

# **30 years after – case study of ‘Ökologische Gemeinschaftswohnanlage Nofels’ (ecological housing cooperative Nofels)**

## **Extended Abstract**

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## **Summary**

The study investigates an autonomous housing project for eleven families in Feldkirch/Austria. This project combines a radical mix of societal alternative, typological innovation and tectonic efforts. The project addressed four key design objectives: ‘radically cost efficiency’, ‘ecological approach’, ‘individual homes in a communal frame’ and the possibility of developing an adaptive ‘self-build’ system. All four objectives required a strong tectonic strategy.

After the experience of almost 30 years, the comparison between the initial ideas and design of the housing project ‘Ökologische Gemeinschaftswohnanlage Nofels’ with the status of 2015 seems to be very fruitful for ongoing discourses on adaptability, life cycle design and new self-determined and self-organized housing forms, which are developing in many places.

Given the low fluctuation of inhabitants over the period, examining the pre-designed adaptations and upgrading of individual dwellings and considering the low cost and low maintenance of the building, Ökologische Gemeinschaftswohnanlage Nofels’ can be considered a success. Still it is useful to look at the the obstacles, contradictions to original goals and the conflicts in the process, but in summary they turn out to be secondary.

**Keywords:** communal housing, ecological building, low-cost, adaptive, self-building

## **1. Introduction**

‘Ökologische Gemeinschaftswohnanlage Nofels’ is a housing project with eleven individual units plus a collective house and an office in Feldkirch/Austria. The project was started in 1986 by five young families. Their goals from start were:

- living individually in a communal frame
- living self-determined and self-organized in respect to the formation of their home
- living ‘ecological’
- building as economic as possible

For a design strategy it became clear from start that only a very flexible, resilient and adaptive tectonic strategy following the concept of ‘growing and shrinking house’ could merge the individual and individualistic desires (in size as well as in standard of the homes) with the needed radical low-cost approach and the ‘ecological program’.

The smallest 'standard house' (including land) should not cost more than 50% of the regional market price for a conventional home with the same size and it should be habitable also in case of a power cut or of energy shortage. A primary obstacle was to find a quality site of the needed size, which was inexpensive because investors had no interest for reasons of site layout or topography. After a long decision-making process with design participation, the building process started in 1987.

## 2. Methodology

This paper is a case study and a reflection with special focus on the tectonic aspects of the dwelling over time. It documents the project's history, based on parameters decided by the group, on architectural drawings and facts of the building process, on comparative photos and interviews with six inhabitants in April 2015. It illustrates problems and contradictions during the process of design, building and habitation. It presents and discusses the transformations that happened over time and thereby it focuses on the tectonic solutions which supported these intentional changes.

## 3. Results and Conclusion

'Ökologische Gemeinschaftswohnanlage Nofels' has many layers to learn from: new homes in Austria became less affordable since 1986, and their environmental impact has not significantly improved apart from marketing propaganda. Adaptability is still an alien concept for most of the housing market. These are the reasons for new self-organized housing initiatives in Austria and other countries. The building in Feldkirch is a valuable object lesson on the field of group dynamics as well as on the emergence of a performative architecture for dwellings, which rather fulfils individual desires than predefined aesthetic clichés.

The project includes several 'controlled experimental' solutions like an economically optimized and unusual hybrid primary structure, Trombé walls to the south in massive wood, self-made straw-earth boards to mention only a few. Eleven individual hypocaust heatings including a cooking part, both working also in case of power cuts using collected fire wood from nearby forest, still provide comfort and the spatial experience of a warm core in each house.

Despite different life situations, higher incomes and new family situations, the minor fluctuation of the inhabitants is a clear indicator of high user satisfaction, which was also expressed in interviews with six owners: Out of eleven families, eight are still the original owners. One family sold the house and moved to another place, two couples have divorced and sold the house. One buyer was the son of an original group member, who together with his wife has four young children. Therefore already the third generation lives in the housing estate and after a period of grown up children leaving their parents homes, again small children inhabit and enjoy the place.

The collective design-, decision- and building processes certainly have been exhausting over some periods and provoked conflicts. But over time, the housing group was rewarded with high living quality at extremely low costs for a life time. And that puts it straight at the heart of departure of this group: What's the point to live in a city or town if you don't interact with your neighbours?

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### **Summary**

The study investigates an autonomous housing project for eleven families in Feldkirch/Austria<sup>1</sup>. This project combines a radical mix of societal alternative, typological innovation and tectonic efforts.

The project addressed four key design objectives: ‘radically cost efficiency’, ‘ecological approach’, ‘individual homes in a communal frame’ and the possibility of developing an adaptive ‘self-build’ system. All four objectives required a strong tectonic strategy.

‘Ecological buildings’ of the 80’s had a stronger focus on ‘natural’ materials and healthy indoor climate than on energy consumption. Innovative structural connections, thin slabs of massive wood, ‘Trombé walls’, were implemented with sophisticated details. Another unique aspect was the incorporation of individual and bivalent hypocaust heating systems into each unit.

The roles of the architect of this dwelling included and combined those of designer, mediator, mastermind for overcoming legal obstacles, accountant, supervisor and building instructor.

The aim of this paper is to compare how the original design, the group processes and the execution of the housing estate performed over three decades and it draws conclusions for self build projects in the present, which seem to have a renaissance in different countries.

**Keywords:** communal housing, ecological building, low-cost, adaptive, self-building

### **1. Introduction**

In winter 1985, five young families in Feldkirch/Austria started the idea of building a joint housing project that fulfils their wishes:

- living individually in a communal frame
- living self-determined in respect to the formation of their home
- living ‘ecological’,
- building as economic as possible

The author of this paper was selected as the architect, having had experience in participatory design projects before.

After placing an ad in a local newspaper, 22 families came to a first meeting. They all had in common a lot of dreams, many ideas for a more ecological life-style but no building site or relevant money and savings.

For a design strategy it became clear from start that only a very flexible, resilient and adaptive tectonic concept could merge the individual and individualistic desires (in size of as well as in standard of the home) with the needed radical low-cost approach and the 'ecological program'.

During the preparatory discussions, the concept of 'growing and shrinking house' was presented to the group. Three different sizes of start-up homes with 95m<sup>2</sup>, 110m<sup>2</sup> and 130m<sup>2</sup> were proposed – all of them with the capacity to be extended and all of them also separable into two smaller apartments. The smallest standard house should not cost more than 600.000 ATS (total price including land). More informative: in 1985, this was about 50% of the regional market price for a conventional home with the same size.

It took eight months until a scouting group spotted a site in the boundaries of Feldkirch. The site had 3225 m<sup>2</sup> and it was inexpensive due to its geometry: the length of 150 meter and the width of only 21.5 meter did not make it interesting for investors or building companies. A car access to the center was economically impossible. This was an advantage for our group, where car-free access was on the ecological agenda anyway (Fig 1).



Fig. 1 The long site is situated close to a beautiful forest in an area, where only space consuming one-family homes existed. There are carports at the eastern and the western end of the site with no car access to the units. The project is structured in 6+3+2 units, connected by a 105 meters long corridor in the north. The gaps are partly filled with a community house and an office.

In the following collective design and decision processes, the number of families reduced to eleven. Some did not like the area, others got scared in the last moment of the needed efforts of such a communal undertaking and its financial risks. The ones who decided to build together signed a collective purchase contract and 'started the adventure'<sup>2</sup>.

## 2. Methodology

This paper is a case study about this very political project and a reflection with special focus on its tectonic aspects. It documents the project's history, based on parameters decided by the group, architectural drawings, the building process, comparative photos and interviews of six inhabitants. It illustrates problems and contradictions during the process of design, building and habitation. It presents and discusses the changes that happened over time and thereby it focuses on the tectonic aspects which supported these changes.

The project was explicitly designed for change and adaptation. How did this change happen and how fit was the concept? How many of the visions were followed over time and how did the building respond to the changes?

After the experience of almost 30 years, the comparison between the initial ideas and design with the status of 2015 on different layers seems to be very fruitful for ongoing discourses on adaptability, life cycle design and self-determined housing forms, which are recently developing in many places<sup>3</sup>. Considering this frame, 'Ökologische Gemeinschaftswohnanlage Nofels' is a critical case having strategic importance in relation to the discourse on habitation.

### 3. Results

#### 3.1 original design parameters

After discussions of almost a year, the general group agendas of 'communal + self-determined + ecological + low-cost' turned into 39 design parameters, such as common spaces for group activities and children, no fences between gardens, self-administration, unsealed surfaces, natural building materials or cost optimization by self-building. They had to be set into context of the specific site and they became binding guidelines based on protocolled group decisions.

Originally, the whole project was designed with (cheaper) flat roofs and a roof garden to compensate the generally small private gardens. As there was no chance to get building permission for this proposal, the 45 degree gabled roof was offered as a compromise to what was called by building authorities 'customary in place' (Fig 2). The owners later considered this forced change as an advantage despite original higher costs: In seven units over time, the attics turned into additional habitable space.



Fig. 2 left: view from East with private gardens and units individually coloured to the south right: view from North-East showing the communal access with the connecting corridor which was designed as a multifunctional space with 261 cm inner width. (Pictures taken 1989)

#### 3.2 the structure and the logistics or the tectonics of 'Fügen und Fugen'

'Fügen' is an old German word and means 'join together' or 'fit into each other'. The meaning is not limited to a technical connection but includes a strong metaphoric and figurative content. The notion of 'fügen' is not only used for describing a process where timber meets timber or timber meets brick. It implies in a wider tectonic sense how design decisions and technical solutions relate to the objectives of 'ecological', 'low-cost', 'adaptive' and especially to 'self-building'. In that sense, 'fügen' has a wide aspiration.

One example in the Nofels housing project is the stairs – a mix of industrially prefabricated parts designed for self-assembling. The prefabricated steps are cheaply produced of only 3mm bent tin, hanging from the beams that support the wooden slab. They are easy to assemble by amateurs with ten screws each step and the round steel bars form at the same time the railing of the gallery. The shape and the thin materialization optimize the useful space underneath the stairs. Loose and small coconut fibre carpets reduce noise and make the stair non-slip. According to newer building regulations, the wide distances between the vertical bars would be illegal (Fig.3).





Fig.3 hanging stair of inexpensive and adjustable steel elements, screwed in glulam beams

The eleven homes were designed in a rigorous 'tartan grid' of 261 cm + 12 cm for primary structure. The measure system generates a total footprint of each individual unit of 8,07 x 8,07 m or 65 m<sup>2</sup>/floor when fully built. The 'mirroring' size of ground floors and the 64 m<sup>2</sup> gardens has been considered by the group as a good balance between space quality and economy. The grid with a maximum span of 261cm allows a very cost effective slab in not-laminated massive wooden floor boards d=6,5 cm, double-tongued and grooved, not polished. These thin (and easy to cut ) slabs reduce the total building volume (and therefore costs) by minimizing building height. It is an easy system for self-building the interior of the units after professional companies had built the masonry and the structural skeleton. (Fig. 4)

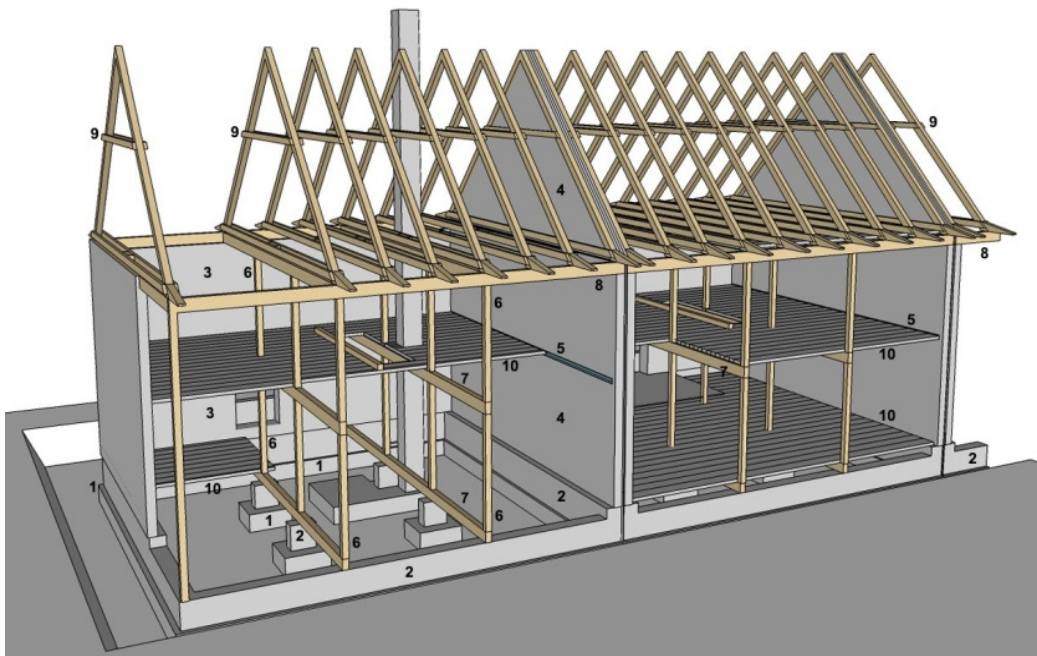


Fig. 4 1 foundation 2 concrete bricks 3 thermal brick 38 cm 4 acoustic brick 2x18 cm with insulation in between 5 u-steel profile with fish plates for slab 6 glulam posts 12/12 7 glulam beams 12/24 8 glulam beam 12/24 9 rafter frames 10/18 + 2 x boards 5/12 10 thin slab of massive wooden boards d= 6,5 cm, double-tongued and grooved, not polished

Traditionally, brick construction was and is the cheapest form of construction in Austria. So for cost reasons, as much brick as possible was used for enclosure (mainly walls to the north and sound insulated brick walls between the homes) and as little brick as possible for optimizing flexibility and changeability. This unorthodox 'hybridisation' between massive walls in brick, a wooden skeleton structure with massive wooden slabs and a low-tech 'curtain wall' to the south - although having strong advantages in indoor comfort, flexibility and cost reduction - created significant challenges on the level of detail, especially because of the very different tolerances in measurements between brick, timber and facade elements. The primary grid was rigidly applied without structural exceptions, also when columns were positioned in the outdoor space. This further means there are freestanding columns in the living rooms (Fig 5), a reason for long discussions during the design process but no complaint after finishing the buildings.



Fig.5 left: hand-drawn plan of upper floor of the smallest unit with loggia, outdoor column and balcony. Red = brick, brown = wood. Centre: loggia of the same house Right: living room with freestanding column in the space and unpolished slab. (pictures taken 2015)

Following the concept of 'growing houses', even the 261 cm wide northern corridor called 'Nordgang' was constructed for possible extensions. The owners of house eleven built a Sauna and a resting room after ten years (Fig. 6). Instead of the original fence, a new wooden wall (with prolonged roof) obstructs the view to his private garden.



Fig. 6 Northern corridor 1988 and 2000 with vertical extension and transformed fence to wall



### 3.3 changing economy – changing values

After the houses were inhabited and over time, most inhabitants got better jobs<sup>4</sup> with higher incomes. Their actual costs for paying back the loans were as low as the rent for a medium sized apartment - the project was an economic success.

This rise of incomes was not without behavioral consequences: Besides making the smaller house bigger along the predesigned options and doing individual upgrading of interiors, a minority started to pressure the group for 'upgrading' the common spaces contrary to the original group decisions. One example is the pavement and asphalt of the common access (Fig. 7). The ecological paradigm of 'unsealed surfaces for free water infiltration' was given up in favor of 'tidiness'.



Fig. 7 left: access 1988, unsealed, rough and jungle-like Center and left: access 'tidied' by a pavement and 'sterile' asphalt with 'domesticized' pot plants (picture taken 2004)

Another fiercely disputed change was the transformation of the common 'northern corridor'. By group contract, this 'Nordgang' had to be an open-plan connecting space. It performed as a meeting space, a dry storage for fire-wood, a space for plants, bicycles and buggies and it especially was a fantastic all-year playground for children<sup>5</sup> with their tricycle races, pedal car trips, table tennis competitions or simple quarrels. The main argument for closing the corridor came from three families with already older children, who felt disturbed by noisy children and who claimed the need of more private 'manipulation space' outside their house. Finally after some years, in the eastern part the corridor was divided into individualized buffer rooms. In the western part, the corridor is still open due to a collective attitude of the people living there. (Fig 8).



Fig. 8 left and centre: still open part between house seven and eleven right: closed corridor Group agreements only make sense if there is also a clear strategy for executing them against breaking minorities. A possible legal battle on the ground of the group contract was considered less productive for neighbourhood than the acceptance of the breaking of this contract (pictures taken 2014)



### 3.4 the building materials and details

Apart from tectonic potentials and low-cost aspects, all materials were considered to be 'healthy' and providing a positive indoor climate. The U-value of 0,4 of the homogenous brick ('thermo-brick' with air-filled cavities and myriads of pores, generated by saw dust during the burning process - no attached thermal insulation) is very high in relation to standards and regulations of today. But the project is compact and 50 % of brick wall is in contact to the thermal buffer of the 'Nordgang', which was always warmer than the outside temperature minima in winter. Additional, the thermal storage capacity and the humidity balance of the brick is an asset for the comfortable indoor climate.

All facade elements were detailed with a special joint and a compressed rubber sealing so they easily could be demounted and/or be reused in a changed configuration of the (growing) house. This assembly detail proved to be very successful and still simple. Five families changed their windows to windows in passive house standard (U-value glass+frame < 0,8) over the last four years. Due to the original assembly detail, the windows could be changed in only one working day and no other craftsmen were needed for finish. This was communicated as strong appreciation by the owners and the craftsmen. (Fig. 9)

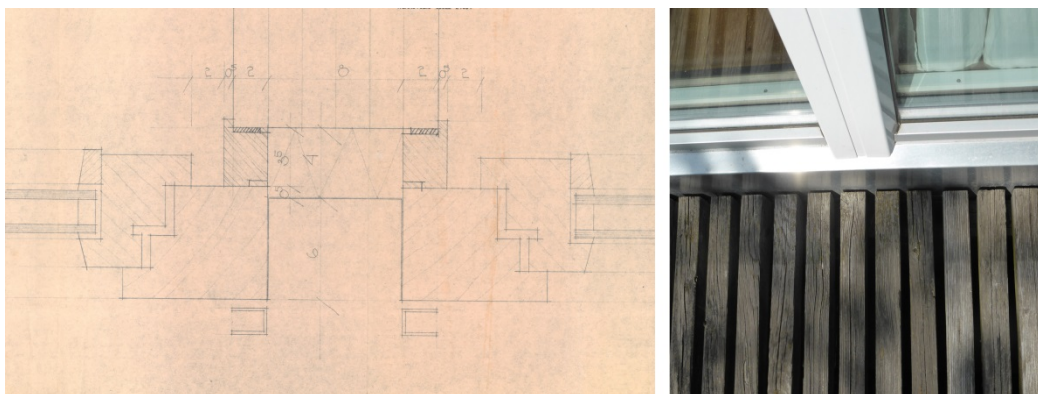


Fig. 9 left: original detail of window connection to glulam column, with exterior profiles for electric driven wooden shutters right: a new passive house window in wood with aluminum to the outside. The outside floor in larch exists since the house was built. (picture taken 2015)

### 3.5 the heating system – part of the tectonic strategy

In the alpine climate of Vorarlberg, a reliable heating system is essential. The most common heating system in Austria around 1985 for new buildings was a boiler fuelled by natural gas with hot water circulation and radiators. For the group, three reasons made this heating system not an option from start:

- the dependency from natural gas and the predicted price increase of non-renewable fuels as well as their environmental impact
- a radiation heating with 'warm objects' and radiating walls was considered as the most healthy and comfortable form of heating
- beside the idea of a resilient heating system (that also allowed heating and cooking in a state of energy emergencies), the memory on warm stoves in old farmhouses was a driving force for the design

Individual hypocaust heating was the selected solution. The central stoves as warm cores in each house with a big 'activity sofa' was a modern reinterpretation of 'farmhouse romanticism' (Fig. 10). This system was independent of fossil energy supply and gas prices and it allowed basic cooking, using legally collected firewood from the nearby forest. Furthermore, all rooms in all floors could be heated (in contrast to historic farmhouses). The system is truly self sufficient: No electricity,

essential for pumps in water driven systems and for gas burners is required as the system works based on stack-effect of warm air only. In addition, eight of the eleven houses got a gas burner which was integrated in the same distribution system<sup>6</sup>. This provided the comfort of an automatic system independent of handling fire wood on a daily basis.

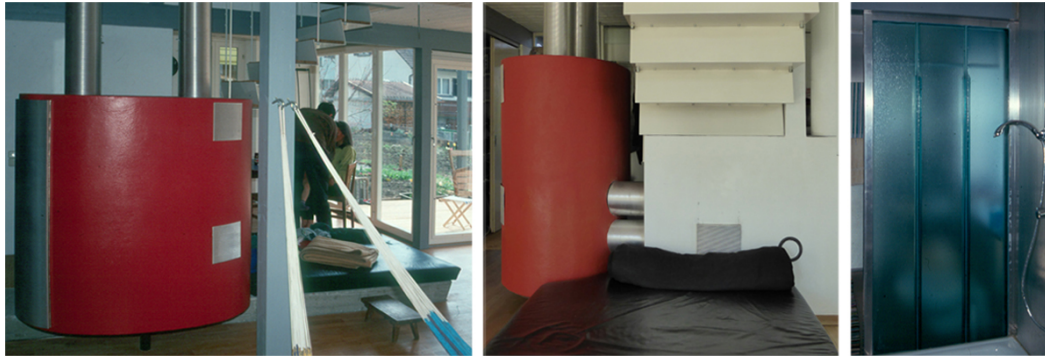


Fig 10 left and center: elliptic hypocaust stove with 'activity bed' in living room right: translucent hypocaust wall in bathroom, made in profile glass, water resistant and used as towel dryer

These eleven heating systems were the continuation of a 'controlled experiment' when it was found out by testing that glass is one of the best materials for radiation walls, that industrial earthenware pipes by geometry and thickness can be used for 'heating sculptures' or that the air-cavity inside a metal bath tub is enough for heating a bathroom. The whole system was designed that in the cases of growing houses the added spaces could be connected to the heating without hassle. The inhabitants are very satisfied with the comfort of the system and all eleven houses still have the original stove and hypocaust elements.

### 3.6 the (self-) building activities and reusing/upcycling second hand building parts

The self-building activities of the group were one of the relevant aspects to keep the building costs on the predicted level. A primary challenge was to define the borderline of liabilities: Contractors would not take their legal liability if their work was 'mixed up' by 'amateur builders'. So the building process needed clear logistics along these borderlines. This included the fact, that self-build activities could not precisely be predicted in terms of needed execution time. Delays could give contractors excuses for follow up delays or asking for financial extras.

Self building in this project included also integrating and 'upcycling' of used or 'waste' building parts, long before the notion 'upcycling' became common language (Fig. 11).



Fig. 11 as one example, the 'nordern corridor' was built with windows and doors of demolished buildings, giving the entrance area 'second hand aesthetics'. Industrial waste like laser-cut steel plates was transformed into a spatial element (pictures 2015)

The most severe issue in the self building process was the relation between the group and its individual members in terms of equality of contribution. It was obvious that there were big differences in 'productivity' of different group members due to their skills, building experiences, physical shape and spare time. The group decided that each hour of each member has the same value. All working hours were written in a list and at the end the ones who worked less had to pay a financial compensation to the ones who worked more. This system sounds very simple but it showed several traps<sup>7</sup>.

The group also decided that its members work equally and in all houses and do not prefer their own unit in terms of intensity or precision of the work. All these decisions can be considered as productive, alone the execution and the sanctions in case of non-solidary behaviour are the crux, when a small minority of group members tended to ignore decisions in daily practice. In 2015 during the interviews with six group members it became obvious, how different participation on group activities for self-building shaped strongly positive and life-long personal relations between some neighbours and lead to conflicts with others.

## 4. Discussion

The results of the process and the use over time must be measured against the original objectives and group agendas of 'communal + self-determined + ecological + low-cost'.

- the statute and the contract for such a project must be extremely clear, including sanctions against violations. The closer the relation or friendship between group members (which is very common), the more essential are precise and legal definitions: (unrealistic) high expectations proved to turn into frustrations when for example self-building revealed contradictions between image and performance of individuals. In this case, the statute was very clear and differentiated but there was not enough clarity about the sanctions in case of infracting it.
- The adaptive design strategies, adaptive in relation to economy, tectonics, family size, amateur building etc. was a key for the success of this dwelling over three decades.
- projects with strong participation and self-building are advised to engage an external (and professional) mediator for conflicts. This should not be the architect nor the building supervisor who is party with conflicting interests in the process.
- 'Ökologische Gemeinschaftswohnanlage Nofels' had an excessive tendency to support the individualistic. Individual choices along individual budgets should be possible, but the differentiation in standard was too wide for this low-cost project and produced a mountain of extra administration and accounting.
- green spaces do not necessarily stay 'green' over time
- some 'healthy materials' showed minor problems: loose bulk cork in floors as thermal insulation was a magnet for noisy field- mice, some died under the floor with 2 weeks of severe smell. This was solved when a significant cat-population was living in different homes.
- self- made earth-insulation or earth-bricks are positive for indoor climate but needed much more time to be produced than the group-members imagined. In general and as a rule of thumb for self-building, untrained amateurs with not optimal tools and fragmented working hours need up to four times longer for the same building activities compared to professional companies !
- A standardization of hypocaust elements with prefabricated chambers would lower the costs and make them a more realistic alternative. In Nofels, experimenting time and development costs were not paid but this idealism cannot be expected in follow-up projects.

After the eighties, by neoliberal tendencies and paralleled stronger individualization of the society, group projects became 'out of fashion' for some time. The difficulties, extreme efforts, risks and practical problems of some of these groups and their projects supported this tendency. But there are strong signs for a new and advanced generation of group housing projects in Austria and Germany.

## 5. Conclusion

The project has many layers to learn from: new homes in Austria became less affordable since 1987. Only between 1999 and 2004, the rents for apartments have gone up by 30% or 5,35% year<sup>8</sup> while the general inflation was average only 2%. Their environmental impact has not significantly improved apart from marketing propaganda. Adaptability is still an alien concept for most of the housing market.

‘Ökologische Gemeinschaftswohnanlage Nofels’ is a success when looking at its tectonic concept and realization, specifically concerning its performance for the ‘growing house’: Seven out of the eleven units have grown over time in different ways, using the various horizontal and vertical offers which were part of the original design.

Further there was no need for major maintenance. Seven of the houses have still the original first colour coating on the wooden facade, there was nowhere a need to replace the low-tech lime plaster.

Despite different life situations, higher incomes and new family situations, the minor fluctuation of the inhabitants is a clear indicator of high user satisfaction, which was also expressed in interviews with the six owners: Out of eleven families, eight are still the original owners. One family sold the house and moved to another place, two couples have divorced and sold the house. One buyer was the son of an original group member, who together with his wife has four young children. Therefore already the third generation lives in the housing estate and after a period of grown up children leaving their parents homes, again small children inhabit and enjoy the place.

The collective design-, decision- and building processes certainly have been exhausting over some periods and provoked conflicts. But over time, the housing group was rewarded with high living quality at extremely low cost for a life time and lasting friendships. Above all: What’s the point to live in a city or town if you don’t interact with your neighbours?

## 6. References

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- [1] Feldkirch is an Austrian border city. It is situated on the border to Liechtenstein and only three km from the Swiss border. The city has 30.000 inhabitants.
  - [2] Edit Breuss-Mueller, co-owner of house five. Beside Edit Breuss, Joachim Breuss, Gerhard Diem, Edith Diem, Katharina Unterrainer and Christine Herbst were interviewed.
  - [3] presently, a ‘renaissance’ of ‘Baugemeinschaften’ (self-determined participatory building groups) can be observed in Germany and Austria. For instance in Hamburg, Berlin, Freiburg, Munich and Vienna, the planning departments have initiated an agency or networks to support these groups.  
<http://www.stadtentwicklung.berlin.de/bauen/baugemeinschaft/>
  - [4] the average age of the participants when the houses were built was 29
  - [5] there were 19 children when the group moved in, 14 of them between one and six years
  - [6] the gas burner heated air and was installed below the wooden burner in a connected cavity
  - [7] There were problems with the precision and interpretation of time records. The compensation per hour was decided collectively clearly too low, so there was no strong economic incentive to work but rather pay compensation, although this was a minority problem: The compensation should be paid on a monthly base, so there are possibilities for adaptations and change during the building process. At the end of such a building project, the money is gone.
  - [8] Statistik Austria  
[http://www.statistik.at/web\\_de/statistiken/wohnen\\_und\\_gebaeude/wohnungsaufwand/betriebskosten/023032.html](http://www.statistik.at/web_de/statistiken/wohnen_und_gebaeude/wohnungsaufwand/betriebskosten/023032.html)