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How to calculate the construction budget of a passive house

Building a highly energy-efficient home is not settled with a single figure but by understanding every item in the budget. We review the mandatory costs, the ones that may arise and the variation range of each.

Anyone considering building a sustainable home, whether in timber or other materials, tends to arrive at the same question: what is the real price to budget for. The answer is not a fixed figure but an understanding of all the pieces that make up the budget, both the mandatory ones and those that can appear when least expected.

At PAPIK Group we have been building sustainable and passive houses for more than fifteen years, and we know the costs involved in bringing a project of this kind to life. The aim of this article is not to settle on a total amount but to organise the items and pin down which ones carry a high variability and how far they can swing. The price of building a house depends on a multitude of factors that, if unknown, can overwhelm the financial forecast. A house is not a standard product: it is a unique process, and its planning must reflect that singularity.

A preliminary note: the land, the great variable

Before discussing the construction budget, we must talk about the ground that will support the house. Buying the land is the first significant outlay, and its price varies enormously depending on location, area and, above all, its conditions. A seemingly cheap plot can hide a considerable added cost: that of preparing it.

Without going into figures, two variables are worth keeping in mind because they affect the final result. The first is orientation. A good orientation lets the house heat passively in winter, taking advantage of solar gain during the cold months, which is achieved with a south-facing orientation free of obstacles that would block the sun when it sits lower. This variable does not directly affect the construction budget, but it does affect the efficiency of the result and therefore the future cost of climate control.

The second is the slope, which does have a notable impact on the calculation. A steep slope complicates the site-preparation phase and forces extra work, each with its own cost: connections to the water, electricity and sewage networks, road access or earth retention. Earthworks and retaining structures can mean a large increase in the construction cost.

The types of expense

Before pinning down amounts, it is worth setting out the general picture. On one side are the known expenses, present in every project; on the other, a series of expenses that may or may not appear depending on the case, but which it is prudent to consider.

Mandatory expenses:

- The architectural project
- Building permit and taxes
- Site development of the plot
- Building the house itself

Other possible expenses:

- Project manager
- Mortgage-related costs
- Other singular expenses

The architectural project: medium variability

Building a house always requires an architectural project. It is both an administrative and a technical requirement: administratively it allows the building permit to be obtained, and technically it defines how the house must be built. This group of expenses includes the architecture practice's fees, the quantity surveyor's fees, site management, the topographic and geotechnical survey, and the professional-body approvals and other administrative costs.

Architecture practice fees

The architecture practice's fees usually range between 10% and 15% of the project cost, which can amount to between 180 and 270 €/m². For a house of about 150 m², the range sits between 27,000 and 40,000 euros.

The architect's work goes far beyond drawing and designing the house: many technical and administrative aspects must be defined, involving structural engineers, energy calculations and other professionals, in work that is often invisible to the developer but necessary for the project's viability. As an independent professional, the architect sets fees according to the value provided. Some practices offer very price-adjusted services and others add value, and knowing how to detect what each one brings is essential to align them with the project's interests. Aspects worth assessing include:

- **Full coordination.** The practice does not merely execute instructions: it studies the site, analyses the user's real needs and proposes an integral vision that optimises budget, time and quality of life. It can take on the role of coordinating all the agents (engineers, builders, specialists) to ensure the project is delivered faithfully, with quality and on schedule.

- **Innovation and design.** Unique, tailored solutions that respond to the place and the people who will live there, moving away from standard templates.
- **Specialisation.** Deep knowledge in areas such as high energy efficiency (Passivhaus certification) or bio-construction is a key factor in guaranteeing results aligned with the project.
- **Handling permits and procedures.** The practice usually takes on the bureaucratic complexity with town halls and public bodies, freeing the client from that burden.

The architectural design has a direct impact on the construction cost: depending on which materials are planned and how they are sized, the cost of building a 150 m² house can vary a great deal. At PAPIK Group we work with an architect specialised in very high energy efficiency, able to design Eskimohaus houses while adjusting budget and timelines, and we have several suppliers who respond to the different priorities of each client. A good project and good coordination between the practice and the construction company are an investment that allows costs and timelines to be adjusted, and the budget to be calculated with precision rather than blindly.

Quantity surveyor fees

The quantity surveyor comes in when work begins and can range between 2% and 4% of the material execution budget (PEM), that is, between 36 and 72 €/m². For a house of about 150 m² this represents between 5,400 and 10,800 euros.

Again, this is a professional who sets fees according to the value of the service. The quantity surveyor holds the greatest responsibility for supervising that what is built corresponds to what the architects designed. This figure can prove key as a mediator between client, architects and builder in the event of disagreements: it may cover the basic administrative and technical obligations or take a more active role in deciding how the project's designs are carried out on site.

Topographic and geotechnical survey

Before designing, we need to know what ground the project will rise on. The topographic survey provides the exact information on the plot's slope, and the geotechnical test determines the composition of the soil. Both parameters are essential for drafting the architectural project. Together, the cost can add up to between 1,600 and 2,500 euros: around 600 to 1,000 euros for the topographic survey and around 1,000 to 1,500 for the geotechnical one. The figure depends on the complexity of the work, but these are the usual amounts when the land has no especially complex features.

Approvals and administrative costs

Finally, we must account for the cost of registering the project with the architects' professional body. It is not a large expense, perhaps around 500 euros, but it must be anticipated. This section could also include other administrative costs tied to project singularities, such as land divisions or re-parcelling, which only arise in the specific cases where the project requires them.

Building permit and taxes

Although they could form part of the previous point, the scale and singularity of the taxes justify treating them separately. The building permit corresponds to the tax on Constructions, Installations and Works (ICIO), a municipal tax that therefore differs in each municipality, and in Catalonia there are more than 900. It is regulated at state level through Royal Legislative Decree 2/2004, of 5 March, whose article 102.3 establishes that the tax rate is set by each town hall and may not exceed four per cent.

In most cases, then, this tax will be 4%. In some municipalities other fees or deposits may be added, which are returned on completion of the project if all goes well, but which must be taken into account. A 4% rate can mean roughly 72 €/m², or around 10,800 euros for a house of about 150 m².

As for VAT, the rate for a construction company is 10%, so a builder of sustainable houses charges all its invoices at that rate. Other professionals in the sector, such as architects, apply 21%. Together, the VAT on the construction of a house of about 150 m² can approach 20,000 euros. Once the work is finished, there will still be procedures for the first occupancy permit, the cadastre update and other formalities that also carry a cost, modest but present.

Site development of the plot and foundations

One of the items that can most increase the cost of the project is what we call the site development or preparation of the plot. It includes many possible works, some fixed and others variable depending on the land and the project.

The fixed ones are the foundations, the service connections and the perimeter enclosure. These elements are necessary in every project and, for a house of about 150 m², the whole approaches 50,000 euros.

In addition, there are expenses that only exist if the project and the land require them and that can make the cost vary greatly: retaining walls, structures, underground parking, a swimming pool or more than one storey. They are not always necessary, but when they are, their size and complexity make a realistic estimate difficult. It would not be reckless to anticipate that, because of these elements, the cost doubles and reaches 100,000 euros. Many of them are linked to the slope of the land: the steeper the slope, the more works are needed and the more complex they are, so the gradient can end up doubling the price of this section.

The core of the budget: materials and labour

This is the bulk of the budget, where the project takes shape and where decisions make the difference both in price and in outcome. Building a house may seem like raising four walls and a roof, and in a sense it is; the difference lies in the how, not the what. It is here that experience, dedication and awareness carry the most weight. At PAPIK Group we specialise in the construction of highly energy-efficient houses, sustainable and of great quality, which we have named Eskimohaus. It is a high-end product, and the price estimate we make here corresponds to a passive Eskimohaus house, certifiable under the Passivhaus standard.

The variables that affect the price can be grouped into five: design, materials, planning, quality and energy efficiency. Each one contains decisions you will make as self-developers according to your priorities. Many are related to one another, and choosing options that generate win-win synergies helps optimise the price. Having a team that advises you on aligning every decision with the common goal can be key to adjusting the cost and avoiding unnecessary expense.

The timber structure is a good example. Timber, as a sustainable and renewable material, offers a faster construction speed and excellent performance as a natural insulator, but it comes in different qualities and origins. Certified timber with CT2 treatment, such as the one we use at PAPIK Group, guarantees durability, pest resistance and sustainability, which is reflected in the price and also in the peace of mind and long-term performance.

The price of building a house results from adding materials and labour, in an approximate proportion of 60% labour to 40% materials. The sum can yield a range of between 1,300 and 1,500 €/m², and the variation depends on decisions on design, materials, efficiency, planning and quality.

In design, savings can be made by opting for standard market materials rather than custom-made structures; a structurally compact house that makes good use of its spaces achieves more usable square metres with the same material. At the same time, adding aesthetic exclusivity brings value to the result but involves more material and labour. In materials, choosing standard ones is cheaper than manufacturing custom pieces, and knowing how to select the right material (timber, concrete, brick, iron) according to the cost-benefit ratio, without oversizing, is essential. Good planning avoids cost overruns, secures the availability of materials so the work does not stop and, where possible, industrialises part of the structure to gain efficiency; anticipating unforeseen events before they appear is a saving that only experience makes possible.

Quality has a cost, but it is also an investment in the future: opting for solutions that exceed the required minimums and need no maintenance can slightly increase the budget and delivers a far better result. As for energy efficiency, the associated price should be understood not as a cost but as an investment. Investing in it means having a house free of an energy mortgage and a notable monthly saving. Building without efficiency may make the work cheaper, but it generates a far higher expense carried throughout the useful life of the house: saving on insulation or airtightness means choosing an option that, in the long term, proves very costly.

Other possible expenses

So far we have seen the expenses common to all projects. Depending on the singularities of each case, however, less usual and hard-to-predict expenses may appear. Among them are those associated with taking out a self-developer mortgage, hiring a project manager (a service sometimes already included in the builder's offer) or possible disputes with neighbours or the town hall to correct errors in the plot boundaries.

The final sum

To know the total construction cost, the different items must be added and modulated according to the priorities of each project. As a reference, it can be said that, at the very least, building a house will cost around 1,600 €/m², always bearing in mind that variables such as the foundations will need to be fine-tuned according to the land.

Knowing where these prices come from is the first step. Knowing the real cost of your house requires identifying the singularities of the project, your priorities and needs, and fitting them to your resources. With a few initial details we can begin to draw up a budget that we will modulate as the project takes shape.

> A reliable budget does not come from a fixed figure but from knowing every item and its margin of variation before construction begins.