Even for social housing?*

Increasing the housing quality of affordable social housing with the use of local bio-based materials.

Research plan

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* Title reference to the book: 'En dat al voor de arbeidende klasse' : 75 jaar volkshuisvesting Rotterdam from Len de Klerk

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Argumentation of choice of the studio	With architecture and the built environment you cannot only have design or only have engineering. There needs to be a combination of both. Lots of times, in my opinion, designers are only looking at the conceptual part or the part that is 'beautiful', but when something needs to be built in the real world it also needs to be technical right. What if we make sure that this step of controlling in between can be a lot more quicker by making architects the multidisciplinary designers like they were before? In every aspect of design and every day products I am interested in how something is build. Without knowing how something is build, how can you design something nice and useful? I like simple solutions for, maybe, big problems. Why over-engineer when something easy is the answer? This is what I want to discover and apply in the Architectural Engineering Studio: solving an important issue with logic, hopefully smart, but 'easy' solutions.

General problem statement

The Netherlands is facing a huge housing shortage.[1] In July 2023 the housing shortage had risen to 390.000 dwellings. With the goal of almost 1 million new houses in the Netherlands by 2030, the Netherlands is facing a major challenge.[2] With the nitrogen crisis, the price increase of building materials and the personnel shortage, these goals seem almost unachievable.[3+4]

The housing shortage, combined with regulations and laws causes high rents and almost no supply in the low-middle rental price, just above the social renting price. So the demand for affordable dwellings in the social and low-middle rent sector is very high.

Although this will go beyond the scope of this research, a little explanation of the current housing market and the history will help to understand the problem better. Currently social housing corporations are private non-profit organizations. The organizations make profit, but they are supposed to re-invest that in maintenance and new buildings. In the mid-80s, the cabinet under Ruud Lubbers and Enneus Heerma the (social) housing sector changed from a governmental regulated 'public housing' (volkshuisvesting) policy, originated from the Housing Act (Woningwet) in 1901, to a more liberated policy.[5] All this led to private owned social housing corporations, who have to compete in the market against other developers. This duality, on one hand act like a private organization in terms of efficiency, returns and happy 'customers' and on the other hand having the social task of taking care of affordable housing, does not go together very well.[6] On top of that, in 2013-2015 Stef Blok, former minister of housing and the civil service, introduced new laws concerning housing. One of them is the rental tax (verhuurdersheffing) where landlords with over 50 social housing(the housing corporations) units in possession pay this tax. This, in combination with other laws made housing corporation selling their rental stock and made it easier for foreign investment companies to buy real estate in the Netherlands. All this led to more scarcity of affordable housing in the Netherlands.[7] Luckily, this rental tax has been abolished in 2023 and the government has a new ministry of public housing after it was cancelled in 2010.[8] This shows how housing in the Netherlands went from investment driven housing to public housing in the early 1900's, to go from slums to affordable housing for the people. With the policy changes started in 1980's the responsibility for public housing drove from the government to more private organizations. It almost looks like we are going back in time.

The other problem is the climate change and the contribution of the building sector to the pollution. The building sector is contributing to a large extend to the CO2 consumption of the world, around 37%, where at least 9% is from construction activities and materials (Figure 1). A change is needed. Both in building and materialisation as in the building operations. This means building with circular, nature-friendly materials and aim at net-zero buildings or even better.

1 'Woningtekort stijgt fors naar 390.000, pas vanaf 2028 minder krapte'.
2 'Zaken, 'Plannen voor Wonen en bouwen - Prinsjesdag'.
3 'Bouwprojecten liggen stil door inflatie en materiaaltekorten'.
4 'Geen enkele sector heeft een groter personeelstekort dan bouw en infra'.
5 Poel, '"Heerma, Not Like This!"'
6 'De corporatie: van sociale huisvester tot vastgoedconcern | NUL20'.
7 Griffioen, 'Te koop'.
8 'Afschaffing verhuurderheffing (36.219)'.

A lot is already happening in making the building construction more sustainable. But this is mostly focussed on expensive housing projects and public buildings. Social housing and middle rent housing is lagging behind in building with sustainable materials, while these groups can really benefit from the decrease in energy consumption and better materials.

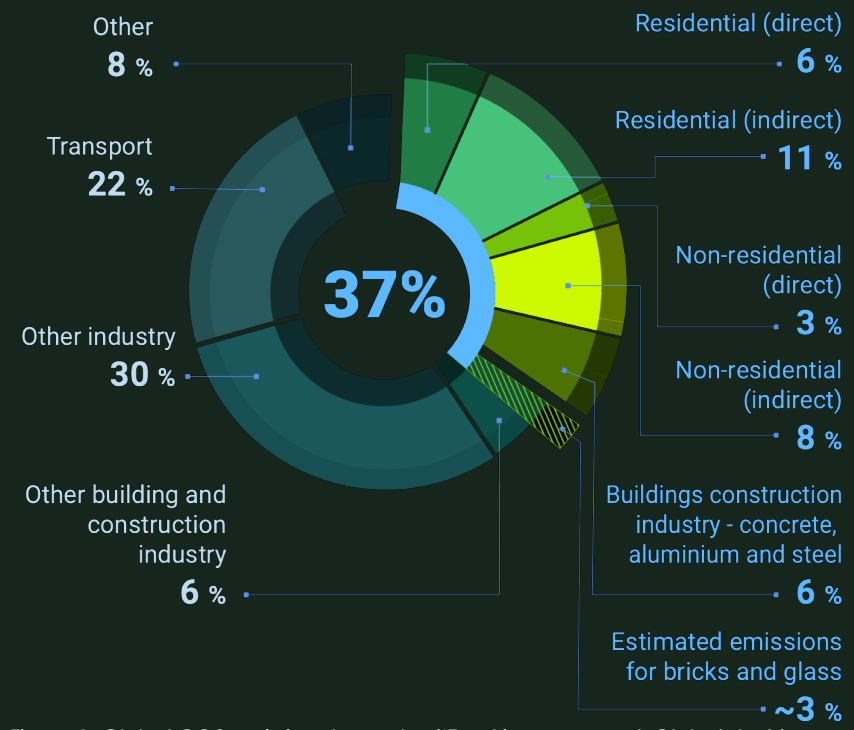


Figure 1: Global CO2 emissions by sector ('Tracking progress | Globalabc'.)

With these major issues now explained a conclusion can be made that big change is needed(Figure 2). One is finding a way to build more affordable homes in a short time period and the other is making a huge shift in the building sector from building traditional with traditional (polluting) materials to a circular sector where (local) bio-based materials will be used.

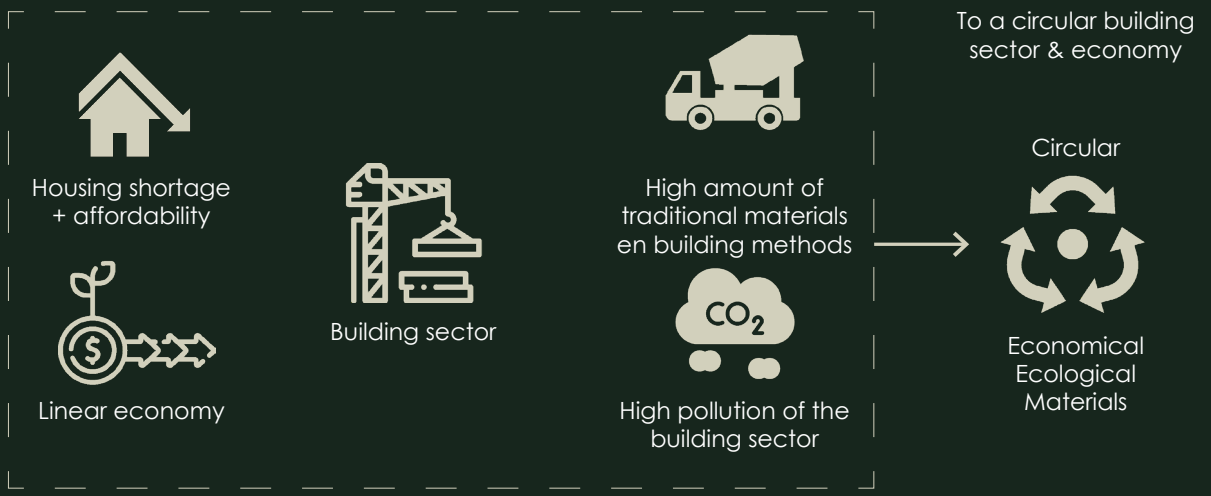


Figure 2: Conclusion scheme problem statement

Context

In the Buurtschap Crailo, situated in Het Gooi, the goal is to realize 570 new dwellings and an innovative industry area, with circularity and environment in mind. The goal is to build 30% social housing, 40% mid-rent and the rest high rent.[1] In an expensive area like Crailo, building social housing is quite a challenge, but interesting. Giving social housing an opportunity in a beautiful area with lots of forest and nature would be remarkable.

Figure 3: Crailo located in the Netherlands (GIS)

1 'BUURTSCHAP CRAILO - STEDENBOUWKUNDIGEN LANDSCHAPSPLAN'

Figure 4: Crailo located in the region (GIS)

Figure 5: Crailo located in the local region (GIS)

Overall design objective

To design social housing in an expensive and beautiful area like Crailo comes with lots of interesting factors. The social contrast between the richer people and the 'poorer' people, the affordability of the social housing in such an area, and the social 'problems' or challenges that might come with it.

Multiple important factors have to be considered:

Financial

The financial part can be split in two factors: The price of the land and the costs of building.
The price of the land to build on is always a big factor for housing. For social housing it is even more significant, because there is less to no profit for the developer. Especially when even municipalities cannot agree on a lower land price for social rent, while 30% of the building needs to be social housing nowadays, building affordable housing is a real challenge. For social functions, there is a social land price, but for social housing this is not always the case.[9]
The other factor is the building costs, with the material costs and other building costs. The majority of times, building with concrete is still cheaper than building with bio-based materials, although building with prefab bio-based can be equal or even cheaper.[10] Further developments in (prefab) bio-based materials and building elements and financial measures can contribute to more affordable bio-based products.

Social

Het Gooi, the area where Crailo is part of, is one of the most expensive areas in the Netherlands(Figure 6). This means that the average income is very high. Building social housing in such an area can be a challenge. How does the different groups interact with each other? And how to design in such a way that those groups can benefit from each other in Crailo?

Environmental

Due to the environmental impact of building and the forest area of Crailo, the goal is to build with local bio-based material. This needs to be done in such a way that the nature of the area is impacted as little as possible. How this aesthetically will look like will be researched. The building might blend into the landscape or there might be a big contrast between landscape and the building. Both might fit very well, but the environmental impact is key.

In the end, the goal is to design a building, multiple buildings or a system where the social housing is taken to the level of quality of high rent. The exact solution for this is, of course, not known yet. Preferably multiple groups (low-middle-high rent and 'houses for sale') will live together, take care of the building and communal spaces, like a garden and living room and kitchen. In this way such facilities, like a (big) kitchen and living room

9 'Geen akkoord met woningcorporaties over grondprijzen voor sociale huurwoningen'.
10 Golchin Far, 'Modular Habitat'.

to invite people, qualitative outside spaces and other facilities will be available also for people with less income.
The building will be build in a way that it positively contribute to the environment, CO2 emissions and energy delivery. Another goal is to make this building a showcase for using bio-based materials and community living for social housing. In that way, these principles can be used in other projects as well. When this goal can be achieved in an expensive area like Crailo, then these principles can also be applied to other areas where there are (expensive) challenges. The end goal will be an integrated building(s) where different social groups live together and care for the building and garden(s).

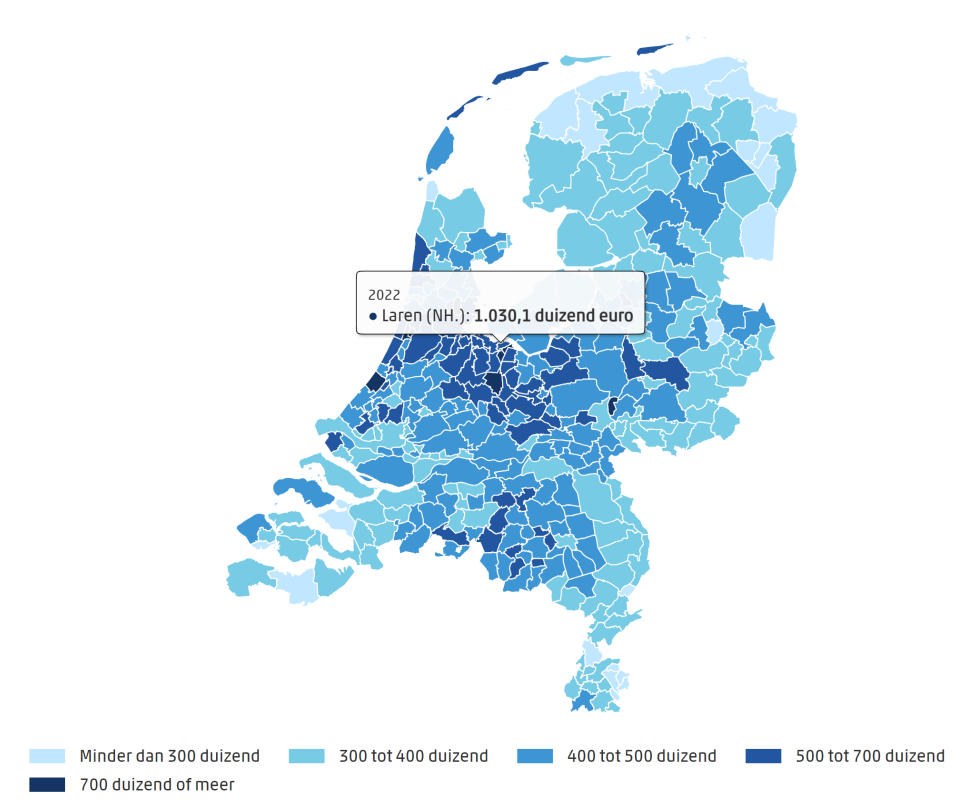


Figure 6: Housing prices per municipality (CPB, 2022)

Overall design question

To find an answer to these problems and to make an integrated design, the following design question is constructed:

How can high quality social housing be built and socially integrated in an expensive area like Crailo, yet, still be affordable, with the use of local bio-based materials?

Thematic research objective

Yearly, the construction and renovating of buildings in the Netherlands demands 22 million tonnes of materials, where 16,6 milion is concrete. Only 13% of these materials are from secondary and/or renewable sources.[11] While there are efforts to promote more sustainable alternatives, the social housing sector is lagging behind. The biggest housing corporations of the Netherlands, Ymere, Eigen Haard, Vestia, Mitros and Rochdale were not even considering building with wood(CLT) IN 2019.[12] They were not even aware of the possibilities and/or afraid of the risks in costs and maintenance, while even then the knowledge was already there for these 'problems'. In 2021 the Metropoolregio Amsterdam made agreements to build 20% of new building with wood. According to Bob van de Zande from the Metropoolregio the biggest developers and contractors have invested so much in building with concrete that they are accustomed to it and will not change this without strict rules.[13] For a significant change, the biggest companies will have to change too, not only the smaller innovative corporations.

With the current type of building and calculating it seems that building with bio-based materials is almost impossible. But what if we can develop a way of calculating the costs by including more aspects than materials, labour and land prices? When a circular economy is the goal, the calculation should also take circularity into account. Also, the question arises why are we building social and affordable housing and for whom? There can be much more costs and income factors be included if the view on value changes.

Therefore, research will be done to the value case of local bio-based social housing construction. By looking at the value case instead of the conventional business case, other aspects that can contribute to the feasibility of using local bio-based materials can be included, such as additional socio-environmental values, CO2 calculations, Life Cycle Analysis and include the MKI. Another big part of the costs for housing corporations is maintenance. This can change positively as well, when using local bio-based materials in a smart building system. When building at a passive house level, less installations are needed, thus less maintenance.

The goal is to find ways to tweak the calculations in such a way that using local bio-based materials in social affordable housing is not only possible, but also the logical choice as investment over time. As mentioned, CO2 can be a driving factor to choose for (local) bio-based materials. Director of housing corporation Fien Wonen, Elisabeth ter Borg, comes with an example on how this can be utilized.[14] She wants to offer the storing capacity of CO2 of dwellings on the market of emission rights. Polluting businesses now have to pay emission rights to relatively clean businesses. In the future these kind of measures will only increase and CO2 will be something to calculate in the investment plans. Another big factor to the emissions of the building process is transport. When building with local materials, the travelled distance of each material is lower. This not only saves money, but

11 'Assessing all materials consumed for building in the Netherlands'.
12 'Wat doen woningcorporaties met houtbouw?'
13 'Heeft bouwen met hout de toekomst?'
14 'Deze woningcorporaties gaan voor hout'.

also pollution and decreases the amount of traffic. When really focusing on the local materials and production of building materials in the area, employment can also be a social value to be considered, especially in areas with a high unemployment value. In a time where specialized labour and tradesmen are getting scarce, investing in local production of building products can really contribute to the area and the area can specialize themselves in this. While the design goal of this project is to make a community, the social impact of using local produced materials can also increase.

To conclude, various local bio-based elements will be analysed and compared to traditional timber frame building. Then, the added value when using local material will be found and calculated. When combining the local social-ecological and economical factors, the social housing sector in the Netherlands can hopefully go back to a more human and social system, back to the intended Volkshuisvesting.

Thematic research question

The following thematic research question is constructed:

In what way does the value chain of building for social housing has to change to make building with biobased local materials possible?

Methodology thematic research

The base of the research to find an answer to the question '*In what way does the value chain of building for social housing has to change to make building with bio-based local materials possible?*' will be analyzing an existing social housing project build with traditional timber framing. The analysis will be done on at least the following aspects: amount of certain materials, material costs, labour costs, time to build, CO2 storage, LCA and MKI for a certain Rd value. If more aspects are found these will be included as well.

Then, possible iterations on the system will be done so that local material will be used. The goal is to get a façade and roof element that contributes close to or is at passive house level. These elements will then be compared to each other and the traditional timber frame elements on the same factors as mentioned before. This will be done similar to the method used by the Bouwtuin[1]. Because these elements are made from local materials, other aspects could also be included, such as transport, employment in the region and maintenance etc.

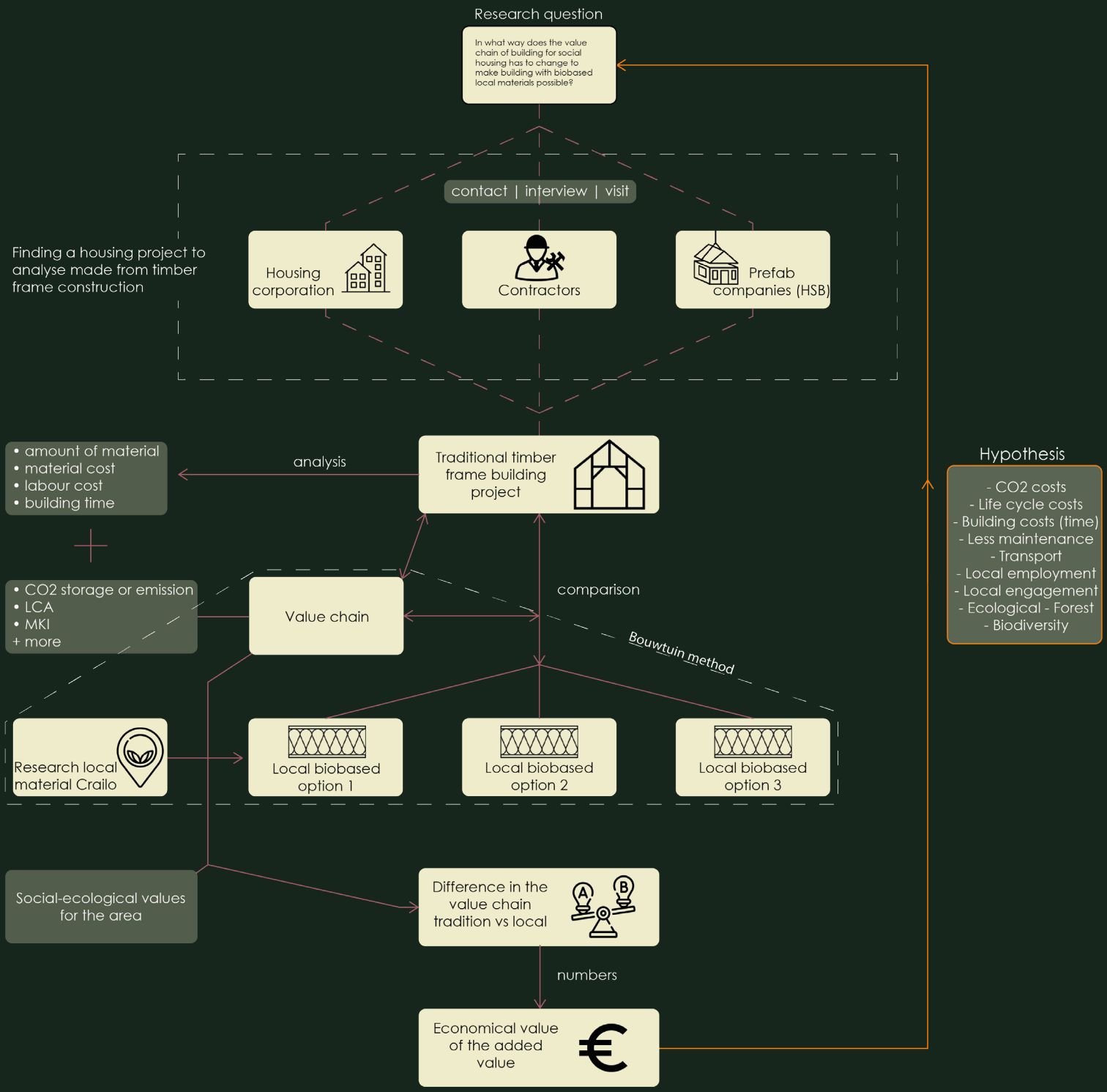
In the end it will be clear what other (social-ecological) aspects can be included in the value case when designing and building with local bio-based materials. These findings will be the input of a (visual) model where tweaking the extra social-ecological aspects (over time) can result in a value case that is interesting for investors.

In this way materialization, architecture and the calculation of building is combined into one research. The outcome of this research can then be used as a tool or guidance for future (social) housing projects.

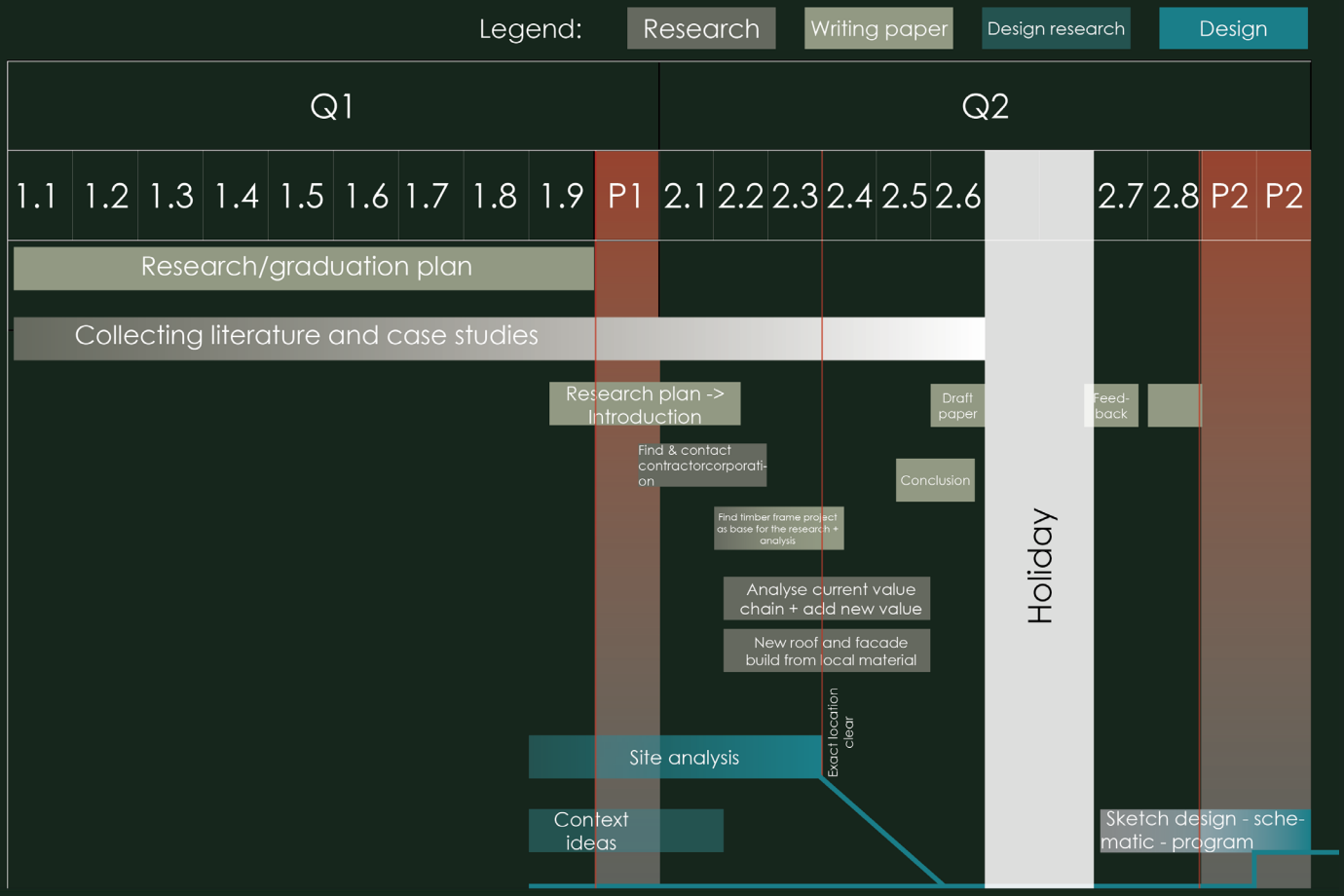
The following sub questions are constructed to find an answer to the main question:
- What are the current ways of calculating social housing projects?
- How can current timber frame building be changed with more local bio-based materials?
- What types of value can be added to the calculation to make bio-based materials possible?

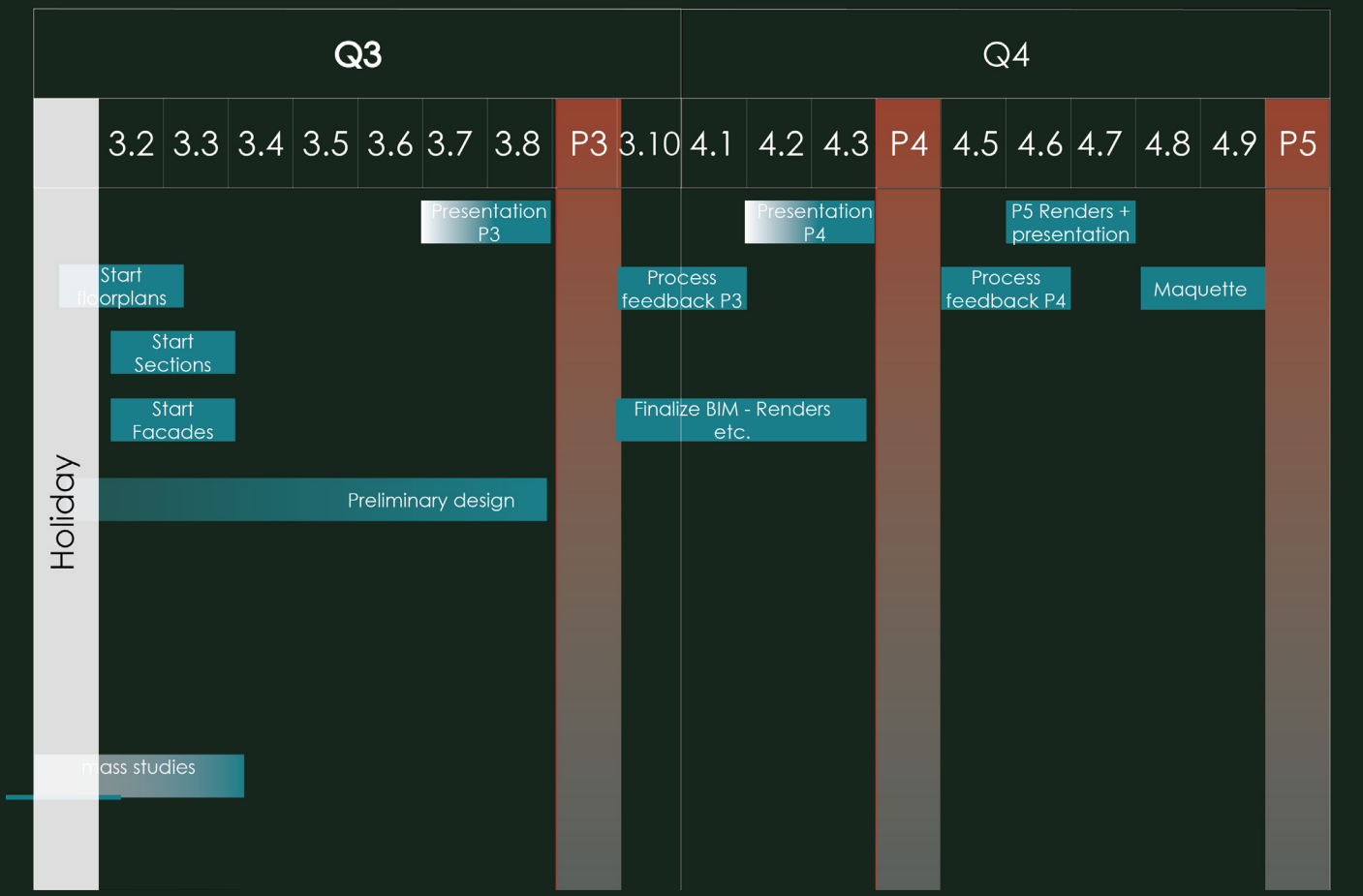
15 'Naar een Nieuwe Streekarchitectuur'

Thematic research scheme



Planning


Legend:
Research
Writing paper
Design research
Design
Q1
Q2
1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 P1 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 P2 P2
Research/graduation plan
Collecting literature and case studies
Research plan -> Introduction
Draft paper
Feed-back
Find & contact contractorcorporati-on
Conclusion
Find timber frame project as base for the research + analysis
Holiday
Analyse current value chain + add new value
New roof and facade build from local material
Exact location clear
Site analysis
Context ideas
Sketch design - sche-matic - program


Q3
Q4
3.2 3.3 3.4 3.5 3.6 3.7 3.8 P3 3.10 4.1 4.2 4.3 P4 4.5 4.6 4.7 4.8 4.9 P5
Presentation P3
Presentation P4
P5 Renders + presentation
Start floorplans
Process feedback P3
Process feedback P4
Maquette
Start Sections
Start Facades
Finalize BIM - Renders etc.
Holiday
Preliminary design
ass studies

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