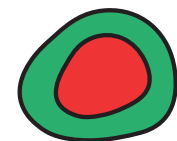


Sustainable Building in Vorarlberg

An Overview of the
History, Projects, and Tools



Energieinstitut Vorarlberg



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The View from Outside



When I was getting requests for lectures and excursions in the field of sustainable building from abroad more than 15 years ago, I was delighted and at the same time surprised. What could be so interesting and worth seeing in the "Ländle"? So much has become self-evident and incorporated into everyday life, that a little push was needed to sharpen the gaze that looked upon the many accomplishments. My impetus came from the view from outside. There were many architects, experts, and decision makers who said that sustainable building would not be possible, was even unthinkable, in France, England, Japan, etc. and that Vorarlberg is at least 10 years ahead in their development!

In Vorarlberg, how is it made possible for architects, craftsmen, and building authorities to work together in the early planning phases? How is it possible to use so many environmentally friendly and regional materials? How does modern complement traditional architecture? How are the costs kept so low? And in general, how can such projects be achieved? These are all very good questions to reflect upon.

The brochure is therefore intended to provide an exemplary view of the many innovative construction projects, products, tools, participants, and know-how used in Vorarlberg. It aims to make all these elements visible as well as show alliances - in the knowledge that unfortunately only a few highlights can be mentioned.

And this insight will hopefully be motivation to take a closer look behind the scenes and also be an inspiration to contact the actors in the region.

Bmst. Harald Gmeiner
Department Head of Sustainable Building at the Energy Institute Vorarlberg



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A Prosperous Region at the Lake of Constance

Two of the more well-known Vorarlberg artists sing ironically “where the woods rustle senselessly, where sometimes the mind blossoms”. One of them is the author, Michael Kohlmeier, who wrote the text to “Oho Voradelberg”, which is the informal anthem for Austria’s second smallest, most western state.

Since the Schengen agreement, Vorarlberg seamlessly borders the three neighboring countries of Germany, Switzerland, and Liechtenstein. On the northern border is Lake Constance and to the south there are the massive Rätikon and Silvretta Alps.

The region is geographically, socially, and economically diverse. While mountain farmers live the romantic cliché of alpine life, the semi-urban Rhine Valley companies compete

in the world market and contribute to regional prosperity. One could say that energy flows between these two polarities. And in this energy field industry and artisans combine talents to produce innovation, which makes Vorarlberg a place that counts as a European model for sustainable development.

Who says “senseless, rustling woods and minds that only sometimes blossom” describe this region! Draw your own picture using the following facts:

Geography

- 2,592 square kilometers
- 84 kilometers from north to south
- 388,000 inhabitants
- 96 communities
- 111,000 inhabitants belong to the three largest communities; about 500 belong to the three smallest.
- 29,600 inhabitants live in the state capital of Bregenz.

Energy

- 9 TWh (32.4 PJ) energy consumption in 2014
- 45 % of consumption is already renewable energy.
- 126 biomass heating plants
- 300,000 square meters of thermal solar systems
- 370,000 square meters of photovoltaic systems

Zones and Buildings

- 93,500 hectares woodland
- 42,000 hectares agricultural land
- 12,000 hectares building ground (4,000 ha unused)
- 89,000 residential buildings, 182,000 apartments
- 30 kWh average heat demand per m² per year in a new building
- 43 square meters of living space per inhabitant
- 20 % of all construction material is timber.

Economy

- 110,000 employees in the commercial economy
- 7,900 businesses, including 53 with more than 250 employees and 6,000 small businesses (1-9 employees)
- EUR 39,800 / inhabitant was the gross regional product in 2013.
- EUR 625 million was used for building construction in 2014.
- 8.5 million overnight bookings were recorded during the 2014/2015 winter and summer seasons
- 15,000 tourists come yearly to visit Vorarlberg’s sites.

» Vorarlberg is a region with much potential for innovation, especially in sustainable constructions. Several decades of knowledge and practical experience has developed into a strong advantage for the local construction industry, whose skills are also in demand beyond its borders. «

Deputy Governor Mag. Karlheinz Rüdissler
Vorarlberg State Government



Two Decades of Sustainable Building

A little more than thirty years ago, the general discussion about hydropower expansion in Vorarlberg began to revert to the old values of economical and efficient use of energy. For the first time, the use of the „storage power plants and energy efficiency“ became the topic instead of thinking exclusively about the construction of new power plants.

This led to the founding of today's Energy Institute Vorarlberg, which has pioneered a large number of programs, initiatives and projects that have significantly stimulated sustainable building in the past two decades. Some examples are the Vorarlberg Energy-efficient House subsidy, the solar energy initiative, the promotion of sustainable housing, the service package „Sustainable Construction in the Community“, energy consultation for citizens and businesses, and the e5 Program for Energy-efficient Municipalities. The Energy Institute Vorarlberg has been able to make contributions to sustainable construction in Vorarlberg.

Sustainable construction has meant fundamentally rethinking construction! A breakthrough that generates new solutions, products, and applications is not easy. A calculated risk must also be taken into account when new concepts are implemented. So, if an innovation is not quite successful, only a small part of the project is affected. Focus on development of know-how and experience is most important, rather than blocking new methods or continuing old ones.

At the heart of innovation, there is a culture of cooperation between different actors, the builder, planners, construction engineers, authorities, and, not least, politics. A good example of successful cooperation is a company called, „vorarlberger holzbau_kunst“, which is well known beyond Vorarlberg's borders. It has been able to develop new solutions through a close collaboration between architects and carpenters, building know-how together step by step. The combination of architecture and craftsmanship has created added value and market advantages.



» Sustainable construction: a comprehensive approach that is used to courageously build the future with love for tradition.

This knowledge, which has arisen in the construction industry, be it in conception and planning, process design, craftsmanship implementation, quality assurance or creation of a suitable framework and support exists in tangible projects and can be visited in countless outstanding sustainable buildings throughout the region.

Sustainable constructions always involve architecture, environment, and economics. And the architects have a great sense of the location. A comprehensive approach is used to courageously build the future with love for tradition. Excellent craftsmanship makes the transformations possible. All this attracts international interest. It leads to exhibitions such as „Getting Things Done“ and to many architectural as well as cultural tourists, wanting to get to know the „Vorarlberg phenomenon“ on site.

In addition to economic benefits and added value in the region, advantages are also becoming increasingly visible

in other sectors, such as tourism, culture, or even regional organic farming. Sustainable developments in environmental, economic, and social issues affect all areas of business and daily life. This corresponds to the decision made by regional government to be energy-autonomous in Vorarlberg after 2050. It is an objective that has generated innovation, created regional value and secured the flourishing and viable region with diverse, intact living spaces.

How the implementation of Vorarlberg's energy-independent objective can be achieved, and what innovations are generated will be seen in the coming decades. In any case, a cooperative, creative, and appreciative environment, which promotes innovative players, is crucial to success. Important to remember is the slogan of our partner company, Traumhaus Althaus, which says "build with joy" and refers to the fifth law of sustainability: „if it's not fun, it's not sustainable“.

» Vorarlberg's goal to be energy autonomous is an opportunity and responsibility for society and business. Our goal is to significantly reduce energy consumption in Vorarlberg by saving energy, becoming more energy-efficient, and expanding renewable energy sources. It is ambitious but possible. This especially applies to the building sector, in which the long-term work of committed actors has already had an effect. «

Federal Councilor Ing. Erich Schwärzler
Vorarlberg State Government



How Vorarlberg Shapes it's Future

These are ambitious goals to which Vorarlberg has made a commitment. The westernmost state of Austria wants to become independent. Independent of price increases and supply bottlenecks for fossil fuels - and thus make a significant contribution to climate protection. Energy autonomy in Vorarlberg has been politically defined as a strategic goal to be reached by 2050. A sustainable energy supply is the vision. Specifically, the balance of energy consumption and energy generation from renewable resources should be balanced by 2050. The vision of Energy Autonomy 2050 includes a safe, environmentally compatible, long-term future-oriented, affordable, and cost-effective energy supply.

Politics stand behind energy autonomy

Energy independence in Vorarlberg is based on a unanimous decision by the Vorarlberg State Parliament. All parties represented in the parliament agreed to this long-term vision - and ultimately the measures that must be taken to achieve the goal of energy autonomy in 2050. These are not measures imposed from above. From the very beginning, citizens from very different professional and social backgrounds have taken the initiative to move forward in shaping the process of energy autonomy and are now also responsible for its implementation.

Four pillars of content

Energy autonomy in Vorarlberg covers nearly all areas of life - in a very different way. In order to better illustrate and communicate the comprehensive project, four pillars have been defined as the basis of the program:

- 1. Energy saving.** Reduction of energy consumption is the basis of energy autonomy. In many applications this is already possible by behavioral change.
- 2. Energy efficiency.** Today's technology better utilizes the energy used and generated in Vorarlberg. That should be placed in the foreground.
- 3. Renewable energy.** In Vorarlberg, we have significant amounts of renewable energy available such as solar power, hydropower and biomass. The use of the relevant technology will be significantly expanded.
- 4. Research, development and education.** Education is an investment in the future. Know-how creates a head start and strengthens Vorarlberg for a life worth living for future generations.



A new process including participation

It is a long and labor-intensive path to achieve the strategic goal of energy autonomy by 2050. A path where many single steps must be put together. And one of the biggest steps was already taken at the beginning: the valuable and strategic decision, in accordance with content, to make this a process using participation.

In the first phase of the project, a vision with a time line up to 2050 was worked out. Concrete implementation steps were defined. The result was summarized in „101 Sustainable Measures“, which is now being implemented and monitored by work groups. It includes topics dealing with buildings, mobility, zone planning, industry, trade and renewable energy. A yearly conference informs all participants and people with official roles about the current state of implementation.

Specific objectives to be reached by 2020

The „101 Sustainable Measures“ were poured into a concrete plan of action. Compared to 2005, energy consumption should be reduced by 15 per cent and CO2 emissions by 18 per cent. The proportion of renewable energy sources is to be increased by 19 percent in comparison to 2005. Listed are some goals in detail:

- continued building renovation at the rate of 3 percent including energy consumption reduction needed for heating by 20 percent
- annual increase in the efficiency of manufacturing businesses by 1 percent
- increase water power from 200 to 220 GWh
- yearly installation of 15,000 m2 solar power and more than 40,000 m2 photovoltaics
- approximately 50 percent increase in heat pumps by 2020
- shift 5 percent of short and medium range transportation to cycling
- 5 percent electric-powered vehicles by 2020
- increase rail transportation of goods and passengers from 22 to 30 percent



» Highly populated apartment buildings were frowned upon by the political establishment up until the 1960s. The single family home has a symbolic status and significant influence up to the present day.

Anchored in History: Contemporary Building in Vorarlberg

Vorarlberg's architectural landscape is quite special. This is not just self-assessment, but an observation based on numerous statements made by national and international experts. The focal point has always been residential buildings.

Since about 1840 and despite intense industrialization, the rural farmhouse, and later single homes, have remained the dominant form of housing. Even during times of residential necessity especially towards the end of the 19th century and then again in the 1920s, no public housing were to be found. Only a few industries built housing settlements for their workforce.

As a rule, domestic workers led a double-life as small-scale farmers and self-employed workers. The people, who just temporarily came to work, had to content themselves with confined and miserable accommodations.

The conservative Catholic party, which had dominated Vorarlberg since 1870, did not regard housing a public responsibility. Until the 1960s, it considered densely populated settlements a catalyst for proletarian and therefore socialist tendencies. Only after 1945 with the explosive population increase of the Vorarlberg Rhine Valley was public housing recognized as a necessity. Housing became vigorously promoted as the need

for private residents also became an issue. The single-house settlements of the 1950s were based on cheap property prices, favorable residential building loans, and personal contribution. For small farmers, it was a powerful ascent. It added more value to their property beyond the utility value. It symbolized diligence, thriftiness, self-employment, commitment, family and good citizenship. All the qualities that Mr. and Mrs. Vorarlberg gladly ascribed to. The numerous new immigrants documented their desire and their willingness to belong to the new homeland by building housing.

At the end of the 1960s, Vorarlberg's population began to grow in the service and education sector, and therefore also influenced the numbers of construction workers and craftsmen. The same was true of the increasing number of academically educated people. These people were the first ones to build using a new type of architecture. It had to be cost-effective, optically and functionally different from common townhouses, use traditional materials such as wood, and have social facilities or community space.

At the same time Hans Purin and Rudolf Waeger, two young and visionary architects, shared sociopolitical views and community ideas. They created new paths by building in an aesthetically pleasing and radical way. Focus was on form and



» The typical modern wooden house in Vorarlberg is a product of the aspirations of its people. It represents affordable living space without engaging your own labor.

function. Being former craftsmen themselves, their focus was on the use of traditional as well as modern materials implemented with their very best craftsmanship. The early clients were young lecturers, artists, with a few doctors and lawyers, too. The houses were often criticized for looking like “wooden boxes” and defamed for ruining the view. However, the Vorarlberg state administration recognized that the new building culture could no longer be stopped and approved them.

Great support was received in 1985 when Vorarlberg won the Builder’s Prize. Winning projects were presented in a brochure, which was distributed in mailboxes nationwide. It praised and accredited the public and private builders as well as the mayor, cooperatives, communities, and state, who often had to make unpopular decisions. This enabled the new building culture to not only focus on private buildings, but also public constructions such as kindergartens, schools, community centers, and fire stations. Social housing projects, which had a lot

of catching up to do, also benefitted from these high-quality building standards.

But there would be no state-of-the-art architecture without the corresponding pioneers, who now represent two generations of innovative architects positioned across Vorarlberg and beyond working on various projects. In addition to planning, some of the most important architects in the second generation teach today at major universities: Roland Gnaiger in Linz, Dietmar Eberle in Zurich, Carlo Baumschlager, Hermann Kaufmann in Munich, and Hugo Dvorzak in Vaduz. The export of this know-how is positive confirmation of the architectural landscape of Vorarlberg as is the numerous visitors from Germany and abroad. The common parameters of the sophisticated Vorarlberg architecture, in all its various forms, show functionality, noble simplicity in form, energy-efficiency, material sustainability and a modernity that paradoxically does not deny the tradition.



» About the author: Mag. Meinrad Pichler is a retired school director and one of the leading historians of Vorarlberg. In 2014, he was awarded the country’s Science Prize.





For the Good of People and Environment

Environment-friendly, organic, close to nature,
resource-efficient and sustainable constructions

Today, the word “sustainability” has come into fashion, which can be defined and understood in many different ways. The term originally comes from forestry. Three hundred years ago, this term was used to describe how the rate of wood to be used would equal the amount that grew back - in other words, to live on interest rather than from principal. The UN Commission defines sustainability as criterion for development in which today’s society can meet its needs without sacrificing the ability of future generations to meet their own needs.

Construction has a major influence on the environment and causes significant burdens that include the exploitation of resources, energy consumption, waste, air pollution, greenhouse effect, ozone depletion, and soil degradation. In Austria, building construction and their use are responsible for about

- 50 % of all our subsidized materials,
- 50 % of our energy consumption and
- 30 % of our waste and our water consumption.

It is often the view that „this one object“ will not change anything. However, it is the intention that every well-designed, building that is constructed with optimized, sustainable material with low operating and construction costs, will be a model that motivates others.

With the successful introduction the „Vorarlberg Energy-efficient House“ in 1989, the Energy Institute Vorarlberg became motivated to think about general building assessments. Therefore in 1995, building energy assessments started to include sustainable criteria, which further led to the introduction of „sustainable building identification Vorarlberg“ in 2000. This became the predecessor to the „klima:aktiv building standard“ in Austria. The introduction of the construction workflow report database for sustainable building and redevelopment was yet another important step to address the lack of any declaration of sustainable construction material across the EU. Based on collected data, the Oekoindex Building Assessment was developed. It automatically shows the expenditure of gray energy, greenhouse and acidification potential of the materials used already in the planning phase. Today, practical tools

are available that make planning, optimization, evaluation and quality assurance of sustainable building implementation easy.

However, sustainable construction does not just stop at property. The impact on building land, community, mobility, as well as other issues must also be considered. In most cases, only construction costs are taken into account in decisions, and the follow-up costs are neglected. However, the building’s follow-up costs, such as operation, inspection, maintenance, cleaning, etc., that are needed for an estimated 50 years of use amount to 50% of the total costs of residential buildings, 80% of office and administrative buildings, and 90% of the total costs of schools, kindergartens and hospitals.

Therefore, when considering construction costs, as well as follow-up costs, sustainable buildings are a long-term and cost-effective solution. To add to the sustainable benefits these buildings are also known for their ambience and comfort.

In the planning, most sustainable improvements are often achievable without additional costs. These four principles are to be observed:

- Avoid using non-renewable resources.
- Ensure the regeneration of renewable resources.
- Reduce the impact of toxic waste and residues.
- Preserve biodiversity.

The opinions differ on how quickly and to what extent these prevention, reduction and conservation principles are to be implemented. Ultimately, the question remains whether humanity, is more threatened by the greenhouse effect, by the extinction of forests, by the shortage of energy and raw materials, or the resulting social impact of these problems. It is good that Vorarlberg has the goal of energy autonomy, because it provides sustainable development in the construction industry, as well as ensures long-term, satisfying and flourishing economic development in a vital region.



» Vorarlberg is the most convincing model in Europe today for carrying out environmentally-conscious development on a regional level. «

Arch. Dominique Gauzin-Müller
architect, architecture critic, author, Stuttgart / Paris

So Much Has Happened More Than Ever Expected

In the past few years in Vorarlberg, many outstanding buildings have been built that serve as a beacon in the implementation of energy autonomy. They are masterful examples of architecture, energy-efficiency, and sustainability, while at the same time showing that innovative builders and creative architects can also work with a great sense for location. They combine traditional craftsmanship with a sustainable selection of materials and state-of-the-art building technology.

All projects combine the following principles: simplicity in form, material and detail, aesthetics, functionality and far-sightedness. Foresight, which begins in the planning stage, not only considers construction but optimizes operation, maintenance, conversion as well as dismantling and disposal. The building owners enjoy low operating costs, long-term use and easy convertibility to a different function. The materials that are used do not burden the environment, can be easily replaced, and age gracefully. Focus is on longevity and cost optimization throughout the entire building lifecycle.

Experience shows that sustainable construction projects are successful if all participants are involved at an early stage in the planning process, from the client to planners, experts, contractors, and the various authorities. This approach to cooperation fosters innovation, generates added value, and creates much more than originally thought.

The principles of sustainable construction are the work of the Energy Institute Vorarlberg. They are responsible for introducing knowledge, consultation, and support about energy-efficiency as well as sustainability. They also research, demonstrate, and discuss energy and material topics that characterize contributions to the building culture in Vorarlberg.

The following pages show five representative buildings from the large number of innovative constructions in Vorarlberg.

The last 10 years of sustainable building

- 80 public buildings
- 3,300 non profit, community apartments
- 4,400 photovoltaic plants
- 4,700 modern wood heating systems
- 11,000 solar heating systems
- 14,000 private residential units
- 30,000 renovated residential units



» Construction workers, planners, and craftsmen all help to find sound, sustainable material for their projects. This is a core focus of the “baubook GmbH” platform. «

Mag. Christoph Sutter
Managing Director, baubook GmbH



House in Hard

Plus energy house with straw insulation

Building Owner: Daniela and Martin Brunn

Planning: Arch. DI Gerhard Zweier and Martin Brunn

Floor space: 150 m² living space and 30 m² office

Heating requirement: 7.3 kWh/m²a

Features: solid timber frame, interior exclusively used solid wood and clay, insulated with straw bales, 14 m² solar heating system, woodgas boiler in living room, 11 kWp photovoltaic system, wall heating, and comfort ventilation with heat recovery

Building costs: EUR 2.500/m² floor space incl. value-added tax

Completion: 2012

The goal was to create a building which can easily be adapted to changes in usage. Each level is therefore largely free of bearing elements, so that three apartments or an apartment for an elderly person could be created. Walls, roof and floor panels are made of straw-insulated wooden frame elements. Sustainable building materials were used and the wood came from the region. The highly efficient building envelope and the simple energy concept has been calculated to produce more energy in the next 30 years than needed for construction, operation, and demolition.



» It is a beautiful residential development that combines sustainable construction with low land use and high living value. Furthermore, a gap in the Wolfurt bicycle path network could be closed using private ground. «

Christian Natter
Mayor of Wolfurt

Compact Residential Development in Wolfurt

Low-energy house constructed in wood

Building owner: Construction Association

Planning: Arch. Christoph Kalb, BSc.

Floor space: 875 m² (7 residential units)

Heating requirement: 25 kWh/m²a

Features: minimal basic requirements, sustainable building materials, wood elements with larch formwork, plank stacking, comfort ventilation with heat recovery, central pellet heating, decentralized solar heating systems, thermal insulation made of sheep wool and cellulose, clay, extensive roofing, use of rain water

Building costs: EUR 2 million

Completion: 2006

A „zipper system“ loosely connects the single family houses with the private terraces and gardens. Wood and sustainable materials were consistently used. Sustainable building principles were also implemented for many applications. The houses are equipped with comfort ventilation and thermal solar systems, which also contribute to room heating. The remaining heat requirement is provided by a central 25 kW pellet system. Current heating energy consumption is 15 kWh / m²a, which corresponds to the passive house standard. Heating costs are under EUR 10,- per month and house.



» With Factor 10 renovations, a new dimension has opened up for large, old apartment buildings in Austria. The work was done with the tenants in the building, which was enabled by committed developers and motivated inhabitants. «

Mag. Susanna Ajkovic

Manager of the partner company network Traumhaus Althaus



Factor 10 Renovation in Rankweil Renovation to Passive House standard

Building owner: Vogewosi (non profit settlement society)

Planning: Arch. DI Andrea Vogel-Sonderegger

Floor space: 1,414 m² (18 residential units)

Heating requirement: 15 kWh/m²a (former 175 kWh/m²a)

Features: Passive house components, heat bridge minimization, central comfort ventilation with heat recovery, 80 m² thermal solar system for hot water and heating support, wooden windows, enclosed balconies with glass, added a lift

Building costs: EUR 925,000 incl. lift

Completion: 2007

The multi-family complex was built in the middle of the seventies and was first rented out in 1978. It consists of 18 residential units. The building was renovated in a fully inhabited state, which required much patience from the tenants and exact construction management and preparation by the craftsmen. Particular attention was paid to reducing existing heat bridges and increasing the building's air-tightness.



» Quality buildings are those that make substantial contributions to society and culture. In addition to their material worth, they also represent emotional values. Only these kinds of buildings enrich our living space in the long term. «

Mag. Dr. Verena Konrad
Director of vai Vorarlberg Institute of Architecture

Ludesch Community Center

Sustainable wood Passive House construction

Building owner: Gemeinde Ludesch Real Estate Management

Planning: Arch. DI Hermann Kaufmann

Floor space: 3,135 m²

Heating requirement: 13.8 kWh/m²a

Features: sustainable construction material (PVC-free), regional wood (white pine), solar heated warm water, biomass district heating, and 350 m² translucent photovoltaics in forecourt roofing

Building costs: EUR 5.6 million

Completion: 2005

The three buildings of the community center were constructed using Passive House standards and all the quality criteria of a climate-friendly house, thus fulfilling the highest environmental requirements. Such success was due to the company's comprehensive planning goals. The end product demonstrates the high quality craftsmanship and professionalism of the Vorarlberg carpenters. Compared to average building operation, it requires 90% less energy for heating, produces 65% less greenhouse effect, and uses 50% less primary energy, or „gray energy“.



» The Illwerke Center Montafon proves that there is virtually no limit to using sustainable wood as building material. The elegant timber construction also offers an unbeatable environmental balance. «

Dr. Matthias Ammann
vorarlberger holzbau_kunst



Illwerke Center Montafon in Vandans

Sustainable wood module for administrative offices

Building owner: Vorarlberger Illwerke AG, Bregenz

Planning: Arch. DI Hermann Kaufmann

General Contractor: Cree GmbH, Dornbirn

Floor space: 11,497 m²

Heating requirement: office building 7 kWh/m²a, catering 15 kWh/m²a

Features: 6 floors (basement, ground floor, 4 floors), timber supporting structure, wood-hybrid ceiling elements, wooden windows frames, integrated heating - cooling panels in ceiling, comfort ventilation with highly efficient heat recovery, heat pumps

Building costs: EUR 30 million

Completion: 2013

Illwerke Center Montafon is the second building to use Cree GmbH's modular and flexible building system. (The eight-story "Life Cycle Tower ONE" in Dornbirn was the first.) With a length of 120 m., a width of 16 m. and a height of 21 m., it is one of the largest timber-built administrative buildings ever to be built in the world. The building has been designed to allow for future expansion and a long service life. The sustainable building needs around 50% less primary energy, or "gray energy", compared to conventional designs.



The Right Tools and Necessary Structures

Without a doubt, the necessary tools for constructing habitable buildings are indispensable: no drawing board, no plan; no saw, no wood; no trowel, no mortar; no crane, no roof no building. The same is true in the „environmentally-friendly“ planning and construction process, which leads to the concept of sustainability.

The large number of wooden constructions in Vorarlberg is probably due to the very old tradition of craftsmanship and their tools. Knowledge about these tools and their correct application is essential for professionals in planning and construction.

And because the use of different materials and resources should ultimately be in accordance with the needs and wishes of the client, it is worth taking a look at various exemplary structures developed by contracting authorities using sustainable measures from planning to construction.

The service package „Sustainable Construction in the Community“ and the Municipal Building Certificate

Since the turn of the century, the sustainable construction motor in Vorarlberg has been decisively driven by the municipalities. They have been motivated by Meinrad Pichler's article about the history and tradition of sustainable private residences and then have scaled up to implement his ideas in public buildings. They soon realized that professional support for the construction process is very helpful. This resulted in the service package „Sustainable Construction in the Community“.

Although technical possibilities and theoretical knowledge are available in small communities, they often lack experience, comprehensive strategy and knowledge about sustainable constructions and renovations. The service package closes the gap between theoretical knowledge and application in practice





and provides valuable support to communities. The key to the success of a construction project is a comprehensive, professional and structured approach throughout the entire construction process, from the idea to planning and implementation.

The service package „Sustainable Construction in the Community“ service package was developed by the Environmental Association, the Energy Institute Vorarlberg, and the engineering office Spektrum. It offers support and in the meantime has assisted in the planning and construction of more than 80 community buildings.

» The service package „Sustainable Construction in the Community“ is an important process for the environmentally-friendly and energy-efficient assurance of high-quality community buildings. «

Dipl.-Ing. Arch. Sabine Erber, Project Manager „Sustainable Buildings in the Community“ at the Energy Institute Vorarlberg

The service package is both a consulting and an accompanying instrument. Conception, planning and craftsmanship is closely observed. Training and raising awareness at the construction site creates understanding - for all those involved in the necessary diligence of creating highly efficient and sustainable buildings.

Since 2011, the municipal building certificate (‘‘Kommunalgebäudeausweis“ - KGA) has been issued with specific assessment criteria for new or renovated buildings. Concerning

community development, it is distributed by the state of Vorarlberg to its municipalities. The buildings are assessed according to a standardized catalog using four different criteria: process and planning quality, energy and supply, health and comfort, as well as building materials and construction.

In the case of a high KGA score, the funding allowance and thus the maximum subsidized investment sum are increased. As a rule, this support results in covering extra sustainable process and material costs during construction.

Push and pull: sustainable subsidized housing

Supporting environmentally-friendly measures is not a novelty in Vorarlberg. As early as the mid-nineties, residential buildings were constructed with environment-friendly and energy-efficient criteria in mind. Gradually, the criteria has expanded, always balancing requirements and incentives, i.e. between mandatory measures and additional subsidies for the building authorities, independent of whether they were for private or non-profit, small or large housing constructions. These activities culminated in a commitment from non-profit builders to build using passive house standards in 2009, which was later withdrawn and replaced by a more incentive-oriented system. Irrespective of the actual nature of measures and the instruments used to assess them, the promotion of sustainable, subsidized housing has become established and accepted. Vorarlberg itself follows „Guiding Principles for Sustainable Federal Buildings“ in the construction and renovation of public buildings.

» The kindergarten in Muntlix was constructed using the highest environmentally-friendly standards. Not only did the ‘‘Sustainability: Building in the Community“ service package accompany the construction process, but the locals also turned out to help bring in clay for the flooring.





» Product declarations for many sustainable building materials are listed in the "baubook".

The Turbo for Sustainable Material Application: baubook

No other tool has shaped sustainable building in Vorarlberg as much as the "baubook". It enables contractors and construction companies to identify sustainable construction material and has developed into a central knowledge and work platform.

Decisive for the success of sustainable buildings is information about building material selection. The baubook database prepares this knowledge and makes it available to users free of charge.

With the introduction of sustainable criteria for Vorarlberg's subsidized housing, there was increased demand for information about products that meet these criteria. In order to meet the increasing demand, these lists, initially manually edited by the Energy Institute Vorarlberg in 2004, were converted into a database. The manufacturers themselves make the product declaration, since they have all the necessary information. Furthermore, only the manufacturers themselves assume responsibility for the declared product properties.

In order to ensure quality data from the beginning and to support fair competition among the manufacturers, the products have been examined for their conformity with the declared criteria. Public presentation of the declared product properties together with the declaration requirements ensure the greatest possible transparency.

The intensive use of the platform in practice, is due to its flexibility. The manufacturers make a one-time product declaration to a central database. Keywords from different applications - especially those that fulfill or support tender criteria - are used to collect relevant information from the declaration database and prepare it free of charge for architects, special planners, energy inspectors, and craftsmen. All these different actors benefit from product information enhanced by initial testing and stored in the central database.

» **We are constantly introducing our products into the baubook, because it gives us the chance to distribute information about the sustainable properties of our products. In addition, it facilitates material verification for use in subsidized housing projects and public tender.** «

Christian Höberl, Röfix AG

A special feature is the platform „baubook green procurement“, which is mainly used by municipalities while in the requisite tendering process of trades to ensure the desired sustainable and energy efficient quality, as well as the professionalism of the manufacturing companies. It is used in particular by the service package „Sustainable Construction in the Community“ and the City of Vienna for sustainable public procurement.



No longer a gray theory: sustainability assessment of buildings

In addition to energy consumption for daily building operations, the energy and resources used to construct a building are becoming increasingly important. In order to show a clear overview of the numbers, it is necessary to use LCA (Life Cycle Analysis Data) for the materials used. Furthermore, calculation methods and their corresponding programs are the tools required to indicate building operation as well as construction.

Along with the IBO guideline, the baubook database provides a comprehensive catalog of sustainable building material data. In order to support the application, the data was linked with structural and product characteristics. When keywords are triggered, the linked data is passed on to programs for energy calculation. It is thus possible to simultaneously record the materials used for the building construction during the course of the energy-ID calculation. As a result, it is also possible to calculate a life cycle building assessment of subsidized buildings that were constructed ten years ago and thusly enables broad-based data collection to be carried out in individual research projects.

» At eco2soft, I am particularly enthusiastic about the practical application and the intuitive implementation. «

Dipl.-Ing. Arch. Heike Wiest, Energy Agency of the State of Baden-Württemberg

The baubook expansion, „eco2soft - lifecycle assessment for buildings“, makes it easier to calculate sustainable life cycle indicators for buildings by taking advantage of product-neutral material characteristics and component catalogs. In addition to the buildings, environmental indicators can also be calculated for further life phases of individual sub-areas. Even the disposal of building materials can be represented in twelve predefined modules.

At the end of the day, it's about money: the baubook amortization calculator

The discussion about insulation thicknesses, especially in renovations, almost always involves the question: „does it pay for itself?“. The amortization and cost-effectiveness calculator provides an instrument which presents insulation costs and savings variants from a life-cycle perspective. Indicative prices allow for an initial estimate. The calculation is also possible using individual prices. All framework conditions for the calculation, such as interest rates or price increases, can be adjusted individually, and the housing subsidy rates can be taken into account. In addition, a sustainability comparison of

the different measures takes place: costs for the production of the insulation system are compared to the savings in heating. From this perspective, sustainably optimal insulation thicknesses are easy to see. Various categories of effects such as primary energy content (renewable / non-renewable), greenhouse and acidification potential, as well as the eco-indicator (Oekoindex) can be seen.

A building, a reference number: the Oekoindex in the baubook

For more than ten years, resource consumption for building subsidized housing has been assessed in Vorarlberg using Oekoindex. Today, this instrument is used in six of nine federally subsidized housing projects and in a number of building evaluation systems (including the municipal building certificate „Kommunalgebäudeausweis“ and the „klima:aktiv“ building certificate). No other measure for increasing sustainable construction has achieved a comparable distribution level. The Oekoindex uses the following three environmental indicators:

- Primary energy content (PENRT) - production energy (non-renewable)
- Global warming potential (GWP) - global warming due to greenhouse gases
- Acidification potential (AP) - regional effect on soil, forests, water, etc.

These three indicators contribute one third each to a key figure, the Oekoindex. It is a simplification which has decisively led to the application of life cycle assessments for buildings in Austria.

Factbox baubook

- 1 central declaration platform
 - 6 regional or topic-specific platforms
 - 400 manufacturers with
 - 3,600 declared products
 - 9,600 registered users
 - 2 million visits per year
-

Prepare the ground for sowing: the e5 national program for energy efficient communities

The fact that the wish for sustainable buildings has made such an impact is mostly due to the fact that Vorarlberg has been systematically strengthening its energy policy agenda since 1998. It is part of the e5 national program for energy-efficient municipalities. The „European Energy Award“, which is well-known all over Europe, brings together



» Networking, sensitizing, and special topic training for craftsmen is the main focus of the partner company network "Traumhaus Althaus".

almost half of all Vorarlberg municipalities in its network, whose primary objective is to enable municipalities to put a constructive and effective energy policy into practice. The backbone of the program is to record and improve all municipal energy policy options in a continuous audited process. The building stock played an important role here. In this way the e5 municipalities also played a major role. The catalogued measures were not only developed and tested on their buildings, but were also applied and used widely by way of political will. As a result, the municipalities are not only aware of the need for action within the program, but are also learning about the good examples of others within the network, which - as we can see - leads to imitation.

Be better together: partner company network "Traumhaus Althaus"

The qualification of craftsmen is a key factor in sustainable building. The same applies to the management of the trades, which is very important in highly energy-efficient, sustainable buildings. It was therefore a matter of bringing together committed craftsmen into a network and training them on the path to sustainable construction. In the year 2000, the partner company and network "Traumhaus Althaus" was founded with a focus on energy-efficient and sustainable restoration and now includes around seventy companies.

Networking and education

Numerous formats from various institutions, such as Vorarlberg Architecture Institute and the Energy Institute Vorarlberg, operate the networking platform and further education of professionals. It also strengthens cooperation as well as understanding between clients and companies implementing the measures.

There is also a program for intermediate training measures, which provides professionals and decision-makers with the necessary assurance in their choices as well as an explanation of available tool application.

In the end, the question is: which of the instruments is the right one and which of the structures is necessary? „The whole is more than the sum of its parts," Aristotle said. And that may be the answer. In any case, it is those qualities that contribute to the emergence of „more" at the end of the day with awareness, knowledge, help, questions and understanding. The condition to be achieved in Vorarlberg could possibly be more comprehensive and consensual than anywhere else.





» Only deliberately acting planners as well as craftsmen and builders, equipped with the necessary expertise and the necessary tools, can create sustainable living space for generations.



» A housing complex will be built here in Feldkirch. It is part of a research project called "KliNaWo - climate compatible, sustainable, housing", that is being analyzed to reach a financial optimum for sustainable constructions.

Is Sustainability Affordable?

„Energy-efficient buildings are expensive and do not pay off.“ This often heard statement is one of the biggest barriers to a broader market. Since it is rarely supported with true figures, the Energy Institute Vorarlberg has focused on the topic of cost and economic efficiency of energy-efficient buildings.

In practice-oriented research projects, the additional costs of highly efficient buildings were compared with architecturally identical buildings at the normal energy level. Based on cost estimates, the economic viability of the building variants was compared using different energy levels. The total cost of buildings for a period of 30 and 50 years was determined. The following categories were taken into account in the calculation of total costs:

- investment costs
- maintenance costs
- energy costs

The research projects dealing with profitability of residential buildings are consistent with the following core findings:

- The additional costs of highly efficient buildings compared to architecturally identical buildings of poorer quality are about 4 to 6 %.
- During the life cycle, highly efficient buildings without subsidies are already more economical than those that only meet legal minimum requirements.
- Additional costs for better energy-efficiency mostly benefit regional companies.

As the research projects show, energetic and economic building optimization is a very useful method of planning. The Energy Institute Vorarlberg has now developed instruments that planners can use themselves. They also offer planning, which includes consultation within the scope of the service package „Sustainable Construction in the Community“ as well as for larger residential buildings. Consultation about new buildings or renovations are also welcome.



» About the author: Mag. Karl Ladenhauf is a long term employee at the office of the Vorarlberg Regional Government and is responsible for strategic development and operational implementation of subsidized housing.

Sustainability is affordable

Having anything to do with housing in Vorarlberg means paying attention to „permanent quality“ as well as construction costs. But then especially to life cycle costs, which also include future restoration measures and future operating and heating costs.

In this case, there is no question of „how is sustainable housing affordable“, but a clear statement of „sustainable building is affordable housing“.

It is underscored by many projects studied in housing research. Their results are clear: investments in durable components (well insulated building envelope and high quality windows) pay off in the long term even without subsidies.

To ensure that not only the life cycle costs are kept low, but also that construction costs stay affordable, the country's subsidized housing offers more credit for new building loans that choose sustainable material and systems. These would also include an environment bonus, a bonus for barrier-free implementation, and for compact apartments and single homes. All the initial costs are just a small part of total life cycle costs, which proves that sustainable constructions are in the long term affordable.

If these considerations are taken into account during planning and including any future application changes, there is nothing to stand in the way of „sustainable building“ and permanently „affordable housing“.

» „Sustainability is not a buzzword. Sustainability is a principle.“, says Karl Ladenhauf, Vorarlberg Regional Government





» Is it thanks to the builder's wish or the professional's sensibility that demands the construction of sustainable buildings - such as the rectory in Krumbach for example?

The Chicken or the Egg?

Is it thanks to the builder's wish or the professional's sensibility that demands the construction of sustainable buildings - such as the rectory in Krumbach for example?

Do sustainable products and an architect's future-oriented attitude along with practical experience come first or does the client's demand for sustainable constructions come first? If no one asks for sustainable buildings, there will be none, but if someone asks for them, no one can professionally plan and carry the builds out. The demand will not be permanent. A classic hen-egg problem, then.

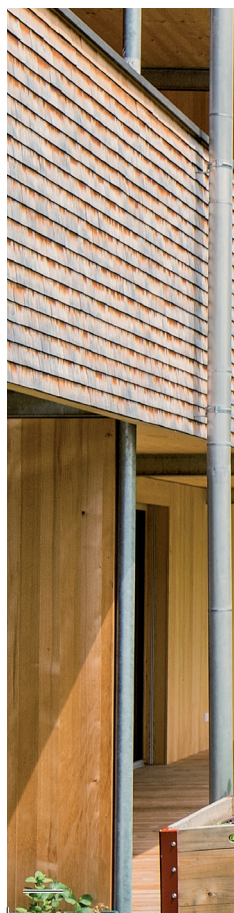
As elsewhere, development in Vorarlberg takes place one step at a time. At the beginning, sustainability was a given: regional and renewable. Existing building products were small in variety: wood, stone, glass and a little metal. Together with long-standing know-how and craftsmanship, durable buildings were built for living and manufacturing in the first half of the 20th century. In the last forty years the building process has been determined by the efficient use of time in process-optimized sequences, cost sensitivity with cost-optimised materials use with many unimaginable process cycles and an unmanageable material diversity that determines the building process.

We come out of this spiral when we get back to the essentials: What do we really need? How do we build so that resources remain large and their use small? What knowledge and skills must professionals have in order to meet meet the resulting requirements?

In Vorarlberg, the original conditions still exist and are available for use:

- There are builders, predominantly exemplary people from the community, who want this durability, regionality, and interior quality. All of which is additionally stimulated by competition, consultation, and incentives.
- There are also planners who are able to reduce their concepts to using original ideals, products, and craftsmanship.
- And there are construction companies, craftsmen, and artisans who are willing to contribute and cooperate together.

Vorarlberg is small. From the development point of view, this is good for sustainable buildings, because regional companies have the capacity to cover construction projects throughout the





» About the Author: DI Josef Burtscher is a long-term employee - and since 2012, he has been the Managing Director of Energy Institute Vorarlberg.

state. Vorarlberg is small. Almost everyone knows everybody. And if a sustainable building is built somewhere in a mountain village, soon everybody else who is planning a similar project knows about it. The scene is ideally supported through connections with several organizations, such as the Vorarlberg Architecture Institute, „vorarlberger holzbau_kunst“, the Environmental Association, and services from the Energy Institute Vorarlberg. Sustainability is intensely communicated, directly and indirectly, through media, publications, education and training programs, and available tools.

Vorarlberg is rich. Rich in ideas, rich in risk-taking, and also rich in financial wealth. And if there is a willingness to take new paths, they have already been staked out by good examples, and where investment costs also assess product life cycles, there are a great many examples of those, too. Beyond the elements described above, there are international networking and cooperation projects, national and international awards,

adapted information, educational and advisory services and helpful tools that support the distribution of information and development.

Subsidies for private residential buildings and zoning for municipal buildings have significantly influenced sustainable construction. The accompanying criteria and action catalogs give direction and support to the ideals that Vorarlberg wants to continue to follow and implement. Furthermore, subsidized housing projects shine some light on the shadow of affordability, which in turn facilitates energy-efficiency and sustainability.

The main motor of all efforts has been the personal commitment of all the participants in their attitude to sustainability. So, has the project been deliberately controlled or coincidentally brought together? Returning to the initial question of the chicken and the egg, what really matters: the result is great.

» Compact, sustainable, housing in the countryside: facility for assisted-living Krumbach



Contact

Energy Autonomy Vorarlberg

www.energieautonomie-vorarlberg.at

vai Vorarlberg Architecture Institute (Vorarlberger Architektur Institut)

www.v-a-i.at

Getting Things Done: Evolution of the Built Environment in Vorarlberg

www.gettingthingsdone.or.at

vorarlberger holzbau_kunst

www.holzbaukunst.at

baubook GmbH

www.baubook.info/en

Energy Institute of Vorarlberg (Energieinstitut Vorarlberg)

www.energieinstitut.at

More contacts, publications and links are found here:

www.energieinstitut.at/nbv

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Bmst. Harald Gmeiner

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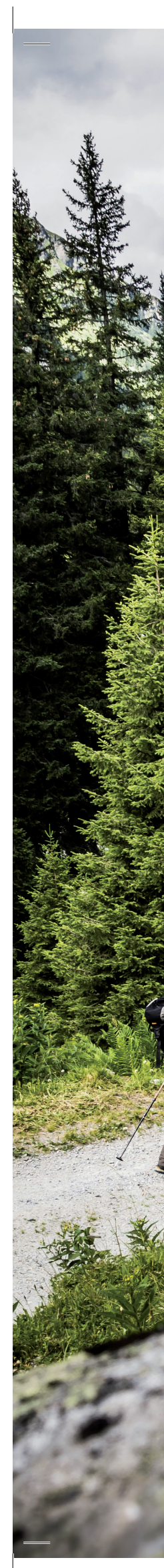
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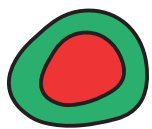
Information about the indicators on page 5: energy consumption refers to the year 2014, without pumped storage and fuel exports. The share of renewable energy is calculated according to EU Directive 2009/28 / EC. The concept of „building land“ includes buildings and farm areas.

» Even when the path winds to the right or to the left, the direction in which sustainable buildings continue to develop is clear and according to plan.





in which
g to plan.



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