



# ENERBUILD

## Enerbuild: Survey on existing buildings for final user

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# Enerbuild: Survey on existing buildings for final user

Results of an empirical study

Giuliana Cannata  
Helmuth Pörnbacher

Bolzano, 2010

Client	Appointed Institution
 <p>The logo for TIS innovation park features three overlapping circles in blue, pink, and yellow, with the text 'TIS innovation park' below them.</p>	<p>Sozialforschung und Demoskopie</p>  <p>The 'apollis' logo consists of the word 'apollis' in a bold, lowercase, sans-serif font, with 'a' in teal and 'pollis' in black.</p> <p>Ricerche Sociali e Demoscopia</p>
<p>Via Siemens 19 Siemensstraße I-39100 Bozen/Bolzano</p>	<p>Pzza. Domenicani 35 Dominikanerplatz I-39100 BOLZANO BOZEN Tel.: +39-0471-970115 Fax: +39-0471-978245 <a href="mailto:info@apollis.it">info@apollis.it</a></p>

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## Summary

### Context

The Cluster Edilizia of TIS Alto Adige appointed apollis to conduct a survey, through in-person interviews, among families in Bolzano who moved into the new Casanova residential units.

### Objectives

The survey addressed what it is like to live with new and advanced construction technology with the intention of evaluating the experiences and learning from them for the future.

### Methodology

The data was collected using two questionnaires that were supplied directly by the client:

- The family questionnaire: conducted face-to-face, i.e. read aloud by the interviewer to a senior person selected among the apartment's residents. The questionnaire posed questions to do with the inhabitants and the building, social aspects, well being/comfort and housing satisfaction.
- Each family member (or caretaker in the case of a small child) also filled out a personal questionnaire to do with health.

### Implementation

During the period of 23/11/2010 to 17/01/2011, the apollis group of interviewers contacted 313 families residing in the CASANOVA housing district. The families had been informed of the survey in advance by a letter in which their assistance was requested.

A target person was chosen during the first visit based on his or her seniority and his or her knowledge of the technical characteristics of the home. At least five attempts were made to contact each family.

All of the available addresses, amounting to 313, were used for the survey. In 39 cases, we were unable to identify a target person within the family. In three cases, the family no longer lived there (according to neighbours). In the other 36 cases, we were unable to contact the nuclear families (despite having made at least five attempts).

In 86 families, the target person could not be interviewed even though this person had already been pinpointed. In four of these cases it was impossible to agree on a meeting time. In two of these cases the person could not be interviewed. In the remaining 80 cases the subjects declined to participate (62 of which were not interested and 18 of which lacked the time). Of the 188 remaining families, 185 valid interviews were conducted. The share of refusals therefore amounted to 26%, an excellent percentage considering the commitment required of the family (with one person being interviewed face-to-face for 45-50 minutes and each family member personally filling out an additional questionnaire) and the particularly busy time period in which the survey was conducted.

## Results

The results of the survey are discussed in relation to four hypotheses upon which the survey was conceived. First the data from the extensive survey involving the housing district of Casanova in Bolzano will be analysed, followed data from Trent and Switzerland, even if the few available cases required us to make a comparison according to other methodological criteria.

Indeed, a fundamental problem with this study is the lack of data from a comparison group. The interpretation of the results is therefore limited to a description of the phenomena surveyed. Neither was it possible to establish a causal relationship between the phenomena evaluated and the energy standards of residential buildings.

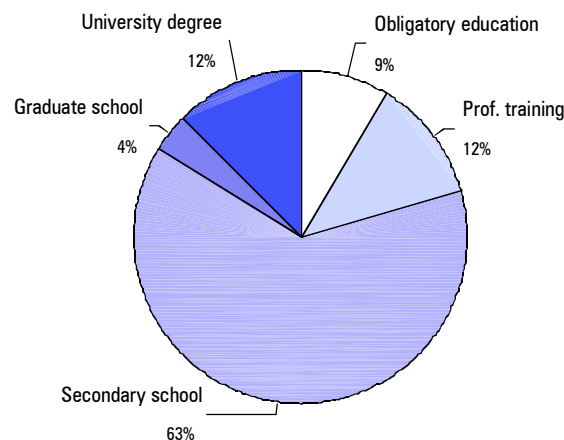
**Theory 1: Residents of energy-efficient buildings have higher levels of education.**

*We take it for granted that individuals interested in energy-efficient buildings primarily belong to a fairly well educated social stratum. Such people inform themselves independently and have specific reasons for choosing to live in a energy-efficient building (e.g. because of their concern for the environment or their social engagement).*

*A higher level of education is associated with a better understanding of technical aspects, higher income, an interest in protecting the environment, an openness to innovation, a greater need for modern comforts and a desire to make exemplary choices on behalf of society.*

The chart below shows the composition of the sample group according to their **level of education**. The largest part corresponds to those who completed secondary school. Those with a university degree make up 12%.

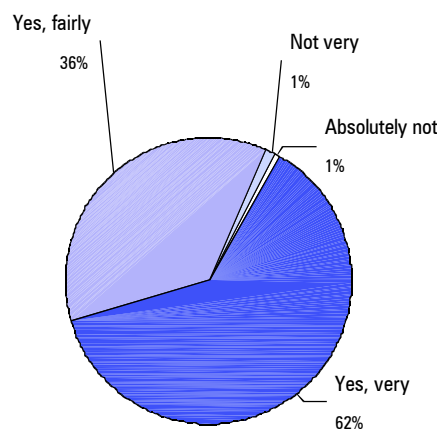
Level of education



We cannot proceed directly to a verification of the first theory according to which residents of energy-efficient buildings have higher levels of education than those who reside in traditionally built homes. This would be methodologically inappropriate for several reasons. For one thing, it would be erroneous to compare this group to other residents since the residents of Casanova do not represent a homogenous sample group. We also cannot say for certain that the interviewee was the same person who decided to buy this kind of apartment, i.e. with specific technical characteristics aimed at saving energy. Because the in-

interviewee did not always coincide with the decision-maker, we cannot contend that those with higher levels of education and are more sensitive to environmental issues are also the ones who choose a house or an apartment with low energy consumption. However, we can analyse some of the responses by distinguishing them according to level of education to see if any characteristic elements emerge. One especially suitable question in this sense was the **level of importance** that interviewees assign to **energy savings** when carrying out their daily activities.

#### Energy savings are important



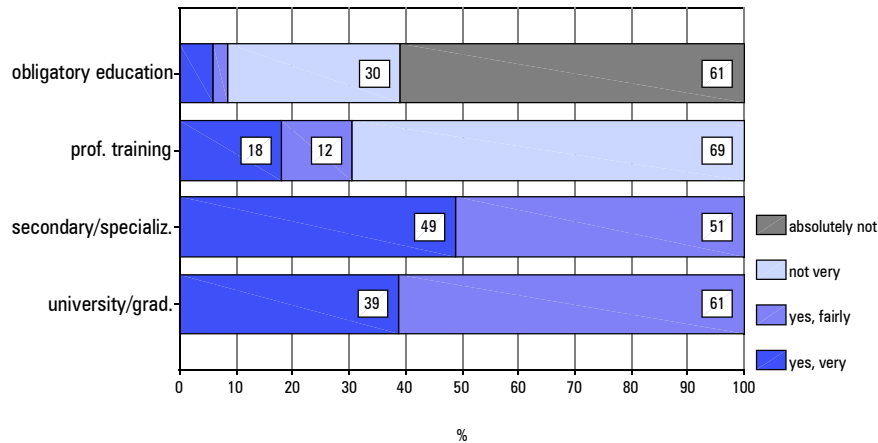
We can see immediately that more than half the interviewees chose the highest answer on the scale, thus assigning energy savings a very important place in their lives. More than a third of the remaining interviewees still considered it *somewhat important*. We could therefore say that for most of the interviewees consuming less energy takes on the role of "morally guiding" their daily habits. In fact, this percentage even exceeds that representing the total number of respondents who have completed secondary school and university, i.e. 79%.

In this case, our survey reveals a relationship between respondents' level of education and the value they assign to energy savings in their own lives. However, while this value does increase in proportion to one's education, it does not reach its highest point where the level of education is at its highest.



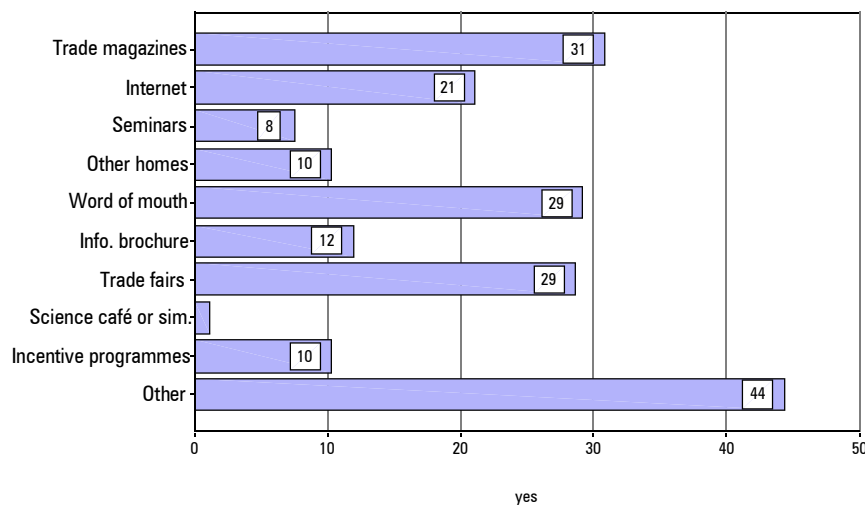
### Importance of energy savings

by level of education



There are several different **channels of information** through which one can learn about energy efficiency in the construction industry.

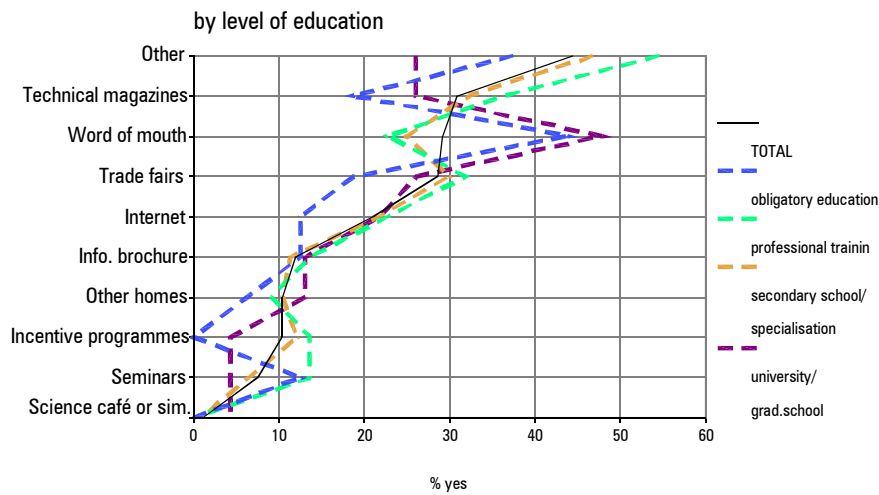
### Sources of information



The highest percentage is the *Other* category, which reflects the active role played by building cooperatives, first in spreading information and then in being involved in the choice, as we will see later. Trade magazines come in second place, followed closely by trade fairs and word of mouth.

However, the chart below shows how the means of communication one uses changes according to his or her level of education.

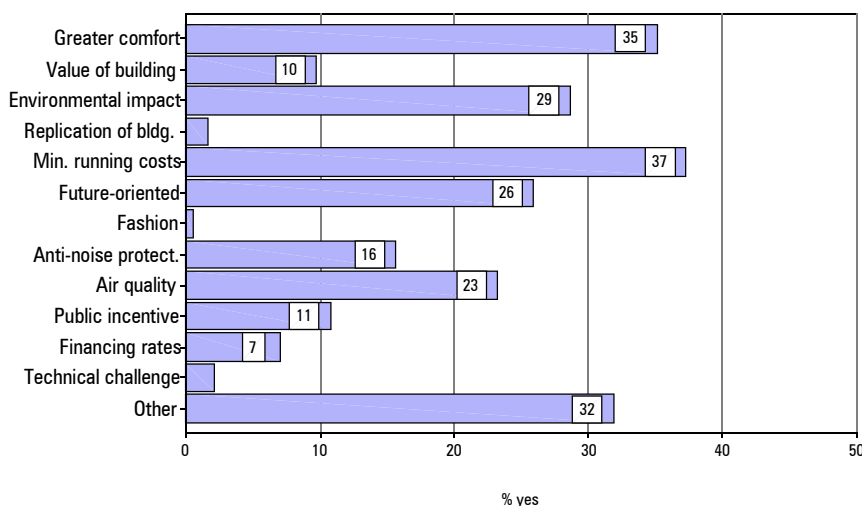
### Channels of information used



Proceeding from the most popular channel to the least, we find that those with technical-professional training are the first to be reached by information spread by cooperatives and *trade magazines*. They also attend technologically themed events like *trade fairs* in higher numbers. *Word of mouth*, on the other hand, reaches the two extremes of the education scale, i.e. those who completed compulsory education and university, respectively, both of whom exchange personal experiences as a way of spreading information. Finally, the economic channel, for example *public incentive* programmes, does not appear to reach those with the lowest levels of education, while it reaches those with technical-professional training the most.

Moving on from channels of information, we will now examine the **reasons** people choose to live in an energy-efficient building.

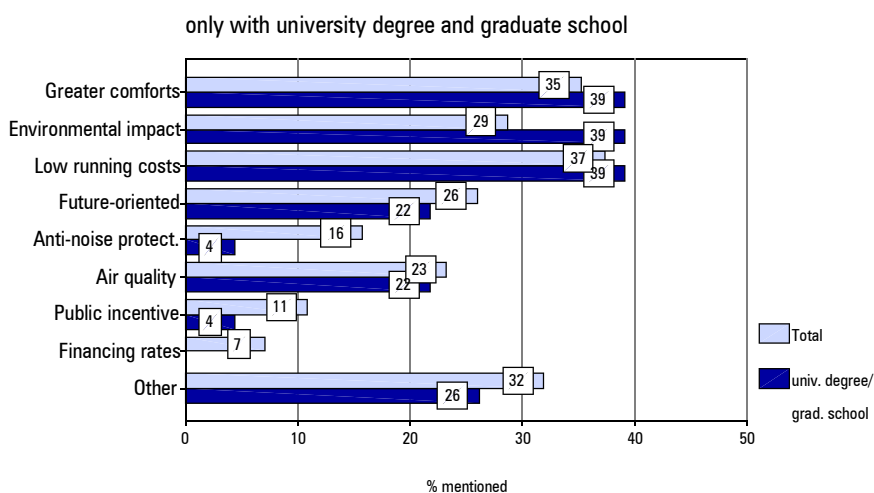
Reasons for choice: energy savings



Here we are dealing mainly with reasons that could be defined as "practical", in other words, reflecting on how to run things carefully in terms of *costs* but also desiring the greater *comforts* a home should provide. The building cooperative is another driving force behind the decision-making process, while trend following or *fashion* plays almost no role at all.

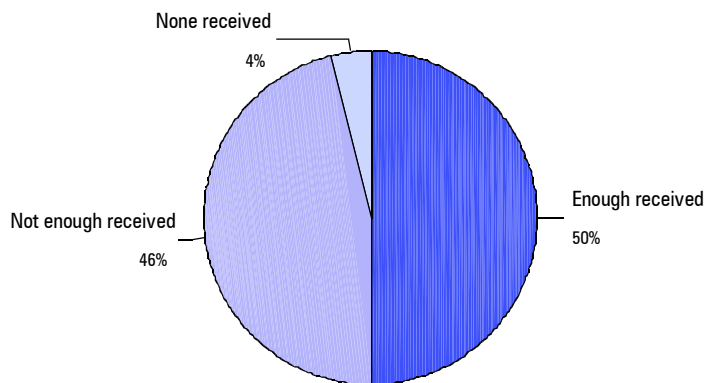
The graph below only compares the answers of university graduates to the total. Here the main reasons are equally distributed between environmental responsibility, economic factors and the desire for modern comforts.

Reasons for choice: energy-efficient building



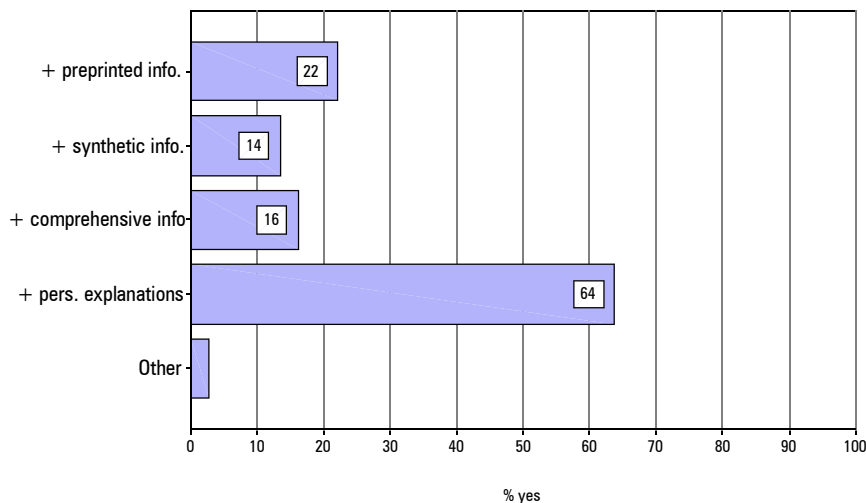
Motivation does not however make up for the lack of **information** needed to handle the difficulties involved in implementing technical solutions. As we can see from the chart below, nearly half the interviewees reported that the information they received about using the technology was *insufficient*, and for a narrow 4% it was missing entirely.

Amount of information received



The data on Trent and Switzerland do not reveal any differences and are in line with that on Bolzano.

More information desired



*Although the first theory cannot be statistically confirmed for the reasons stated above, our observation of values such as the importance of saving energy, of inclinations and of attitudes, as well as the rea-*

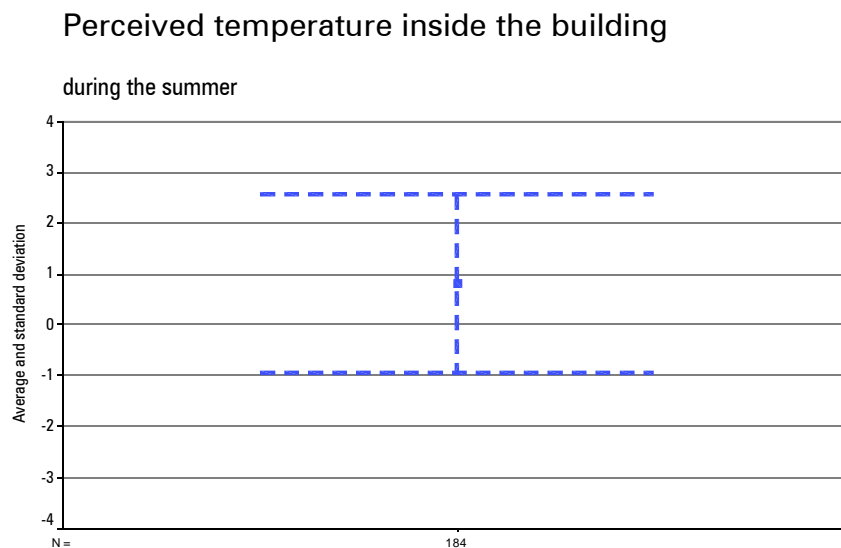
*sons for their choice confirm that the interviewees are fairly concerned about the environment. Furthermore, the source of their reasons is twofold. While many respondents are certainly strongly motivated and actively search for information on several fronts, many others come from building cooperatives in which there is much less free choice and decision-making processes are different. However, motivation does not make up for a lack of information. Even the most motivated customers need information, preferably in the form of a personal explanation.*

**Theory 2: Residents of energy-efficient buildings appreciate the comforts provided by such buildings.**

*Comforts refer to temperature, humidity, amount of space and the power to regulate the ventilation system. Do inhabitants perceive and appreciate these factors as an improvement from living in conventional buildings? What do the inhabitants perceive as "comforts"? And what do comforts require of users? (technical knowledge, usability, behaviour)?*

In our analysis of the part of the questionnaire that evaluates the kinds of comforts offered by this kind of building, we discovered that in terms of **temperature** and humidity, there do not seem to be any problems.

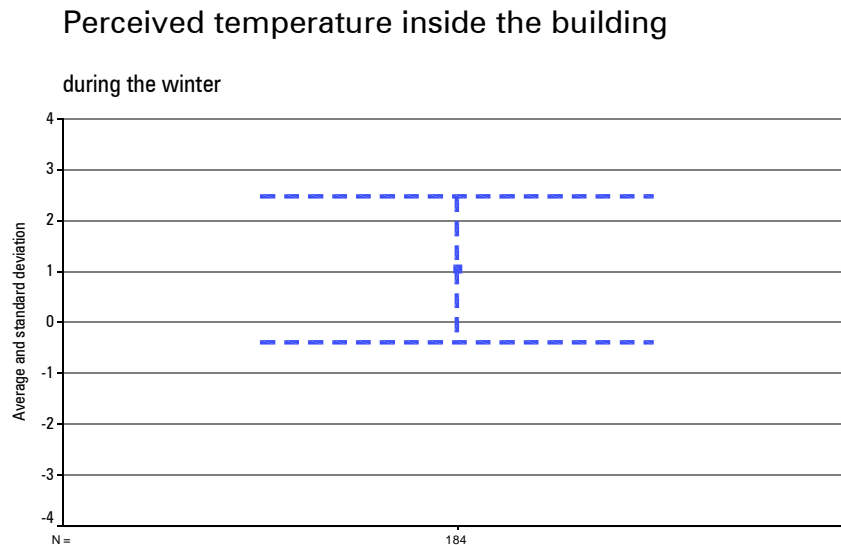
The graphs below show the average response on the proposed scale and the interval in which the various measurements are distributed, i.e. the positive or negative distance between each value and the average.



On a scale in which +4 is *very warm* and -4 is *very cold*, the average assessment of the building's temperature during the summer is slightly less than 1 and therefore *mildly warm*, whereas in winter it is slightly higher. Most striking however is the extent of the deviation from the average that in some cases reaches a temperature between *fairly warm* and *warm* in the winter as well. Twelve per cent report a perceived temperature during the summer that is *too warm*, just like

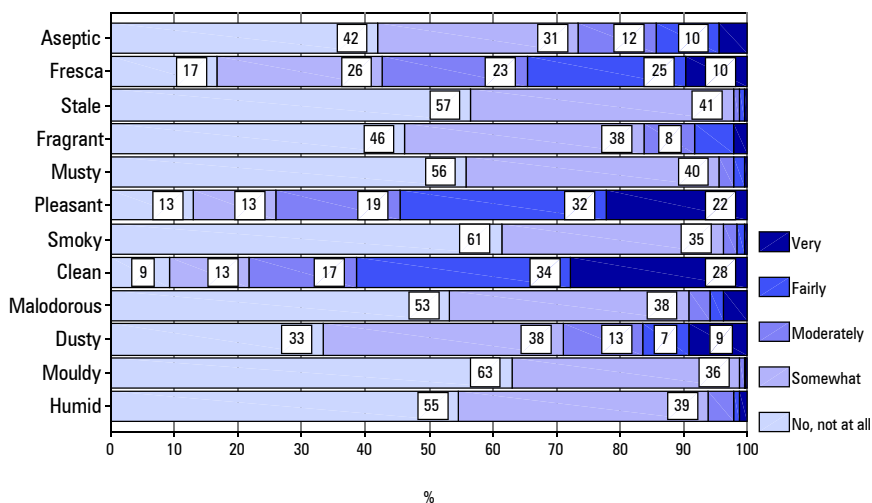
those in other city dwellings! The temperature is also *fairly warm* during the winter for 15% of the interviewees and *warm* for nearly a fifth, while 4% of the interviewees reported the perceived temperature during the winter as *very warm*.

As for the perceived level of **humidity**, the tendency is even more pronounced, i.e. more than 20% of the interviewees find the air *dry* and 13% find it *very dry*, especially during the winter.



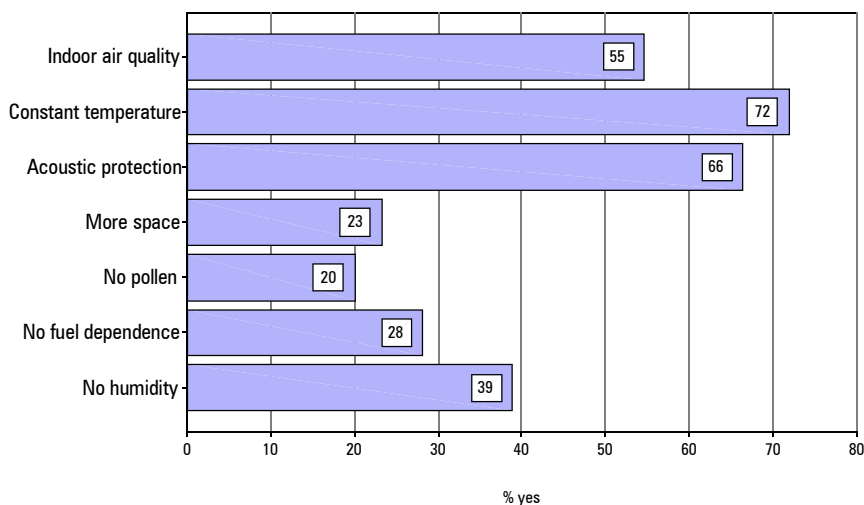
On average, opinions about **air quality** were positive. More than half the respondents did not find the air to be stale, *musty*, *smoky* or *malodorous*. Instead, 62% reported the air to be *fairly* and *very clean*. Nearly 30% of respondents found the air to be *dusty*, though this was perceived differently. As we will see below, this was affected by the controlled-ventilation system and necessary maintenance, such as air-filter cleaning for example.

### Perceived air quality in the apartment



What are the **advantages** and **disadvantages** of living in an apartment designed to be energy efficient?

### Perceived advantages compared to a traditional building



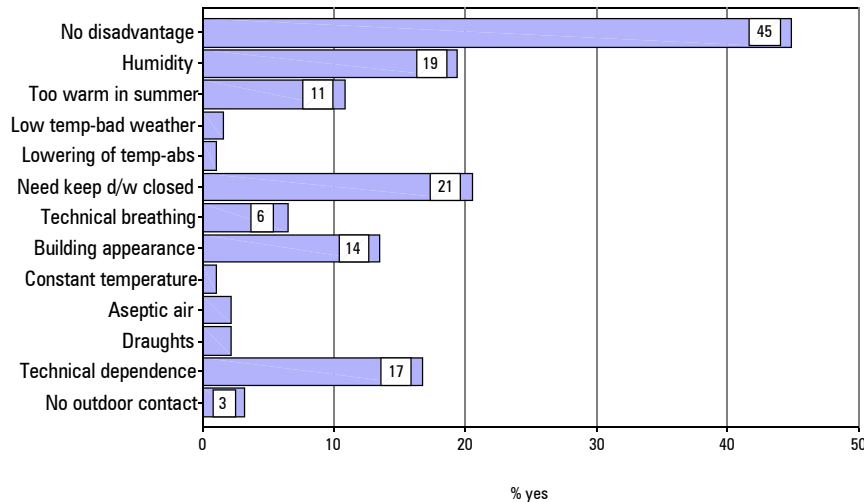
In answer to the question about the perceived advantages compared to a traditional building - for which multiple answers were expected - *constant temperature* is the most-appreciated advantage compared to a traditionally built home. Two thirds of respondents also chose *acoustic protection*, meaning in relation to the outside world since, as we can see in the responses to the question regarding noise, 39% identify an *adjacent apartment* as the source of perceptible noise in the home and a third attribute this to the *properly functioning ventilation system* (see the statistical compendium, pg.102).

A look at the perceived advantages compared to a traditional building reveals a positive situation overall. Almost half the interviewees do not



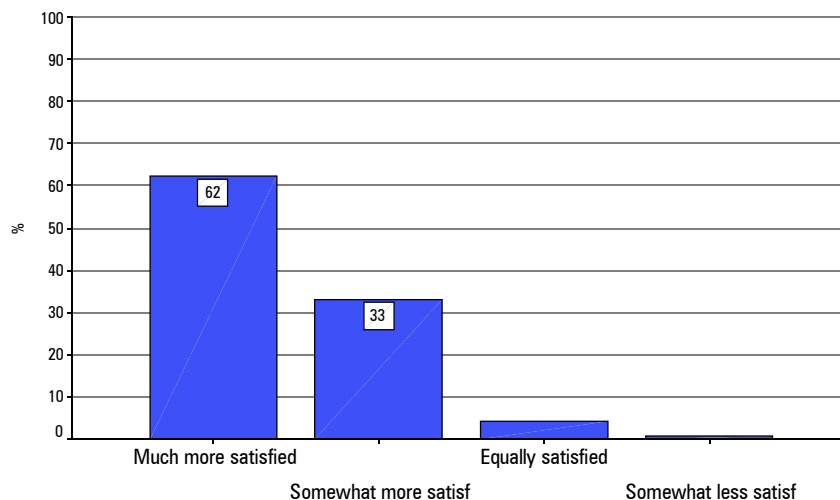
experience any disadvantages. Barely a fifth refer to the *obligation of keeping doors and windows closed* that comes with having a mechanical ventilation system, and to this regard, 17% of interviewees consider their *dependence on technical solutions* to be a disadvantage.

Perceived disadvantages compared to a traditional building



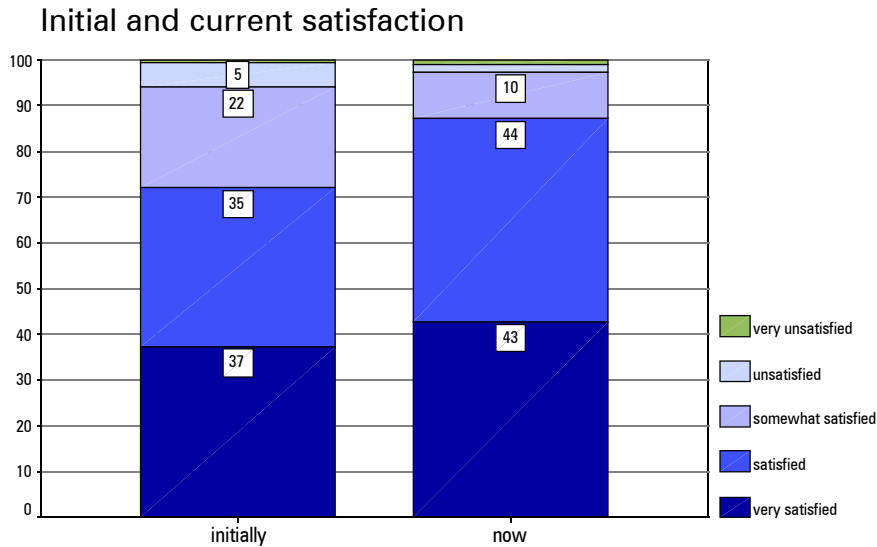
Despite the aforementioned disadvantages of living in an energy-efficient building, when it comes to the **satisfaction** of respondents compared to their previous homes, the results reveal a true success. Sixty-two per cent of interviewees are *much more satisfied* and 33% are *somewhat more satisfied* compared to their previous living situation.

Housing satisfaction compared to previous dwelling



In fact, the satisfaction of respondents tended to increase not only in comparison to their previous living situation but also over time, that is, from when they first moved in until now. The graph shows how in

every case satisfaction increased over time and therefore through experience.



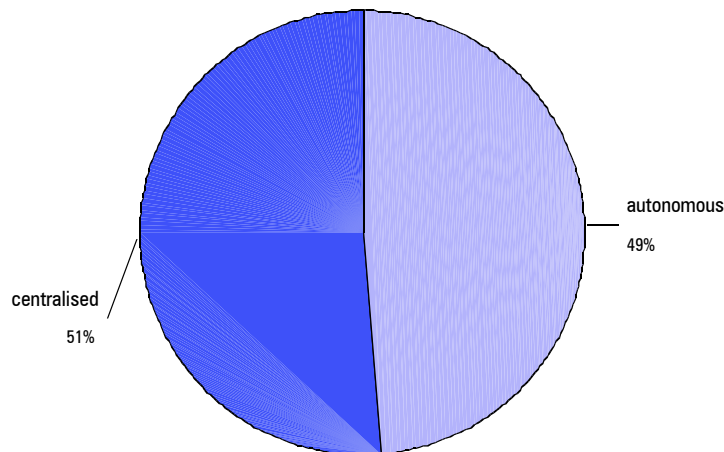
*If comforts are understood as the levels of temperature and humidity and the ability to regulate the ventilation and keep levels constant, we can see that even homes with low energy consumption present problems in this sense. We must not undervalue the percentage of those who complain that the air is dry or even too dry during the winter, even if the constant temperature appears most frequently among the perceived advantages overall compared to a traditional home. Nor do opinions about air quality imply complete success. Indeed, more than a quarter of interviewees said the air was dusty. The advantages of the comforts are still higher than in a traditional home, and this is clear from the fact that satisfaction grew in every case, in comparison both to the homes of friends and to when they first moved in. However, people with an autonomous ventilation system are more satisfied than those with a centralised system.*

**Theory 3: Residents of energy-efficient buildings are satisfied with the technology.**

*When inhabitants are satisfied with the building and they have no problems with the technology, they recommend the same buildings standards to others. The survey results should show if and where problems arise and to what degree the inhabitants are influenced by their own behaviours and attitudes.*

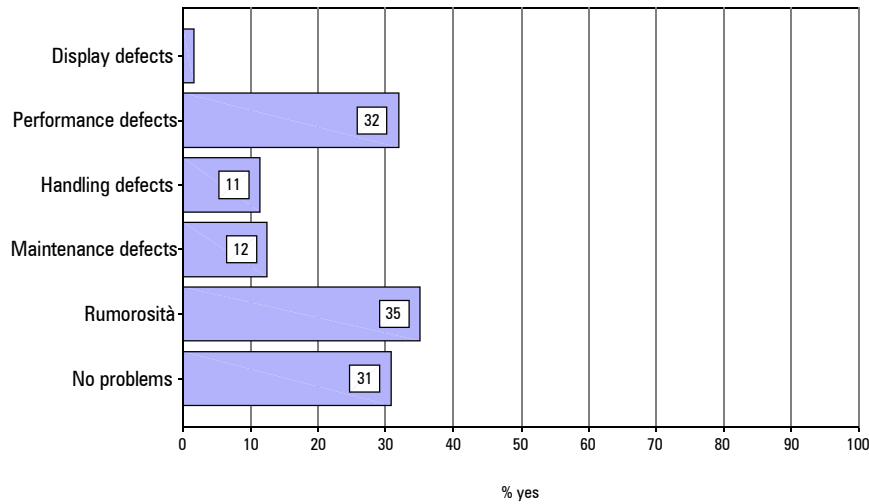
The technology in the apartments of the energy-efficient buildings in the Casanova housing district is mainly represented by autonomous and centralised **controlled ventilation** systems.

Type of controlled ventilation



The **technical problems** that have arisen are mainly due to the noise of the system and defects in performance that have not been clearly identified. The noise caused by the ventilation system is a problem that comes up again, as we will see.

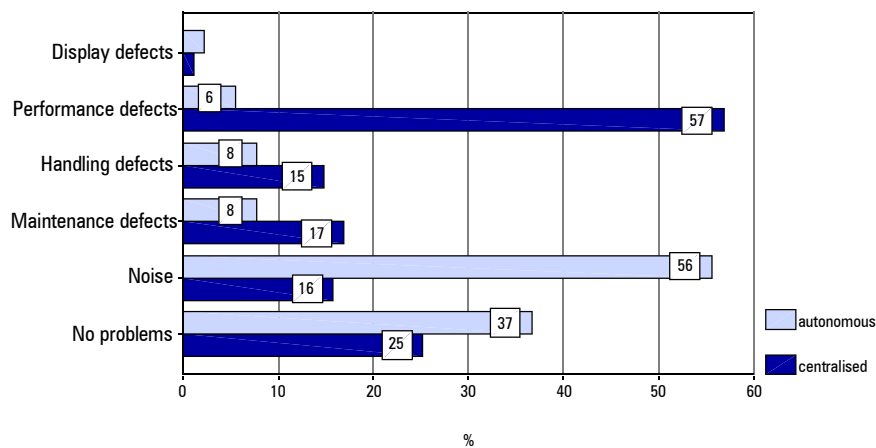
### Technical problems encountered



By splitting up the answers according to the type of ventilation, we can see that those who complain the most about noise are those with an autonomous ventilation system.

### Technical problems with the ventilation system

by type of ventilation

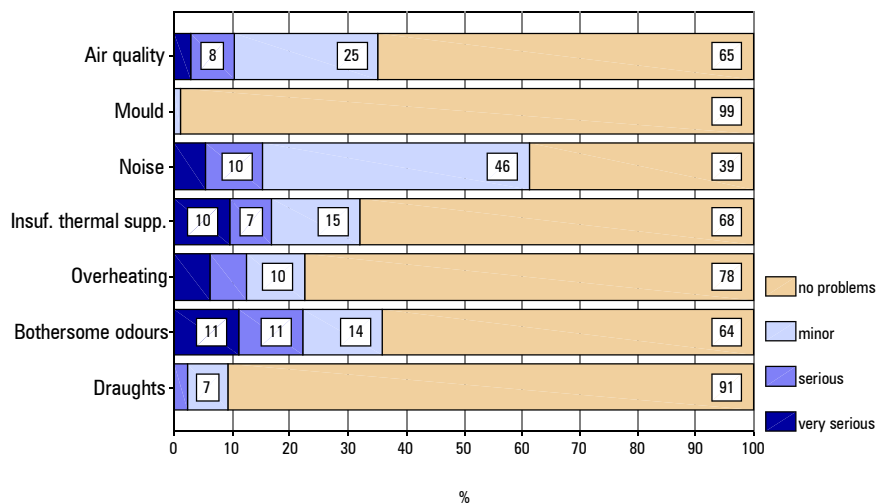


A big difference between the two systems is also revealed by the percentage of respondents who reported *performance defects*, which seem mainly attributed to the centralised ventilation systems. Overall, inhabitants in apartments with an autonomous ventilation system seem to be more satisfied than their neighbours with centralised ventilation, which is also expressed by the fact that 12% more of the former report having *no problems* with the system.

Another battery of questions posed the issue in a different way: what **other problems** has the ventilation system caused, even in other contexts, and how serious were they?

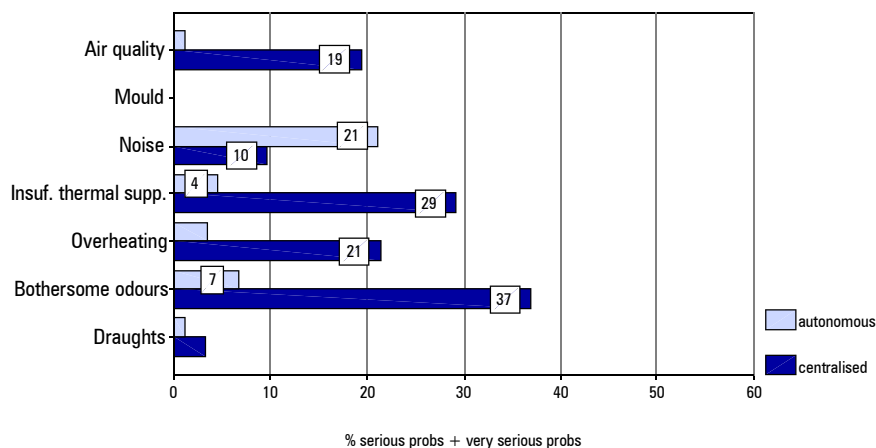
The noise of the system remains a weak point, though to varying degrees for different people. More than a fifth complained of having *serious* to *very serious* problems caused by the system's release of *bothersome odours*.

Problems caused by the ventilation system



Problems caused by the ventilation system

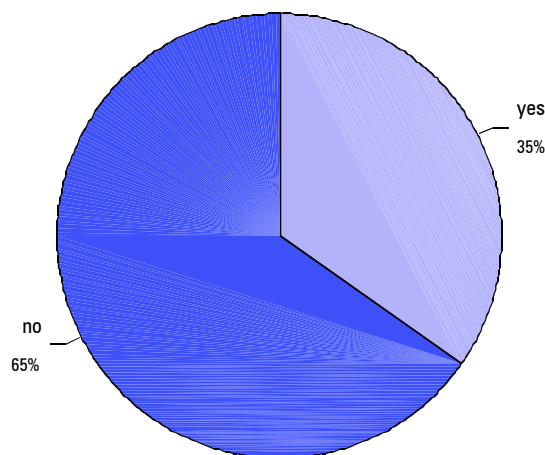
by type of ventilation



The difference between the responses of both groups, subdivided according to the kind of system installed in their home, once again highlights the fact that the centralised system has more technical problems than the autonomous one. This is the case both in terms of the technology of the system itself - *defects in performance, handling and maintenance*, as we have seen - and secondary issues like *bothersome odours* or *insufficient thermal supply*, for example.

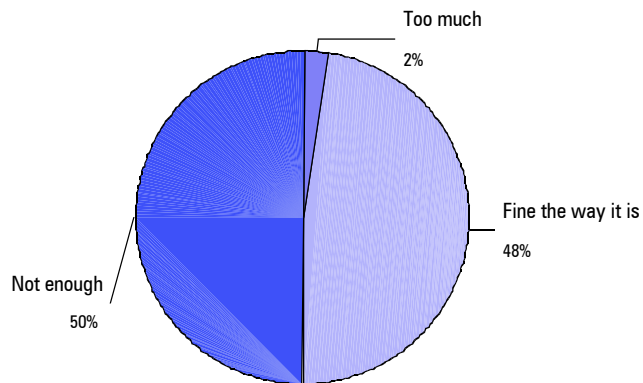
**Annotations outside the questionnaire** provide more details about some of the problems with the ventilation system. For example, malfunctions occur in some buildings more than others, such as the central system jamming when several tenants shut it down, therefore causing the engines to break down, or when the air recirculation system releases bad odours, especially during specific times, "because of their proximity to the vents", as one interviewee explained. In fact, the ventilation ducts seem to have some design defects. Doubts have therefore been expressed with regards to their actual convenience. Their advertised convenience, which is not entirely clear or fulfilled, has left some respondents unconvinced, even after two years of living in this kind of building. Some respondents also worry about the quality of the air they are breathing, in reference to the cleaning of the filters, since **maintenance** has yet to be performed in some of the buildings.

Is maintenance performed regularly?



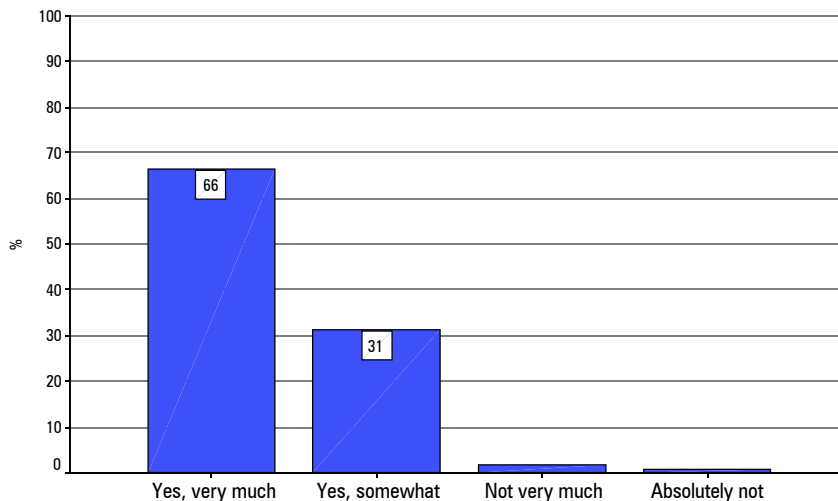
The sample group was divided when it came to expressing opinions about being able to regulate the ventilation system. Unsurprisingly, more than two thirds of those who think there is *little possibility of regulation* are also those with a centralised system. The impossibility of regulating the temperature in a differentiated way in different rooms, which is typical of the centralised system, is a problem precisely because of the jumps in temperature to which the building is subjected but also occur within the apartment itself between the different rooms. This is what we observed from reading the interviewees' notes.

In your opinion, the power to regulate the ventilation is...

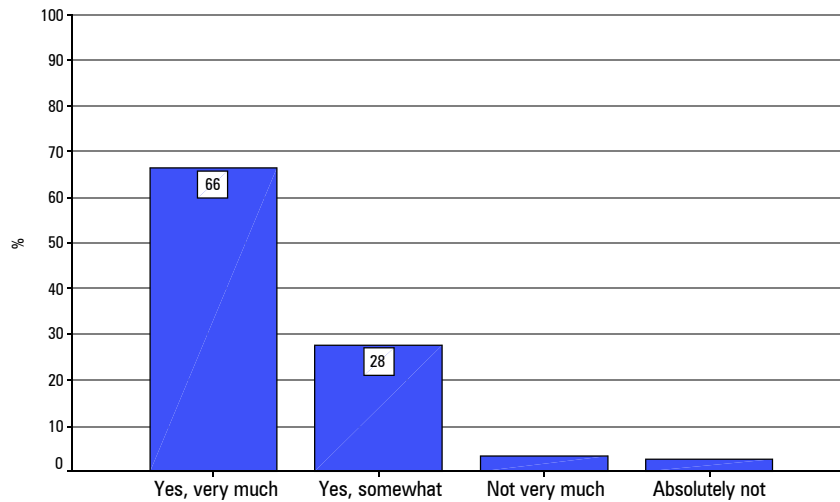


Regardless of what causes the problems that we have analysed above in terms of their extent and which type of system they relate to, none of it seems to jeopardise respondents' **satisfaction** with their choice in any way. This is equally true for the high percentage of interviewees who say they would recommend living in an energy-efficient building to others and would even make the same choice again if given the chance.

Would you recommend an energy-efficient building?

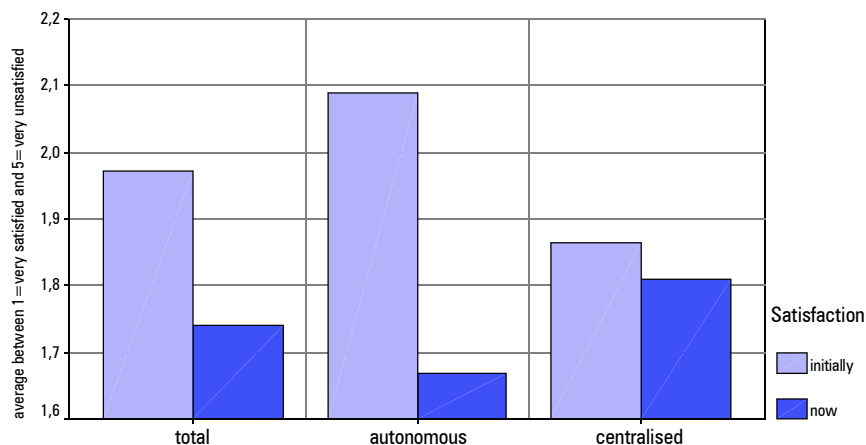


### Would you choose an energy-efficient building again?



### Initial and current satisfaction

in total and by type of ventilation



*The technology in the apartments of the energy-efficient buildings in the Casanova housing district is mainly represented by autonomous and centralised controlled ventilation systems. By splitting up the answers according to the type of ventilation, we can see a clear difference in regards to problems. The centralised system causes more problems, both in terms of the technology of the system itself - defects in performance, handling and maintenance - and secondary issues like bothersome odours or insufficient thermal supply, for example. Another frequent problem is that of noise, which is instead mainly reported by those with an autonomous ventilation system. The problems we have analysed, in terms of their extent and which type of system they relate to, do not seem to jeopardise respondents' satisfaction*



*with their choice in any way. This is equally true for the high percentage of interviewees who say they would recommend living in an energy-efficient building to others and would even make the same choice again if given the chance.*

**Theory 4: Residents of energy-efficient buildings are healthier.**

*The following argument is often used to sell energy-efficient buildings: controlled ventilation produces better air quality for allergy-sufferers, for working and for sleeping, and after a prolonged absence. The inhabitants of these buildings should therefore be healthier than they were before, i.e. when they lived in conventional buildings.*

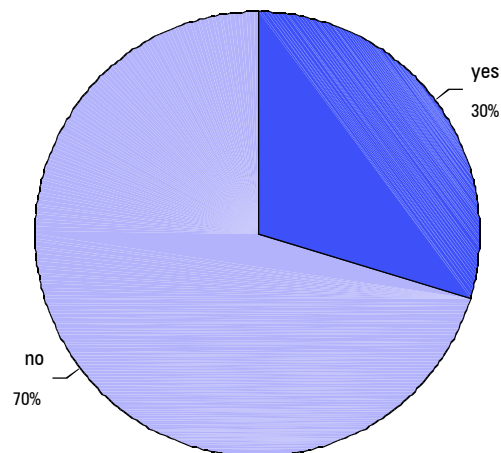
*If this theory cannot be confirmed, it means that the controlled ventilation of the living environment has no effect on one's health.*

*The interview should also show whether controlled ventilation and airtight buildings can cause "sick building syndrome".*

This theory cannot be verified in a causal way with the available data. In this sense, we lack both the proper screening for factors that might influence one's health and a comparison group, as mentioned above. Moreover, the kind of ailment that would manifest itself during the relatively brief period of residence of the interviewees in one of the buildings is debatable.

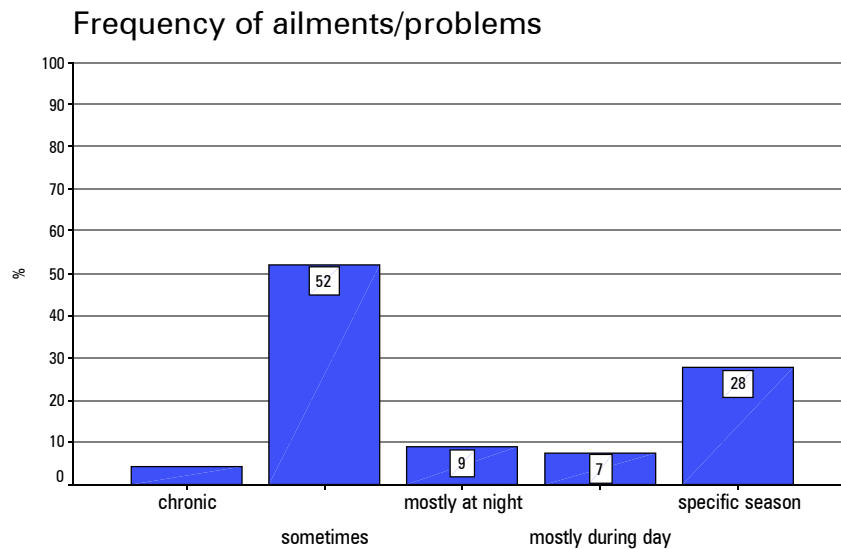
The share of people who claim to suffer from **allergies** is high.

Allergy sufferer



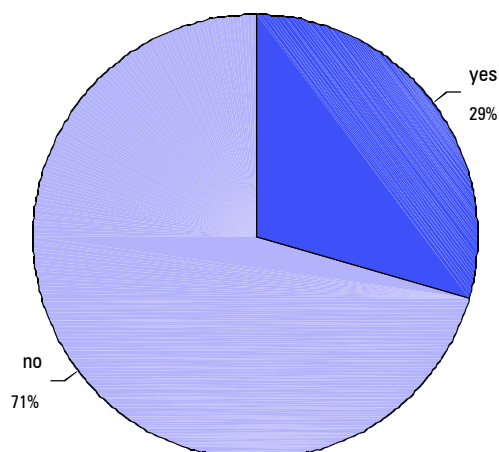
According to the Istituto Superiore di Sanità (National Health Service) in Italy, some 10 million people are afflicted with allergies, i.e. a sixth, or slightly more than 16%, of the total population. If we use these numbers for a comparison, it appears that the theory according to which inhabitants of energy-efficient buildings are spared from allergies is invalid. In fact, it seems the opposite is true. Thirty per cent of

the sample group claims to suffer from allergies - over half to pollen, followed by dust, mites and pet hair. Having said this, the relationship between the number of allergy sufferers in Italy and the number residing in Casanova remains more speculative than statistically confirmed. More than half the allergy sufferers in Casanova experience their allergies *sometimes* and often during a *specific season*.



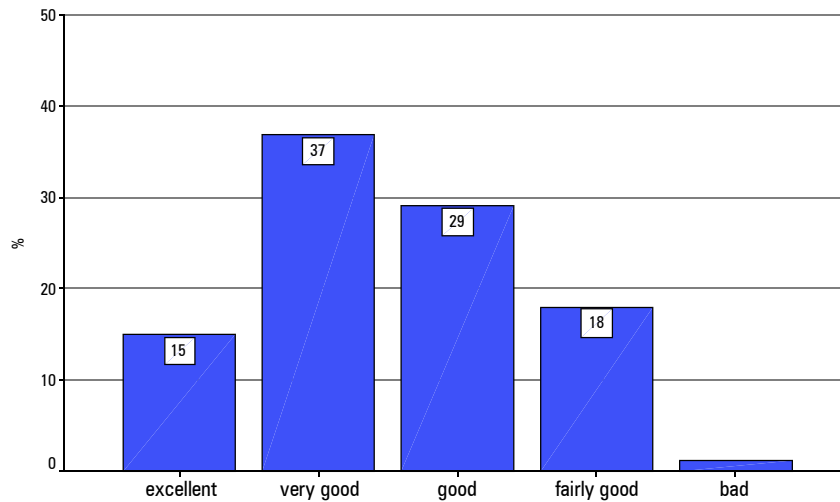
The *improvement outside the home* reported by nearly a third of allergy sufferers was explained, thanks to those who chose to annotate this alongside their answer, by the fact that this happens when "outside the home" means, for example, while residing near the sea.

#### Improvement outside the home



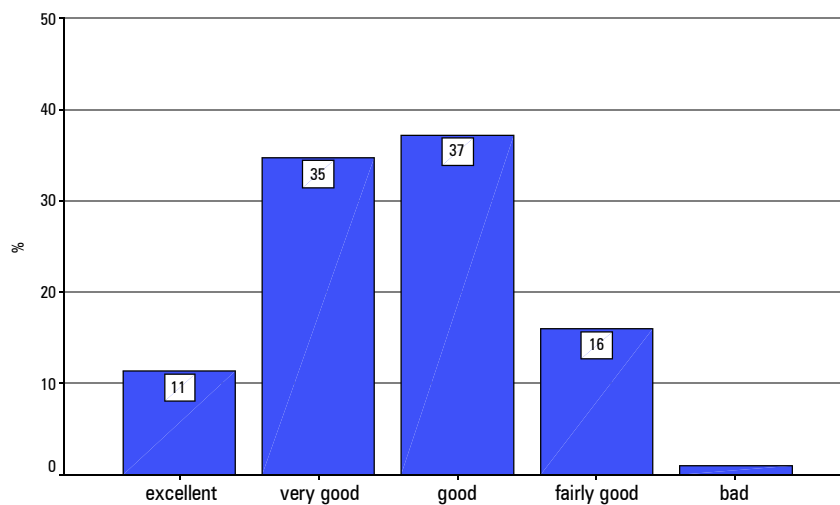
Now we will analyse the current perceived health of interviewees in comparison to what they can recall of their health when they lived in conventionally built homes.

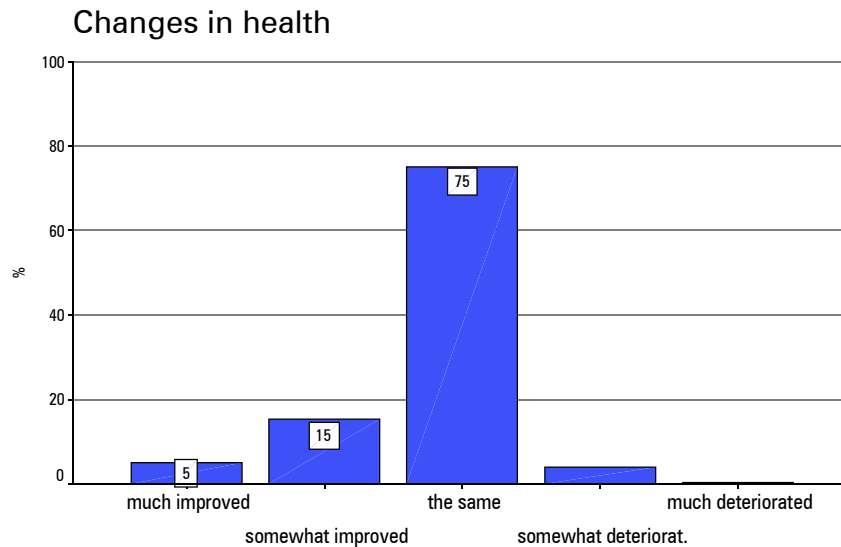
### Self-evaluation of current health



In terms of respondents' self-evaluation of their health, we can say that the population of Casanova is ranked at a high level. In fact, those in *excellent* or *very good* health even saw their health improve after they moved.

### Health before moving





Of 100 people, 20 recorded their health as *somewhat or much improved*. Seventy-five of the remaining 80 reported no perceptible changes in their health and were therefore *the same*. We cannot know for certain what caused the health of the last five per cent to deteriorate. However, we can hypothesise that personal reasons may have influenced their deterioration. In fact, the only annotation made by an interviewee when compiling the personal questionnaire on health was made to this very regard: "*I was widowed a few months after I moved into this apartment... and if there is anything wrong, it has nothing to do with my home but rather my own personal misfortune*".

### Epilogue: The environment and the quality of the dwelling

We would be remiss if we did not mention another dimension of the quality of the dwelling, one that is essential for new housing districts yet often disregarded, i.e. the social dimension. In fact, the new district of Casanova-Kaiserau still lacks a fabric of connection, sociability, encounters and exchanges.

The district is located south of Bolzano, at the end of the long and heavily trafficked Via Resia going towards the interior, bordered to north by the existing district of Ortles-Similaum and to the south by the railway. It consists of eight blocks of some four buildings each in which 941 housing units were planned for some 3,500 people and a yard with various functions (residential, commercial, third-party and public) located in the centre of the district. Some subdivisions are still unfinished and construction work is still underway, with completion intended for 2012. Almost nine out of ten people have lived here for

more than a year and less than four years. There are still no services for individuals and families, youth centres or self-managed areas for music and other artistic activities. Inhabitants also complain about a lack of parking spaces.

The district will have to wait until late 2014 before it has any nursery schools or day-care centres, and 2015 for nursing homes. As for transport routes, there are only bicycle/pedestrian paths for now, but the project has provided for the presence of the railway, thus representing an important chance to activate the "metropolitan railway" project with a new station positioned in close proximity. The possibility of having a railway station in the CasaNova-Kaiserau district is one of the Municipality of Bolzano's main objectives in relation to mobility.

However, the "Casanova-Kaiserau Workshop" - a work team comprising representatives from each subdivision and involving the other residents - has been established in Casanova. Rather than protest, they have chosen to make proposals by demanding that the Municipality focus on services and solutions that have yet to be provided, e.g. surface parking, among other things. They are concerned about the dangers common to any new housing district, i.e. of its being built and filled without being provided with vital services and spaces needed to build a social network, which would not only increase cohesion but also encourage inhabitants to help create their own living space. This could also prompt them to contribute to the eco-sustainability at the heart of this project, one whose objectives were to meet housing needs in the social construction industry; to inject quality, efficiency and timeliness into town-planning procedures; to guarantee the utmost environmental services; and to test a preeminent settlement model within a suburban context.

## **Bibliography**

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