clay Earth”, which is due to his encounter with primitive means of existence and techniques of building in simple cycles and with the optimal use of resources. Rauch has developed archaic building techniques instead of applying extremely complex and ecologically far worse solutions of the First World. His decisive impulses came from the months he spent as an aid volunteer in Africa (Bolthausen et al., 2011: 60). He led international workshops in Bangladesh, South Africa, and Austria in co-operation with BASEhabitat, and worked together with several architects such as Stefan and Bernhard Marte, or Rudolf Reitermann and Peter Sassenroth. Since 2010 he holds a position as an UNESCO Honorary Professor in the Chair of Earthen Architecture.



**Figure 1.** *St Trinity Church in Fatima, Portugal (er. 2004-2007) (Photo by the authors).*

### **Environmentally responsible centre for pilgrimage**

One of the possible ways is the conscious use of light and orientation which leads to a representative architecture of spaces that is optimal also from the aspects of acoustics and heat balance. The need for a structure that is chosen with respect for its integration into nature, orientation towards the sun and heat storage capacity as well as the demand for a controlled interior climate requires the grandiose architectural gestures to be handled in harmony. This attitude finds its metaphorical

expression in the elemental force of minimalism produced by the reduced forms. There is a relation between formal reduction and the geometrical characteristics of the undivided hall-spaces that can be easily modelled with physical building calculations or the shape-experiences of the smallest surfaces belonging to the largest use of spaces. Environmental awareness is especially pervaded with prophecy, responsibility for nature or with the fear of natural catastrophe. Even if the new visions are about to increase the effectiveness of human labour by generating delightful, productive places for community cooperation (McDonough and Braungart, 2003:223), their nascent architectural language will be abstract, clear and utopian.

For these reasons, the ecological approach results in an avant-garde architecture inspired by technology, which is well represented by the works

of the Greek architect Alexandros Tombazis. No architectonic contrast could have been realized in a liturgical environment that is more conspicuous than the building raised in the main square of the Portuguese pilgrimage town, Fatima. The architect of the Church of Santíssima Trindade (St Trinity) (er.2004-2007) has created a disc-shaped complex grandiose in size that is hidden a little behind the refraction line of the hill top and opposite to the Church of Our Lady (er.1957). The building complex is a compact unity represented by its shape: it is the symbol of the community, and with the north-south central axis it opens up toward its predecessor which is encircled by a neo-classicist colonnade. The duality of these two architectural elements reflects the light-control of the interior being solved parallel in a natural and an artificial way. The axis consist of only two snow-white surfaced reinforced concrete frames that have no intermediate supports and run through the inner space exactly in the middle. Between the walls and the frames, the cover of the undivided hall of the church is separated into nine inner fields – articulated by cross beams – and these cassettes are at the same time skylights.

Sunlight arrives through sawtooth roofs that also work as sound-deflector lamellas above the gallery and along the slabs of the perfectly insulated, curved side walls. The continuity of the space and light is without any break and details: the reticence and undividedness of the building block is also created in the interior. The windows of the light-fields placed between the cross beams of the hall are north-oriented, while the openings between the two main load-bearing beams receive a strong southern light. The middle axis, which leads to the altar, becomes a strongly lit path of sacrifice that is marked out by the sun at its zenith, while the rest of the space is left in a homogenous pastel-light. In this way, the circle-shaped space and the duality of the axis is expressed in the language of light (Katona and Vukoszávlyev, 2009). Here the light comes through filter-canvases which at no point let in direct lighting. The position of the canvases can be adjusted and the lighting conditions can be adapted to the needs – in this way the characteristics of the light is permanent but their distribution is readably changeable. When the interior light is adjusted in order to make the sanctuary brighter than the other parts of the space, the visual emphasis of the liturgical centre is increased; or alternatively, the space can be made more relaxed.

The one-lined pen drawings of Alvaro Siza, placed on the walls of the sunken vestibule of the church, are also relaxed and plastic. The building has become the avant-garde expression of the orientation toward natural light, the dissolved space and the compactness of building mechanical equipment (Castanheira, 2007). Despite its formal simplicity, the building is served by innovative solutions. Some of them belong to the energy efficient construction of the church, to the electrically controlled reflectors and to the glass fibre sound insulation system.



**Figure 2.** *St Gabriel of the Sorrowful Virgin Parish Church in Toronto, Canada (er. 2001-2006) (Photo by Roberto Chiotti).*

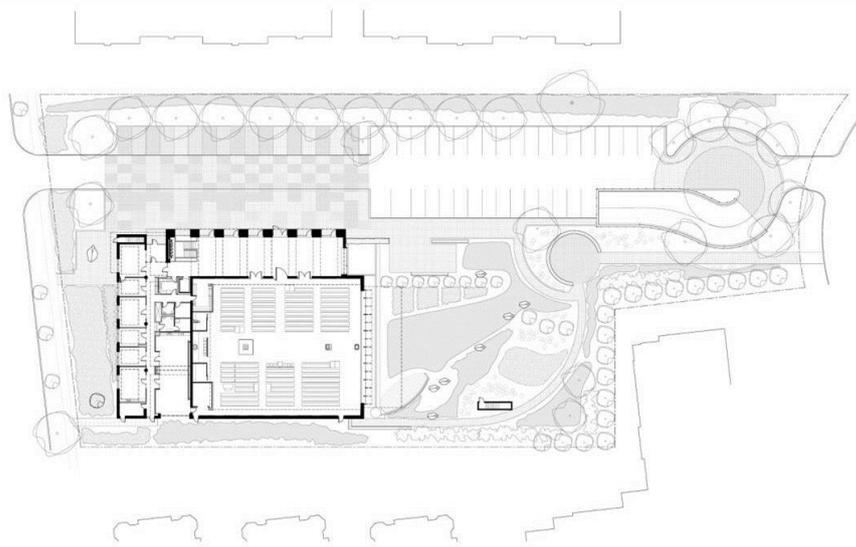
### **Sustainability creed born in a transatlantic parish**

Today, not only avant-garde technical aspects but also communal and religious dimensions of this eco-mission are developing. The imprint of this intellectual concurrence can be seen in the Church of St. Gabriel (er. 2001-2006), Toronto, designed by Roberto Chiotti. The creation of the church has required a complex architectural approach from the initial concept to the detailed design, in order to implement not only a sustainable use of energy, environment protecting and cost effective construction, or natural air conditioning but also the theological dimension of this mission. While the first aims were realized with the use of the incorporated materials and structures, the latter goal was achieved with the architectural tools of space arrangement and lighting conditions. The architect of the building has been awarded the Gold Medal of LEED™. In the design of the church he went back to the theological principles of Thomas Berry (1999); how was it possible for theological concepts to be transferred into an ecological programme, the built form, its structure and materials?

According to Chiotti's (2008) practical interpretation of Berry, buildings designed on an ecological basis have to be oriented first of all to the Sun in order to 'address' the light of the planet. Sunlight is the most important characteristic of the modern church that is opened towards nature. Pre-modern church architecture usually expressed the presence of sanctity with the lack of light and with some directed rays or spots of light breaking through this hiatus; the sun glimmering through the coloured window of the Gothic style became the symbol of the transparent (immaculate) conception. The period following Modernism re-discovered an architectural quality rooted in historical solutions, but did not forget about the co-ordinates of the openness and cosmicality of modernity either (Vukosavljev, 2010). For Chiotti, the latter has become more important. The light arriving from the centre of the solar system can freely access the rectangular space of the church through the glass screen, which opens south across its whole width. The north-south axis connects the building to this centre and is originated from there. This parallel order composed to endlessness is the reason for the modern formation and the simple design. The geometry of the opening 'eye' of the building and its emphasized canopy are determined by the angle of incidence of the sun at its zenith, by its extrema in winter and in summer. In summer, the church is shaded to prevent it from overheating but in winter it is warmed by the heat that it gets freely together with the light. Even the cross section dimensions of the poured concrete cross walls are defined by thermo-dynamic aspects. The architect decided on a thick load-bearing wall structure with good heat storage capacity instead of the modern, slim structures. Thus the undivided church hall does not need cooling in summer and in winter the heating requirements are reduced.

The path of the sun at its zenith is also a determinant in the liturgical space arrangement. On each side of the middle axis, three rows of benches border the path of the light. The well known symbol of the community is manifested in the prayer benches turned against each other with the priest's throne between them; it is completed here with the celebration's mystery of the waiting for the light. The edges of the light slab, which is installed with a cantilevered truss structure on top of the thick walls, leaves a slot of light between the edge of the wall and the slab, from where rainbow-like rays of light pass through the coloured window to complete the pastel of the reinforced concrete surfaces. Leaving the liturgical space behind, the

believers can enter the exonarthex of the church. The airy narthex is a traditional element of transition between the outer world and the sacred space. Here it is bordered by large wooden gates and it lies between the window facing the garden and the exit leading to the underground garage. The former element gives a view to the rainwater collector pool of the garden, which is filled with the water that comes rushing down from the marked trough of the roof and nourishes the vegetation of the pond. A specific element of the latter is a 'green wall': a vertical garden planted with indigenous greenery. This garden has a humidifying and natural air-changing function: it is a silent 'air conditioning system' that only needs some nutrients and sunlight provided by an elegant skylight. The vertical garden is the first spectacle, the first image that visitors see when ascending the stairs. Outside, on an extra area that was cleared through the construction of the underground garage, a larger garden was formed. Among the groups of plants native to North America, a nature trail winds to the church, linking eight resting places. These places are called by the architect the 'stations of our cosmic earth' (Chiotti, 2007).



**Figure 3.** The garden for the 'stations of our cosmic earth', site plan of St Gabriel's Parish, Toronto (Source: Private archive of Larkin Architects Ltd.).

In order to avoid the contradictions of sustainable planning, best illustrated by an intrinsic argument of Simon Guy (2012:564-5), Chiotti strongly emphasizes the necessity of design methods using sustainable and renewable features instead of the merely technological approach; which means natural wind and air change instead of artificial ventilation, a vegetative green wall instead of air conditioning and interactive heat exchangers instead of central heating and which rejects the installation of sanitary equipment that comes together with water pollution. According to his conviction, architects have prior responsibility in integrating the built environment with the bio-regional surroundings, from the smallest details to the general plan. Only this way is it able to rejoin the 'cosmic dance' of nature, which dance gets its creative origin from the cosmological past and creation (Chiotti, 1996). An agreement similar to this approach led to the declaration of the World Congress of Architects held in 1993, in Chicago, which was commonly announced by the International Union of Architects (UIA) and the American Institute of Architects (AIA). The Declaration of Interdependence for a Sustainable Future asked every architect to use



**Figure 4.** Village mortuary chapel in Batschuns, Austria (er.2002) (Source: Szakrális építészet: Liturgikus építészet napjainkban (Sacral architecture: Liturgical architecture in our days), Retrieved on October 1, 2012, <<http://www.szakralis.hu>>).

renewable energy sources and to take part in the protection of bio-regional diversity. Among the practical guide promoting the realisation of the agreement's principles, the Environmental Resource Guide prepared by AIA can also be found.

#### **Earth building solution for religious communities**

The use of natural materials can also be based on regional building traditions. This vernacular-inspired architecture is typical of solutions not too general at an international level, much rather featured by a constructive thinking based on local experiences and historical recollection. Here the ecological

closeness appears as a special condition for architecture, which – as immanence – is in close relation with the theological interpretation of the environmental integration achieved with conscious means. The experience rooted in the proof of being, is placed into a critical context that is mainly set up from the roughness of the used materials and of the arrangement's simple formula. Due to the limitations of the building material, this critical context returns to the elemental forms again (Frampton, 1983). The morphology of necessity and the tradition are both connected to earth as a resource: natural ventilation, insulation, optimal micro-climate and all their psychological impacts are immanent in the options being locally available in the material. This is well illustrated by the regional architecture of Vorarlberg, the settlement that has connections with the working field of Martin Rauch, a contemporary artist from Schlins (Kapfinger, 2003).

The adobe mortuary chapel in Batschuns, designed by Stefan and Bernhard Marte (er.2002) was positioned to the end of the church garden of Pfarrkirche zum Hl. Johannes dem Täufer (er. 1921-23), a church, which is now under monument protection and was designed by Clemens Holzmeister, the Viennese architect. Local citizens found it necessary during funerals to commemorate the deceased in an open-air place; as well as to extend the cemetery, and suitably separate it from the street of the village. The dedicated community insisted that instead of building a church at the expense of the Church, the pledge and effort of the community should be used. For this aim they found the building technology of adobe (rammed earth) developed by Martin Rauch to be the most appropriate. Schlins itself is a village in Vorarlberg with the artist work locally. The rammed earth wall is raised with the use of formwork, building the rammed earth layers on each other inch by inch. The wet earth dries in the sunshine so the technology is rather slow. The result is a tiny space bordered by square surfaces where the light can get in through the split opened in the roof on the north side and through the slot at the foot of the eastern wall.

The closeness of this secular world results in the chapel becoming a private space of prayer; and it is made complete with the cross that is formed by the vertical line of the oak plank integrated into the northern wall and by the horizontal stripes of the adobe layers. The cross is at present in the space as a quotation, a symbolic section; and it expresses the same delicacy which is also suggested by the volume of the building when it was assigned the most articulated spot at the corner of the cemetery. A thick parapet wall, made of the same material as that of the chapel, forms a border between the garden and the street, and at the end it leads to the eastern urn-wall where the ashes of the deceased are returned finally – by the material of the wall – to earth. The small cube opens with a heavy, deeply placed oak gate, which is pulled to the corner of the building and in this way creates the ancient, symbolic L shape of a lodge. The dialogue of the minimal forms and the chiselled material is similar to the conversation between the chapel and the church under monument protection. This building is the first chapel made of rammed earth with the technology of the tradition of Schlins. In addition, the use of the natural material has become a community forming force (Anonymous, 2006).

All this gets an even more complex meaning in the Chapel of Reconciliation (Kapelle der Versöhnung) (er. 1999-2000) in Berlin, designed by Rudolf Reitermann and Peter Sassenroth at the turn of the millennium, where Martin Rauch again took part in the implementation.

On the northern bank of the bend in the Spree River there stood the former Versöhnungskirche (er.1894), built according to the design of Gotthilf Ludwig Möckel. When Berlin was divided in 1945, the French-Soviet sector border was laid next to the church. Though between 1950 and 1961 Sunday masses were allowed with the proviso of pass control, after the construction of the concrete wall it became inaccessible. Executing an East-Berlin order, the church was blown up in 1985, just like the houses of the famous Bernauer Strasse standing by the border twenty years before. After the demolition of the wall it took some time to put the area into order, however, a strip of the former border zone called 'no man's land' represents an elementary line even today. In 1998, Hans Kollhoff, the Berlin architect designed a wall-memorial by restoring or reconstructing part of the original wall. He installed steel blade-walls forming a right angle with the axis of the wall, and these blades are the edges cutting the wall that once cut the area.

The monument would not be complete without the Chapel of Reconciliation, which was built opposite to it, in the place of Versöhnungskirche. The chapel's name gains a new interpretation if we reconsider it in the light of the collapse of opposing political regimes or the reunion of the divided Berlin. This chapel, which is 'loaded' with heavy and symbolic historical duty, has to fulfil religious and secular, political functions at the same time. Similarly to some other examples from Germany, the congregation of the chapel has already taken part in the design process. The original plans included concrete and glass building materials but



**Figure 5.** *The Chapel of Reconciliation in Berlin, Germany (er. 1999-2000) (Photo by the authors).*

because of their local negative interpretation the community stood out against their use. The new concept was designed with natural materials: wood and earth.

The chapel is composed of a double ring at the site of a wheat-planted boundary where the contour lines of the demolished church are marked with gravel topping. The outer ring is made from a dense series of timber lamellas being installed at a right angle to the elliptic line of the layout. The shape of the inner ring is also elliptic, and is built from rammed earth. This chapel has no real centre; the arrangement of the inner circles is determined by history and the liturgical tradition together. Three axes with acute angles penetrate the central space. One of them is adjusted to the building line of the vanished urban district, parallel with the historical axis of the former church; while the other is astronomically oriented in an east-west direction. Both of them assign a section by the eastern wall of the cylindrical wall, in this way they symbolise the double function and the intersection of past and present at the same time (Welzbacher, 2001). In the fore-apse, the skylight illuminates the wooden frame of the historic altar and the exposed foundation of the former church, while the invisible curve of the new apse becomes part of the wall. There is a skylight above it; the bronze cross, the Bible-stall, the altar and the tabernacle can be found at the same place. This double-orientation is counterbalanced by a western apse and the gallery, the axis of which is the bisector of the two other ones. These three sections define together a central space.

The building material of the place is earth that is mixed with the brick dust of the demolished buildings and church. Receiving the priestly blessing, during a ceremony held by the local residents the dust of the buried remains of Versöhnungskirche was put into the layers of the wet rammed earth wall. The new chapel was built in this way, layer by layer. Though the chapel works only as a double screen that frames the historical ruins, the local history would be incomprehensible without it (Sharr, 2010). The chapel was constructed as a new work from the materials, space and air of the former world. The chapel in Berlin approaches sustainable architecture from this context, the cultural and historical sustainability of which lies in the sediments of the material, in its natural and local character.

### **Comparison with other buildings**

It is worth mentioning some ecological buildings from the same domain, but with different functions. In the Germann-house in Feldkirch (er.2009), designed by the two Martes, the deliberate self-restriction of the architect being critical of the period that is consuming its resources is expressed. This building continues using the reticent language of reinforced concrete that was present in the Marte-house in Dafins (er.1999) ten years earlier. The same architectonic order can be found in Martin Rauch's own residence in Schlins (er.2009), built again from rammed earth, which he designed together with Roger Boltshauser. The adobe walls rammed from layer to layer like concrete are supporting slabs with timber beams, the insulation is made of straw and the foundation is of Roman cinder blocks. A fortress-like mass was built from natural elements, and the overall mass shows the texture and the inner power of materials accompanied with abstract shapes. The architectural character of these clearly articulated natural houses is similar to the one shown before, but these building do not have as significant

cultural dimensions regarding community building or the conservation of historical memory.

Other designs of contemporary public buildings solving ventilation, heat and moisture exchange in a natural way, serve good examples as well. The headquarters of the Electricity Authority of Cyprus built in Nicosia (er.2000-2004) of Alexandros Tombazis makes use of the central hall's stack effect where the ceiling height is raised to generate natural ventilation. The otherwise energy consuming air conditioning is taken out by geometric tools, for instance the curtain walls are protected with shutters that can be adjusted according to the seasons. The premise of this latter design was the AVAX Headquarters in Athens (er.1993-98), where the ventilated secondary façade of the building is made of a perforated lamella-net that can be rotated around the vertical axis. The rotating panels can control not only the intensity of air-change but also the amount of received thermal radiation. We can mention the Museum Brandhorst in Munich, designed by Matthias Sauerbruch and Louisa Hutton (er.2009), as an environmentally conscious public building, which has its own heating system connected to local geothermic sources. The heating, heat recovery and air cooling system is built into the wall and floor structure, and needs 50% less heat than the average specific consumption, uses 26% less electric energy and produces 356 tons less carbon-dioxide emission (Long, 2009). Design aspects similar to this have linked the image of the world of museums to an introverted character, to dissolved monumentality which is defined by straight planes and reaches majesty itself. The designs of these kinds of public buildings encounter environmental awareness with formal reduction together with technical precision, which differ from the informality of earthen houses. Their modesty hides a sort of inner richness, in other words, an ethical attitude.

## Conclusions

There are three eligible answers to the challenge of both an environmentally, and culturally sustainable architecture. The first is the transformation of avant-garde architecture into the manifestation of a non-formalist ecological programme, which is capable of expressing the targets of environmentalism with a substantive vocabulary. This also includes the technical potential in the abstraction of forms, the coherence of low energy costs and minimal design, as is indicated by the architecture of Alexandros Tombazis. The second is a claim for a more advanced meaning of sustainability revealing the moral depth of the responsible use of environmentally renewable resources. This attitude can tie natural elements, like sunlight, heat, clean water and earth, with spiritual significance, which is exemplified by Roberto Chiotti's works. The third possibility is the understanding of the role of local materials in forming communities or maintaining cultural reminiscence. Local materials, such as rammed earth, are evidently environmental regarding their non-industrialized use. They consequently provide the basis for manufacture and irreproducible design, as shown by some works of Stefan and Bernhard Marte, Rudolf Reitermann and Peter Sassenroth. This kind of localism also reinterprets traditional technologies, as proven by the activity of Martin Rauch.

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