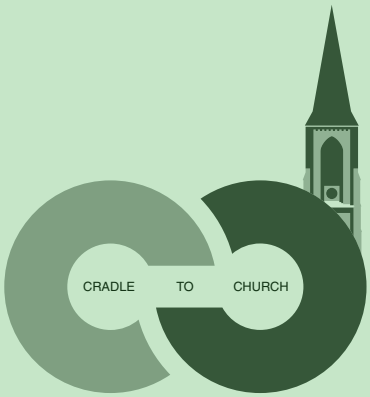
# REFLECTION

## CRADLE TO CHURCH

**A SUSTAINABLE RESPONSE ON RELIGIOUS HERITAGE**

REVITALIZING THE JACOBUSKERK

DINAND KRUIZE




Delft University of Technology, Netherlands
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MSc 3/4 studio Heritage and Architecture - Revitalizing Heritage



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## GENERAL INFORMATION


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| Date | Juli 3, 2020 | |

## PROJECT INFORMATION

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| Title | Cradle to Church – A sustainable response on religious heritage |
| Building Case | Jacobuskerk |
| Location | Winterswijk, the Netherlands |
| Project description | ... |
| Research question | *"How can the potential of sustainability deriving from the existing values of the Jacobuskerk in Winterswijk be translated into a circular design for a new building function of education center, to increase the value of ecology from the specific perspective of circularity, in monumental church revitalization?"* |

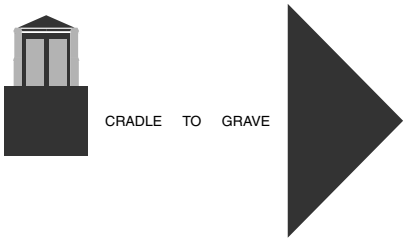
# I. RELATION BETWEEN PROJECT AND SCIENTIFIC FRAMEWORK

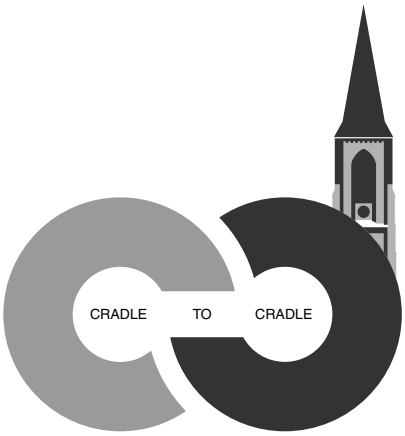
The relation between the graduation project and the scientific framework of architecture are strongly related to the relevance of the graduation topic and my personal position as a designer. The relevance of the graduation topic derives from two urgently increasing problematic situations which is on the one hand the increase of vacant Catholic churches as typology, which is a problem occurring not only in the Netherlands but also in other countries worldwide, and on the other hand the implementation of ecological solutions within the building environment and more specifically in relation to heritage.

Throughout history the Catholic religion has been one of the largest form of religion with many followers spread around the world. The Catholic religion has had significant influence and a fundamental role in the formation and development of many countries of todays world. Due to this significance and the numbers of followers it involved, many churches were build to practice the religion in great numbers, and often formed central points around which cities, towns and villages were created and developed. With this churches are not merely function objects but are the embodiment of the influence and status of the Catholic religion. Due to the influence the Catholic religion had always had, churches are overall highly valued buildings. Due to the influence and status of the Catholic religion, Churches can be see as the embodiment of the influence and status of the Catholic religion and are overall highly valued buildings.

Throughout history the Christian religion grew so large that many iconic churches were build. However, over the past few decades the numbers of the Catholic religion has began to decrease and has grown into a serious problem today. The decreasing numbers within the Catholic religion result in a large supply of vacant Catholic churches, and represent a new vacant building typology to the existing heritage within the built environment. This new typology contains important sets of values and represent a well respected and iconic character, making (Catholic) churches a building typology that heritage architects will need to increasingly respond on in the near future.

Another topic that architects will need to increasingly take responsibility in is the topic of sustainability. The ecological problems and the influence of the current building environment for the future has become more and more clear, it is becoming reality to nowadays society at a rapid rate. Many architects and also within heritage are gaining understanding for the need for a sustainable building environment and are therefore increasing response. However, due to the complications of ways of implementing products and concepts such as the circular economy of Cradle to Cradle, we remain to be unable to make it much further then less bad building designs. Especially with the implications that heritage values bring to the table implementations of sustainable concepts within heritage remain limited. With the vacancy rates being an ongoing problem on a large scale, heritage in particular is an important and influential sector to target. The revitalization of vacant buildings is essential for a sustainable future building environment as vacant buildings form a large part of the aspects that make our current building environment unsustainable in terms of unused space and embodied energy. Vacant buildings often contain a set of reasons why the building should be maintained and revitalized as it contains highly respected values. However, in terms of circular economy an object of heritage and the values it features are initially not at all designed to be circular. They were initially build for a cradle to grave life cycle in a time of linear industrial systems. What currently makes heritage 'sustainable' is the extended lifetime of the building to maintain the values of the building instead of demolishing and forgetting them. This is however a less-bad approach of dealing with sustainability as it is not solving the source of the problem but merely delaying and minimizing the effect. But how can an existing product become a solution to the root of the ecological problem when this solution would rely on a new way of designing according to the concept of Cradle to Cradle? This is exactly the problem that this graduation project tries to stress on and find answers in, or at least gain attention for. Since heritage is designed as linear product in a significantly less advanced linear economical system that is eco-effective and less bad at best, can it become a circular and eco-efficient cradle to cradle product in a building environment, economy and society slowly but surely shifting towards a circular model? Or is less bad the maximal sustainable potential reachable in heritage?




*"Since heritage is designed as linear cradle to grave product in a significantly less advanced linear economical system that is eco-effective and less bad at best, can heritage become a circular and eco-effective cradle to cradle product in a building environment, economy and society that is slowly but surely shifting towards a circular model? Or is less bad the maximal sustainable potential reachable in heritage?"*

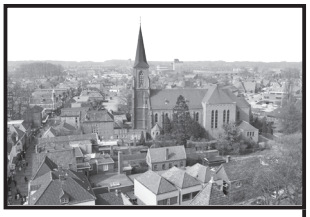
## II. RELATION BETWEEN GRADUATION TOPIC, STUDIO TOPIC, MASTER TRACK AND MASTER PROGRAM

Explain the role of the graduation topic within the master track of heritage. (so why is sustainability relevant in Heritage but more specifically in relation to the master program of the faculty). Explain therefore the relevance for the project to the master track of Heritage for the future. Explain the relation stressed in the previous chapter more directly on the graduation project within the master track. Involve value matrix.

My interest to focus strongly on sustainability as a designer and therefore also in my graduation project within heritage, derives partially from the environment created at the university by certain professors and co-students. More specifically courses such as *'Delft Lectures on Architectural Sustainability'* helped me to develop this interest. In the lecture series given in this course the size of the environmental problem, the influence of the building industry and our influence as architects being the first party in the process from idea to building, is stressed by different architects from different perspectives. In addition to the course is the book *'Delft Lectures of Architectural Design'* (2018), that forms a bundle of professors and experts writing about a position of sustainability within their department of the faculty. The book and the lecture series both discuss very theoretical as well as very practical positions of sustainability within architecture. It is very noticeable how some projects can indeed become incredibly sustainable throughout its architecture when the intention is prioritized from the start of the project. Typically is that the lecture series and book mostly elaborate on newly designed buildings and fictional projects. In regards to heritage, which is particularly stressed in the book by Wessel de Jonge from the department of Heritage & Architecture, it is mostly stressed that the aspects of sustainability lie primarily in the valuable aspects that compose the character of the building. It is discussed that the right treatment and application of these values in the design, result in a building that is worth remaining over an extended lifetime. I agree with this perspective that extending the total lifetime of a building by creating a new life-cycle at the end of the previous life-cycle is a way of reusing the features and characteristics that make the appreciated essence of a building, and can therefore be considered as a/the sustainable way of dealing with existing buildings. This perspective is especially sustainable as it takes into account the adaptability to a changing environment, and can therefore be considered as flexible in the future. Even though architecture in heritage essentially relies on the values to be create a successful and meaningful design to the existing building, whether this is with sustainable intention or not. That would mean that any heritage project in that sense would 'automatically' be sustainable disregarding further aspects such as material production, composition and implementation. As this is being addressed as one of the core ways of viewing sustainability in heritage in the master track, it made me wonder if heritage could be something more in addition to the extension of a buildings life-cycle by successfully preserving and enhancing the monumental character of the building through its values. A building can have a meaningful and influential position in our society with heritage buildings being particularly appreciated buildings due to their monumental status. In my opinion, for an existing building to truly be sustainable, it should have a positive effect on the future beyond human appreciation through the existing values. As architecture is not merely an object of aesthetic beauty or functional use, a building also has the ability to communicate with its environment and interact with its surrounding, it could and should be more. Especially highly valued buildings of which the existing monumental status and identity can be utilized to communicate something additional towards its environment and surrounding. For this additional communication to be the importance of the ecological problems our time is facing though valuable and meaningful forms of architecture could be just the language a building should communicate to current day society (to also be shifted into something else to communicate in the future).

In the search of what sustainability could be for heritage in addition to value management I found the perspective offered by the concept of Cradle to Cradle incredibly inspiring and diversely covering. This concept is able to grasp on to the problem, possible solutions and the mindset for sustainability from a very wide range of varying perspectives in a very comprehensive and coherent way. Being a manifesto for proposing a new way of thinking, designing, producing and using, it clearly describes a proposal on how to develop from our current situation to the future ideal situation. However, it does not at all considers the criteria of existing products that should be maintained in a very particular way, like values in heritage. With this graduation project it is tried to design a potential way of approaching this very specific yet important gray area of Cradle to Cradle in relation to heritage, which could form a point of inspiration for the step in the direction that we are urged to develop and implement further by architects in general as well as in heritage.







Legend

- High monumental value
- Medium monumental value
- Low monumental value

| | AGE VALUE | HISTORICAL VALUE | INTENDED COMMEMERATIVE VALUE | NON-INTENDED COMMEMERATIVE VALUE | USE VALUE | NEWNESS VALUE | RELATIVE ART VALUE | RARITY VALUE | RELIGIOUS VALUE | OTHER RELEVANT VALUE |
|---|---|---|---|---|---|---|---|---|---|---|
| SURROUNDINGS | | MATCHES HISTORICAL STREETPATTERN<br>TIME LAYERING IN BUILDINGS. | | | ACCASSIBILITY FROM TOWN CENTER. ON A CROWDED STREET (MISTERSTRAAT). PART OF THE LINE OF PARKS. | | | | THE CHURCH IS VISIBLE FROM FAR AWAY AND A SYMBOL FOR CATHOLICISM. | LANDMARK. RELATION WITH THE TOWER OF THE JACOBSKERK, THE RAADHUIS AND THE TRICOT FACTORY |
| SITE | | PLOT HAS MAINTAINED CURRENT SITUATION FOR 150 YEARS. | | | RECTORY CONNECTED TO THE CHURCH.<br>GREEN/MEDIATION SPACE IN FRONT OF THE CHURCH. DIFFERENCE OF SCALES RECTORY AND | | | ONLY CATHOLIC CHURCH OF WINTERSWIJK.<br>DIFFERENCE BETWEEN HUMAN SCALE (RECTORY)AND LARGE SCALE (CHURCH) ON ONE PLOT. | TRANSITION FROM PROFANE TO RELIGIOUS. | GREEN ON THE SITE. |
| SKIN (EXTERIOR) | ORIGINAL 1868 BRICKS. | NEO-GOTHICAL FACADES, BUTTRESSES AND TOWER.<br>EXTENSION TIMELAYERING VISIBLE: WINDOWS, DIFFERENT BRICKS. | | | | WELL MAINTAINED BRICKWORK. | | VISIBILITY OF SPECIFIC TIME LAYERING IN A CATHOLIC CHURCH. | | |
| STRUCTURE | | RHYTHM OF THE STRUCTURE.<br>FIRST STONE VAULT OF WENNEKERS. | | | BIG SPAN FOR FLEXIBLE USE. | | STRUCTURE BRINGS THE RHYTHM TO SPACE AND FACADES AND IS DECORATED. | | | |
| SPACE PLAN | | RELATION OLD AND NEW PART OF THE CHURCH AND DEVELOPMENT (TIMELAYERING) | | | WIDE AND OPEN SPACE. SPACE FOR MANY PEOPLE. DIFFERENT ATMOSPHERES BY SHAPE & DIMENSIONS.<br>DAYLIGHT INFILTRATION. | | THE STAIRS OF THE RECTORY. | | SPATIAL SEQUENCE PROFANE TO RELIGION. | |
| SURFACES (INTERIOR) | | ORIGINAL CEILING OF THE RECTORY. | | | USE OF CATHOLIC SERVICE.<br>ACOUSTIC RESONANANCE. | 50'S PLASTERWORK. | ORNAMENTS IN AND OUTSIDE (ENTRANCE) THE CHURCH. | | | |
| SERVICES | | TOWER CLOCK. | | | | | | | | |
| STUFF | OLD CHURCH PEWS. | OLD ORGAN.<br>OLD DOORS IN THE RECTORY. | | | OLD ORGAN.<br>LARGE NUMBER OF SEATS. | | STATUES, PAINTINGS AND 14 STAGES OF THE CROSS. | | ALTAR, STATUES OF SAINTS, TABERNADE, 14 STAGES OF THE CROSS. | |
| SPIRIT OF PLACE | | NEO-GOTHICAL EXPRESSION THROUGH MATERIALS, VAULTING AND DECORATION. | | | MEETING PLACE. | | | | HIGHT OF THE SPACES. DAYLIGHT INFILTRATION. VERTICALITY. | |







Image 01. Heritage Value Matrix of the Jacobuskerk in Winterswijk.

## III. RESEARCH METHOD AND APPROACH

Explain the research methods used and why you chose to use them. Conclude the role of the methods in the project and how they shaped it. Conclude where they worked and where they have implications.
With my motivation and the goal of my graduation project being clear, it was needed to work from the large scale questions and research.

As has been addressed in the previous chapter the fundamental essence of an heritage object lie within its values, as these values compose the character of the existing for which the building is monumentally appreciated. Without sufficient understanding and the rightful treatment of these values, the monumental character and sole of the building would be lost, to which it would be impossible to create a meaningful intervention to the building. It is therefore crucial in any heritage project for the architect to first fully understand the values through careful study and extensive research of the existing to then be able to assess and use them in the design. This fundamental methodology for approaching designing in heritage is described by Marieke Kuipers and Wessel de Jonge as *'research-based design'* in the book *'Designing from Heritage - Strategies for Conservation and Conversion'*.

As this book formulates an explanation of how this methodology is applied within Heritage, it describes multiple layer classifications as a general tool for this research to systematically map the character from different aspects of the building and its context. The results of the mapping of the building characteristics through these layers define the values of the existing which are combined in the Heritage Value Matrix developed by Nicholas Clarke, Marieke Kuipers and Hielkje Zijlstra. The research involves observation through different methods of data collection involving field research, archive research and literature research including careful analyses of this data. It involves research through different scales, from the urban context and historical analyses to important architectural language of details and ornamentation throughout the building. Through the process of analyzing and concluding the data, different mediums of research and communication were used involving pictures, writing, sketches, models and oral discussions. As the research team of the Jacobuskerk being a relatively large research team composed of five students, the many different opinions resulted in many discussions regarding analyzing methods and conclusion forming along the development of the research. These discussions in the process result in constant reflection on your own work and the work of others to motivate to the research team and to the coaches what, why and how you conduct research to conclude the process. Close management of the individual production in relation to the group as a collective and coherent research prove necessary to maintain overview of the research and the information being collected, to ensure my complete understanding of the existing to be well founded knowledge for the next phases of the project.

In the case of the Jacobuskerk being a religious object of heritage some very specific assessment and validation of values had to be taken into account. For any type of religious object the layer classification of Steward Brand does not fully convert on the building directly. A layer that focuses specifically on the spiritual and emotional value of religion translated within the church had to be added to sufficiently map the complete understanding of the character of the Jacobuskerk. With this added to the Brand layers, the value assessment was able to be mapped in the Heritage Value Matrix. It expresses which aspects create the identity and character of the Jacobuskerk in different evaluations of importance based on the designers personal perspective gained through the research. This value assessment formed the first part of the foundation of the design concept and has been a carefully respected guideline and point of dialogue throughout the entire design process of the graduation project.

The second part of the foundation of the design concept was the research in search of an additional role of sustainability in heritage that could enhance the monumental values of an existing building through ecologically focused interventions. As the first and second chapter of this reflection attempts to explain, the clearly uprising ecological necessity in relation to the role and influence of heritage inspired this graduation project to study what sustainability could mean in heritage in addition to value management in an extended life-cycle. With the status and values of the Jacobuskerk mapped and evaluated in the first research phase, I noticed potential aspects of values within the characteristics of the Jacobuskerk that could possibly be enhanced by a sustainability oriented intervention. These potential aspects were characteristics typically shared with other Catholic churches as the possible sustainable interventions could then also be an orientation point of intervention for other churches within this religious typology. Shared characteristics were for instance architectural features typically representing Neo-Gothical architecture such as vaulted ceilings, outside buttresses and brick constructions as these are common arche-

type of Catholic churches. The direction of this 'possible sustainable interventions' still being vague, this needed to be defined for the design concept to be able to further approach the role of sustainability in heritage. With the many vague questions that the word 'sustainability' guarantees to brings forward in the field of architecture, a second phase of research prove necessary to get a grasp on the theme and define it from a bigger and more general scale to a better specified and apprehensible scale in relation to heritage. Being slightly lost to which direction this specific perspective of sustainability should best be approached, my method was to begin the research by searching for starting points at the most recent source of my inspiration, which as explained in chapter two was the course of '*Delft Lectures on Architectural Sustainability*'. Having the intentions towards sustainability clearly defined based on the lectures, notes and additional literature research of this course I found most personal perspective in the concept of the circular economy. With the awareness of the gray area between circular economy and the existing building environment, the focus in the approach towards a circular economy was mostly sought through literature research into the concept of Cradle to Cradle by William McDonough and Michael Braungart.

The concept of Cradle to Cradle offers a very specific mindset and perspective in a very diverse range of approaching the topic of sustainability. Although it operates according to a limited number of strict principles, it allows wide implementation within not only architecture but basically any other product that we design, manufacture and consume. It ranges from awareness in personal behavior, to the influence of design and manufacturing towards to environment, and the use of product as small as the chemical components of a soap bar in every household to entire building methods of a future building environment. Cradle to Cradle forms a manifesto of an 'ideal' circular balance for the benefit of economy, society and ecology. The theoretical framework created with the extensive literature research into the concept of Cradle to Cradle helped me to gain understanding in the possibility of implementing the wide and vague topic of sustainability in architecture in general but also specifically as an approach to heritage. However, it remains difficult to implement this theoretical framework in the specific practical framework of values of heritage.

Having created the theoretical framework of Cradle to Cradle offering possibilities to heritage, the research continued by relating this theoretical framework to a more practical relating framework, to be able to formulate a focused design concept that could be developed further into the designing of interventions into the Jacobuskerk. A research method that fitted this was studying references. In this study multiple building types and categories were included to create a diverse practical framework. The referential projects all contain a certain approach or embodiment of sustainable architecture in them which formed the main inspirational factor in selecting the projects to analyze further. The practical framework includes both heritage and non-heritage references, with categories specified on referential aspects of material, atmosphere, function and climate. These referential aspects were categorized as such to relate to the design process regarding the Jacobuskerk that was simultaneously being developed.

The research of the existing building into the value assessment in the first phase formed a practical framework as first part of the foundation of the design concept. The literature research into Cradle to Cradle formed the theoretical framework that formed the second part of the design concept. This design concept was further brought into relation with the Jacobuskerk by the referential study that composed a practical framework that could be compared more accurately with the practical framework of the value assessment, to be able to relate the principles of the Cradle to Cradle framework with the value assessment framework. The process of constant reflection of this relation between the framework of Cradle to Cradle and the framework of the existing values, enabled a set of three main interventions to be created to form the design concept. This design concept is developed further through the design process.

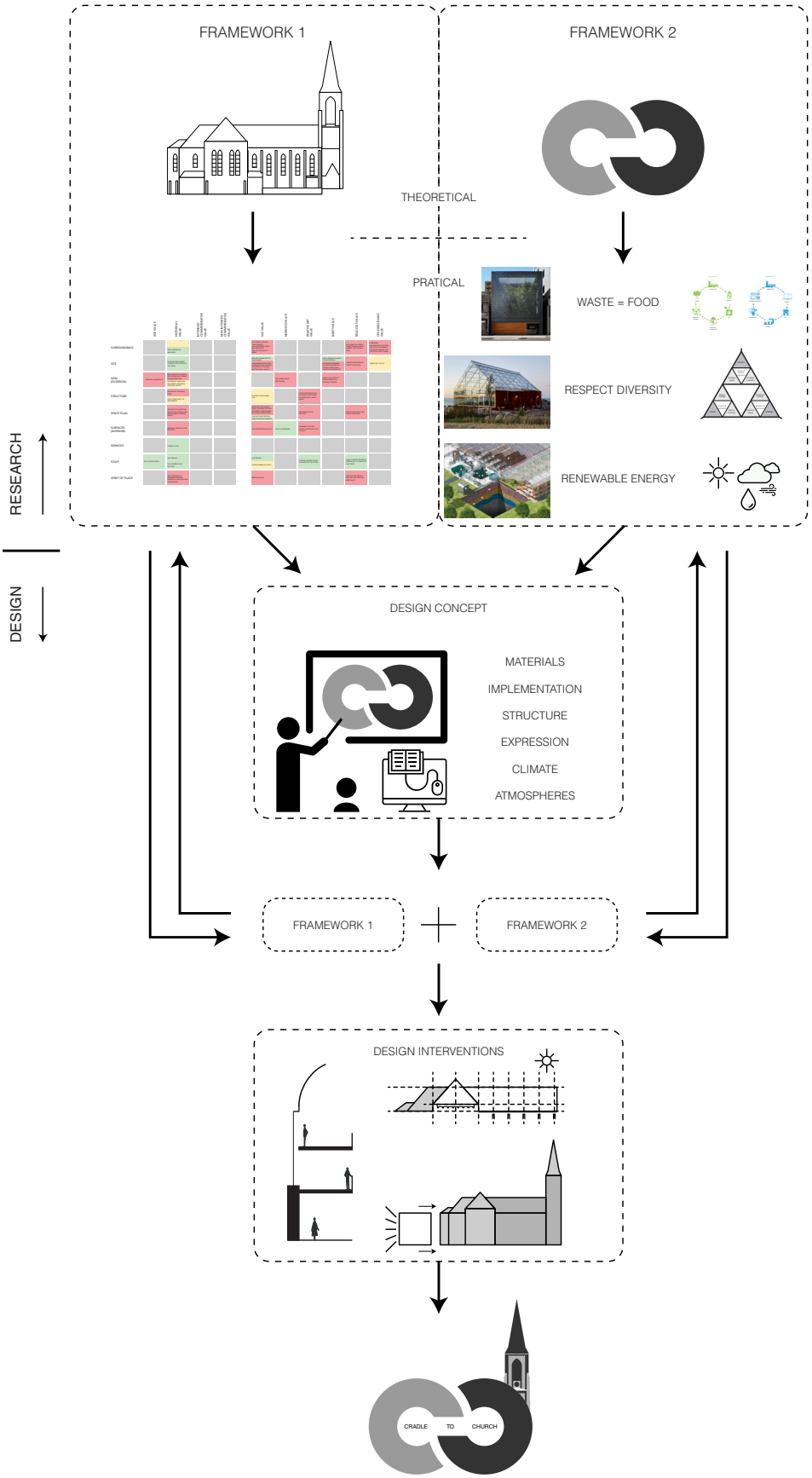



Image 02. Research-based design method.

## VI. DESIGN PROCESS AND THE RELATION BETWEEN RESEARCH AND DESIGN

The design has been a process of constant reflection of the relation between the two frameworks. The communication between the two frameworks during the design is a constant reflection of fitting the ecological design aspects, based on the Cradle to Cradle framework, into the existing character of the church by preserving or enhancing the existing. If a design aspect would not fit in this framework of existing values, the intervention would be damaging the existing character and therefore have a negative effect on the valued heritage. It is depending on a constant search of where the existing allows an implementation to enhance the character and a check of how this implementation would effects the existing in response. A constant process of trial-and-errors of what would be allowed from the perspective of the one framework to benefit the other framework. The design process is therefore a constant conversation of comparison between the two frameworks as only the right balance of the two can form the intervention that benefits the project from both perspectives. Out of this constant reflection I would like to address a signifying example of a design conflict during the design process that represents the crucial problem in the discussion of sustainability in relation to heritage.

This design conflict applies to the glass brick facades of the extension positioned against the back facade of Koldewey and the openings in the Neo-Gothical of Wennekers. In both elements the glass bricks function as a blending element that adds a new 'ecological' time layer through a new expression of material, that respectfully blends in the existing architectural language of the existing time layers by Wennekers and Koldewey. From an ecological point of view the specific use of glass as material would enable o.a. daylight infiltration to create pleasant and diverse atmospheres within the existing spatiality, secondly the exhibition of the interior vegetation towards the interior and exterior of the building to express a healthy and natural environment that stimulates the natural productivity of people in and around the building, and lastly the collection of solar heat to create and express a passive and renewable climate inside the building. Together the use of glass is a way of communicating these ecological design aspects towards the inside and the outside of the building as expression of the new ecological time layer within the existing building character. The way of implementing the material of glass to be able to translate these beneficial aspects within the sensitive character of the church is depending on a heritage perspective. As the glass would be implemented in the facade, the material implementation has to respect the criteria of preserving or rather enhancing the valuable character of the exterior created by the visibility of the existing time layers and the blending material expression of these time layers, such as the identical language of brickwork to compose the facades as plane and continues surfaces. Specifically using glass bricks to implement the glass material into the existing valuable aspects that compose the unique character of the Jacobuskerk, is therefore defined by the constant communication between the framework of the existing values and the framework of Cradle to Cradle. With the balance of both frameworks being reached by specifically using glass bricks to add the new time layer in the same brick size and bond as the existing time layers, the implementation would not be harmful and form a positive effect on the valued character of the Jacobuskerk. The implementation can therefore be considered as 'monumentally acceptable'.

With a balance reached in the material relationship of new and existing on a more general scale, the way of implementation to a more detailed scale becomes the next crucially aspect in which a balance between Cradle to Cradle and the existing character must again be reached. According to the strict regulations derived from the three main principles from the perspective of Cradle to Cradle, it is crucial to find a solution that is for instance 100% re(up)cyclable in the nutrient metabolism cycles and therefore has to be designed to disassemble, without existing of non hazardous components, manufactured locally in a process that is not ecologically harmful, and used preferably as a product of service in a concept of eco-leasing. With many strict regulations that firstly has to be taken into account within the Cradle to Cradle framework, the regulations of the framework of existing values that the intervention secondly has to fit in is similarly strict. The regulations of both frameworks are so strict that, to fit into the existing heritage, the new sometimes simply has to respect the existing and make way for the old. Without this respect, the implementation of new on to the existing without harming the character of heritage would be impossible. Heritage can only offer flexibility in the values that are less than crucial in maintaining the existing monumental character, which are the values that would be assessed as less than 'highly valued' in the Heritage Value Matrix. As the monumental character of the existing building relies fully on these crucial values to be considered as heritage, these high values can not be adjusted to become flexible within the framework of values. It is either monumentally tolerable or not. To remain the character of heritage, it is therefore sometimes inevitable for the newly implemented solution to offer specific flexibility to be able to be implemented within the existing. If it then does not fit sufficiently enough in regards to the strict framework of the new implementation, it is

simply not able to be implemented in the particular scenario of this specific building (frame of values). Within this graduation project this means that some strict criteria of Cradle to Cradle have to be made more flexible and have to be accepted to be less circular than as strictly proposed by the principles of Cradle to Cradle, to be able to fit in the particular values of the Jacobuskerk. This would decide whether the Jacobuskerk is 'fit' to become a Cradle to Cradle circular heritage building. This would be a referential case to the eventual conclusion whether the circular level of Cradle to Cradle can be applied into the field of Heritage.

Referring this back to the example of the glass bricks, the bricks cant simply be masoned together by glue as this would not be able to be disassembled (even though the existing brickwork is of course masoned with mortar and therefore not designed to ever be disassembled into a nutrient for a 100% recycle process, although options for partial recycling of brickwork is already on the market in practice). Gluing the glass bricks would therefore not be considered as a Cradle to Cradle circular solution. Studying the structural principle used in the particularly inspiring reference of the Optical Glass House by Hiroshi Nakamura & NAP, the bricks are not glued together as one element but the bricks are hung inside a structural frame of steel vertical cables and horizontal slabs. This solution could not be used in the intervention of the Jacobuskerk as the structural cables running vertically through the glass bricks visually disrupt the brick bond which would be a crucial disruption in relation to the blending with the English Cross bond that is crucial for the character of the facades of the Jacobuskerk. An alternative of a permanently glued connection and the disruptive cable construction of the Optical Glass House reference had to be found, that also takes into account the specific circumstances of this design dealing with water and airtightness, solar heat and maintenance. Having designed several variants of possible options, none of the variants fully worked in the specific circumstances of the facade principle. Within the time scope of this project, it had to be accepted that this problem would not able to be perfectly solved and a compromise had to be accepted in the solution. The compromise eventually concluded from the research was to use silicone to make a water and airtight connection between the bricks positioned on steel horizontal slabs per layer of bricks in the same thickness of the joints of the existing brickwork. This steel slab would span in between vertical mullions who led the forces from the curtain facade to the concrete wall slab behind it. Silicone of itself is not a biodegradable material and to fully recycle it in a material metabolism is also questionable. And even if it was recyclable, the facade being constructed of the glass bricks as small components of the whole would take a unrealistic amount of meters of silicone joint to connect all the separate bricks, that after their life time all have to be manually scrapped off to 'disassemble and recycle' the silicone without damaging the glass bricks in the process. For the quantity involved in the facade surface along with the maintenance needed for the connection of the silicone onto the glass bricks, this would not be cost-efficient. Even if the silicone could be fully recycled and re-used it would not be a realistic solution. With the awareness of the solution being fictional it is acceptable within the scope of this graduation project.

The example shows that the design process has been a constant communication between the two very strict frameworks, and that eventually a solution had to be concluded and accepted for the implementation of the decision of using glass bricks, as described to have derived from the Cradle to Cradle framework, to blend in to the criteria set by the existing brickwork. However fictional, in the scope of this graduation project the solution of using silicone for the joint had to be accepted even though this solution is not to be considered as fully circular based on the concept of Cradle to Cradle, as the silicone joint is not designed to be disassembled at the end of its life time and is also not able to be recycled fully in the biological or technical metabolism. By having to compromise within the strict framework of Cradle to Cradle and make the decision for silicone even though not optimally circular, a certain flexibility has to be accepted to be able to implement the glass bricks in a way that blend in with the existing form language of the brickwork and thus not damage the high value of this brickwork within the Jacobuskerk. Whether the use of silicone for this joint would eventually lead to the conclusion that the facade of the extension would be considered as not Cradle to Cradle circular and therefore the intervention fails to be circular is the interesting point of discussion as result of the design process. However, in relation to the Jacobuskerk this decision should be seen as 'the sacrifice' to make for the concept of the glass bricks to be implemented within the highly valued aspects that is crucial for the character of the church to be considered as heritage (within the scope of this graduation project).

Taking the example of the silicone connection of the glass brickwork it would be a next step to either continue the research to a better fit solution of connecting material or to dive into the material composition of silicone. This dept of material compo-

sition would be likely to lead to material databases to be able to research if there is a way to manufacture a type of silicone or an alternative material that is able to be 100% recycled back into the biological or mechanical metabolism. In regards to the scope of this graduation project is chosen not to approach the depth of this subject from this angle leaving this area open for further research. However not reachable in this graduation project, the development of such material research would be highly relevant for the future of sustainable architecture. As such research is currently being developed further and material databases are becoming more detailed and advanced, finding ways of producing materials of a circular composition in relation specifically to heritage is an angle in particular to be further researched, as the implementation of the material within heritage remains to be very specific and project reliant. Circular material development and approaches of circular material implementation within heritage, towards a more general concept of implementation relating to more frequent types of criteria in heritage objects, would therefore be useful for further research. Especially ways of circular material implementation as more general concepts for building typologies within heritage such as religious buildings or Catholic churches in particular would be a continuing research of this graduation project.

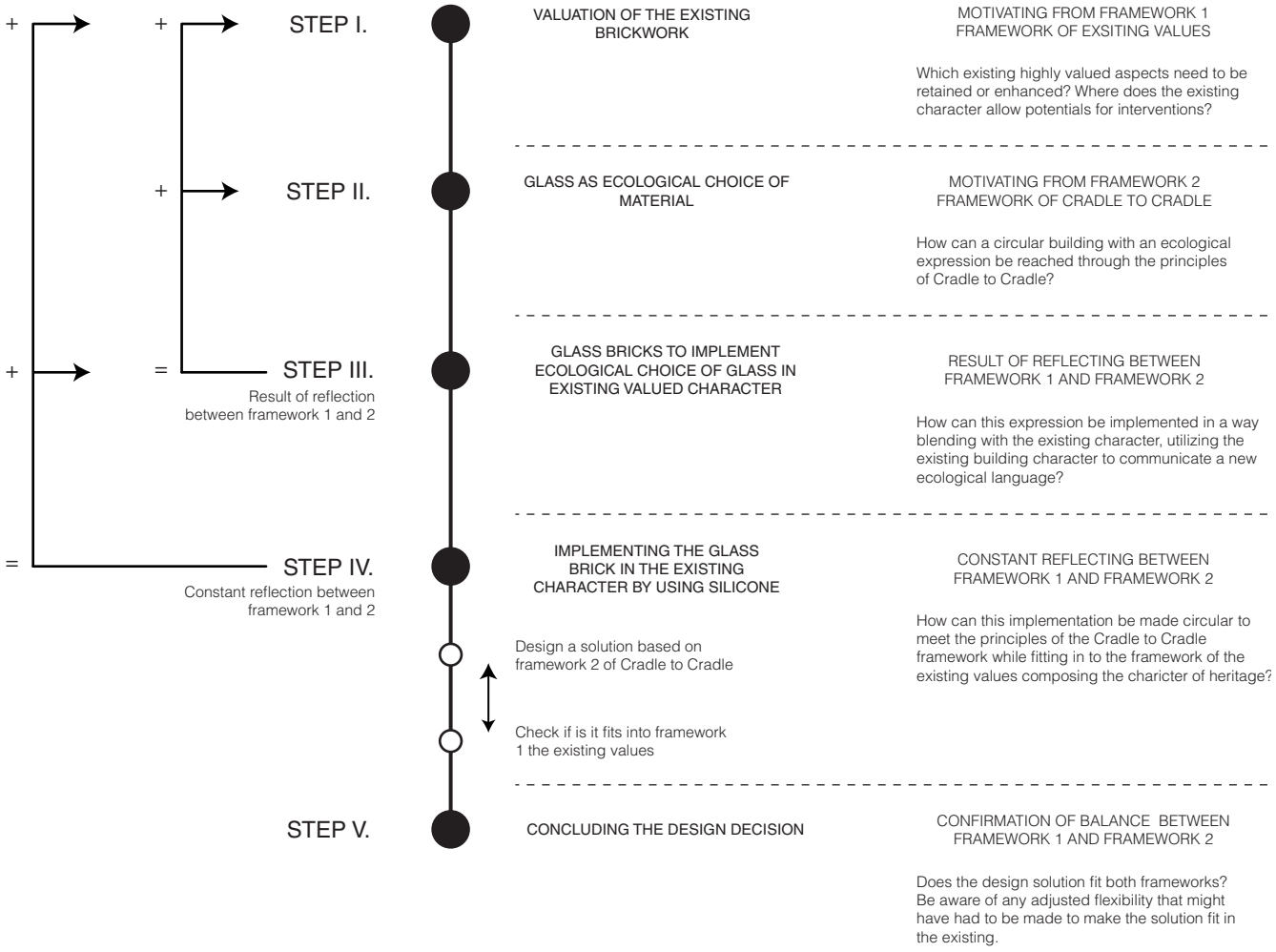



Image 03. Design process and the relation of research.

## V. PROJECT CONCLUSION

As explained in the first chapter of this reflection, the goal of this graduation project is to explore the possibilities of circular heritage as a way of approaching the topic of sustainability for the future of heritage. Vacancy rates are an ongoing problem on a large scale and include highly valued and important building typologies for the development of our history, such as religious objects like Catholic churches. Such heritage has an influential position in the communication of the building environment to society, and has to be maintained. This influential position offers possibilities for other relevant topics to be communicated from building environment to society. The topic of sustainability is a topic that architects are increasingly taking responsibility in, as the ecological problems and the influence of the current building environment for the future is clear. The revitalization of vacant buildings is essential for a sustainable future building environment as vacant buildings form a large part of the aspects that make our current building environment unsustainable. With the unique position of heritage it therefore forms an important sector of our future building environment for architects to respond on.

Currently the potentials of sustainability in heritage are mostly understood to essentially lie in the extension of the lifetime of a building retaining the important and valued character of the building. But can it be more? In terms of circular economy an object of heritage and the values it features are initially not at all designed to be circular. They were initially designed and build with a cradle to grave life cycle in a time of linear industrial systems. Initially designed with high status and values or gained over time, they are designed to become waste eventually, disregarding how far the inevitable result of becoming waste would be postponed by the treatment as heritage. The postponing of becoming waste by the extended lifetime of an heritage building is typically considered as a less-bad approach of dealing with sustainability in terms of circular economy as it is not solving the source of the ecological problem but merely delaying and minimizing the effect. This graduation project focuses on the question if heritage being an existing cradle to grave product can become a solution to the root of the ecological problem, as according the concept of Cradle to Cradle this solution would essentially rely on a new way of designing. Since heritage is designed as linear product in a significantly less advanced linear economical system that is eco-effective and less bad at best, can it become a circular and eco-efficient cradle to cradle product in a building environment, economy and society slowly but surely shifting towards a circular model? Or is less bad the maximal sustainable potential reachable in heritage?

This graduation project of the revitalization of the Jacobuskerk in Winterswijk is approached through the formation of a set of interventions that translate the circular principles as proposed by the concept of Cradle to Cradle into the existing framework of values that compose the monumental character of the Jacobuskerk. The two frameworks being the framework of existing values and the framework of Cradle to Cradle form the design process through a research-based design method. The design is a process of communication between the two frameworks through a constant reflection of fitting the ecological design aspects, based on the Cradle to Cradle framework, into the existing character of the church by preserving and enhancing the essential values. It is depending on a constant search of where the existing allows an implementation to enhance the character and a check of how this implementation would effects the existing in response. The design being a conversation of comparison between the two strict frameworks, ultimately searches for the right balance of the two frameworks to form the ecological interventions that benefits the project from both perspectives.

During the design the constant communication between the two very strict frameworks resulted in a series of conflicts where the flexibility to adapt was lacking in both frameworks. With many strict regulations that firstly has to be taken into account within the Cradle to Cradle framework, the regulations of the framework of existing values that the intervention secondly has to fit in is similarly strict. The regulations of both frameworks are so strict that to fit into the existing heritage, the new sometimes simply has to respect the existing and make way for the old. In some situations it appears inevitable for the framework of Cradle to Cradle to have to adapt, as without this respect the implementation of new on to the existing without harming the character of heritage would be impossible. Heritage can only offer flexibility in the values that are less than crucial in maintaining the existing monumental character, which are the values that would be assessed as less than 'highly valued' in the Heritage Value Matrix. As the monumental character of the existing building relies fully on these crucial values to be considered as heritage, these high values can not be adjusted to become flexible within the framework of values. To remain the character of heritage, it is therefore sometimes inevitable for the newly implemented solution to offer specific flexibility to be able to be implemented within the existing. If this solution then does not fit sufficiently enough in the strict framework of existing values,

it is simply not able to be implemented in the particular scenario of this specific building.

Within this graduation project this meant that some strict criteria of Cradle to Cradle had to be made more flexible and have to be accepted to be less circular than as strictly proposed by the principles of Cradle to Cradle, to be able to fit in the particular values of the Jacobuskerk. Specific values of the Jacobuskerk are highly important values in this particular building, yet the values of the Jacobuskerk are of similar monumental value as in general comparison with other objects of heritage. Therefore the frame of existing values, however individually different for each building of heritage as every building contains its own very specific circumstance of values embodied in its character, would be similarly strict to work is during a revitalization project of any other case then the Jacobuskerk. Therefore this strictness of the relation between new circular interventions of ecology and the existing framework of the Jacobuskerk as experienced in this project, would be comparable in essence and referential to the implementation of circular focused interventions in other buildings of heritage.

As some specific conflicts in the design process of the Jacobuskerk has expressed, the development of technology and materials to become circular will not be the factor that will remain to be problematic in the future of circular heritage. The main problem is and will maintain to be for these new technologies, methods and materials to be implemented in a building that was never designed to be flexible and adaptable for such change. Especially because the valuable aspects of heritage lies in the particular aspects of the opposite, which it to specifically not change and stay the same in a changing environment. With this contrasting difference to be respected it is still possible to integrate circular interventions within heritage. Assuming that future research and development would enable the possibility to design and implement circular interventions, within the Jacobuskerk or another heritage building, in a fully Cradle to Cradle circular way meeting and enhancing the values of the existing heritage throughout every stage within the life-cycle of the interventions, only and purely the new interventions would be circular. The existing building in the valued aspects that are considered crucial for the monumental character of the building would however remain to be the untouched linear product as initially designed, as they are unable to be changed in essence. Therefore, the existing building through the maintained character of heritage would remain to be a product of a time and manufacturing process that is designed to eventually become waste at the end of the life cycle. In exception to this, disrupting and replacing existing values by implementing circular interventions that result in a more valuable character of the building, can be situationally and arguably possible depending on the specific circumstances of the values replaced. However, this does not apply for values such as age values and historical values, as their value generally lies in the fact that they remain original. Replacement would permanently take away these specific values.

In answer to the main question of this graduation project being the search if heritage can become a circular and eco-effective cradle to cradle product instead of a linear cradle to grave product, thus becoming more then less-bad as stressed in chapter 1, can be concluded that heritage can become circular to a very specific degree. Circular interventions can enhance the essential values of the existing heritage, thereby enhancing the influential and valued position of heritage in the communication of the building environment to society, while communicating an additional ecological expression in blending relation with the existing. These interventions can be circular according to the concept of Cradle to Cradle as they are newly designed products. However, with the conflicting need of preserving the essential existing values that form the monumental character, this character of heritage can not become fully circular as this preserved essence remains to be the linear product as initially designed. It appears that the maximum possibilities for heritage to become circular, lie mainly in the interventions that are implemented for a new sustainable life cycle until the point were the existing character would be crucially disrupted and the values critically damaged as this character of values is unable to be changed in essence. Circular heritage therefore relies on a respected balance for new ecological interventions to be implemented in the existing heritage. As the existing character of heritage is generally only able to offer flexibility in the values that are less than crucial in maintaining the existing monumental character, this balance can only be reached with circularity respecting this aspect of heritage. Therefore the strict principles of Cradle to Cradle have to become sufficiently flexible to be able to be adapted and implemented in heritage. This results in heritage being unable to fully become circular in line with the initial concept of Cradle to Cradle. But with the added value of heritage in our building environment and society, this is the realistic framework that circular architects have to work with. Heritage will have be the only acceptable cradle to grave product in the future building environment.

## VI. APPLICABILITY TOWARDS TYPOLOGY OF CATHOLIC CHURCHES

Having concluded on the main question of this graduation project, being the search if heritage can become a circular and eco-effective cradle to cradle product instead of a linear cradle to grave product, the initial problem of the increasing vacancy of Catholic churches forming a new building typology of heritage, remains yet unconcluded. For this graduation project to form a solution to this problem as a project of reference, it is relevant to reflect on the flexibility of the specific design of the Jacobuskerk and the applicability of this design for the typology of Catholic churches. As is self-evident for any project of heritage, the design is depending on the uniquely essential values for the character of that particular object of heritage. However, the specific design solutions of the graduation project of the Jacobuskerk, are from its principles, mindsets (motives) and approach generally applicable for other Catholic churches, as they share general characteristics values and architectural embodiment of these values in a way typical for 'standard' aspects of Catholic churches.

For the applicability of this graduation project in relation to other Catholic churches it is essential to analyze the characteristics of the Jacobuskerk for similarities with a typical Catholic church that can be concidered as representable for its typology. With this typical Catholic church is meant a Catholic church that contains the core aspects to essentially form the typical character of Catholic churches. To analyse this is it necessary to compare the existing values as analyzed of the Jacobuskerk in relation to the existing values generally present in the typical Catholic church within the typology. Even though this comparison is inevitably project depending and should be specifically researched for any Catholic church, it is possible to construct a typically shared framework of values as standard within its typology. This typical framework of values is deduced from the framework as composed and applied for the Jacobuskerk based on the Brand layers with the addition of the layer of religious values, to form a generally applicable framework to relate to the typology as general model of approach. This generally applicable framework of values for the typology of Catholic churches is brought in comparison with the framework of existing values of the Jacobuskerk in image 04. As can be concluded from this comparison, the character of the Jacobuskerk is highly similar to the typical character of a Catholic church within the typology of Catholic churches. Similarities signifying for the typical character of the Jacobuskerk as well as typical Catholic churches are for example, position of status in surrounding context, spatial sequence and central axis of the floorplan and the religious atmosphere created by daylight infiltration, verticality and acoustics. Aside from the specific influence of the two different time layers that essentially construct the specific character of the Jacobuskerk, the existing values of the Jacobuskerk prove to be referential within the typology of Catholic churches. These two different time layers essentially constructing the character of the Jacobuskerk are the Neo-Gothical time layer of Wennekers from 1868 and the Neo-Romanesque time layer of Koldewey from the 1950's. As concluded from the analyzes of the existing character in the P1 analyses rapport *'The Jacobuskerk, Winterswijk'*, the Neo-Romanesque time layer of Koldewey is important for the specific character of the Jacobuskerk as a whole but is less highly valued in itself. In the Heritage Value Matrix of the Jacobuskerk in Winterswijk, forming the framework of existing values, the aspects of this time layer are less strictly valued and therefore offers more accessibility for change in comparison with the Neo-Gothical time layer of Wennekers. Mainly the aspects of this Neo-Gothical time layer of Wennekers contains the high values of the character of the Jacobuskerk. The valuable characteristic mainly created by Neo-Gothical elements in the Jacobuskerk, such as the rib vaulted ceiling, pointed arches, buttresses and verticality, are strongly in common within the typical Catholic church, as Catholic churches within heritage are typically made in Neo-Gothical style from around the time period of the 19th century. As the Neo-Gothical style is typically signifying for Catholic churches forming the typology within heritage, the architectural elements that express this typical Neo-Gothical language are rightly assessed as essentially valuable for the character. Therefore, the Neo-Gothical elements significantly forming the framework of existing values of the Jacobuskerk, with awareness of the influence of the time layer of Koldewey, are referential for the typology of Catholic churches. It can therefore be stated that the role of the framework of the existing values within the approach of the project of the Jacobuskerk, as described in chapter *III. Research Method and Approach* of this reflection paper, is referential for the typology of Catholic churches.

The second framework being the framework of Cradle to Cradle, is generally applicable as the theory behind the principle of circularity based on the concept of Cradle to Cradle can be broadly interpreted and integrated. The theory behind the circular economy as proposed by Cradle to Cradle is multi-disciplinary and complex as the information involves a diverse perspective from a large variety of circular aspects. In regards to this graduation project, the theory is captured in the document *'Research Thesis'* belonging to this graduation project. Even though, within the scope of the project the scale of the research paper has

## FRAMEWORK OF EXISTING VALUES - JACOBUSKERK

Legend

- High monumental value
- Medium monumental value
- Low monumental value

| | AGE VALUE | HISTORICAL VALUE | INTENDED COMMERERATIVE VALUE | NON-INTENDED COMMERERATIVE VALUE | USE VALUE | NEWNESS VALUE | RELATIVE ART VALUE | RARITY VALUE | RELIGIOUS VALUE | OTHER RELEVANT VALUE |
|---|---|---|---|---|---|---|---|---|---|---|
| SURROUNDINGS | | MATCHES HISTORICAL STREET PATTERN<br>TIME LAYERING IN BUILDINGS. | | | ACCESSIBILITY FROM TOWN CENTER.<br>ON A CROWDED STREET (MISTERSTRAAT).<br>PART OF THE LINE OF PARKS. | | | | THE CHURCH IS VISIBLE FROM FAR AWAY AND A SYMBOL FOR CATHOLICISM. | LANDMARK.<br>RELATION WITH THE TOWER OF THE JACOBSKERK, THE RAADHUIS AND THE TRICOT FACTORY TOWER. |
| SITE | | PLOT HAS MAINTAINED CURRENT SITUATION FOR 150 YEARS. | | | RECTORY CONNECTED TO THE CHURCH.<br>GREEN/MEDIATION SPACE IN FRONT OF THE CHURCH.<br>DIFFERENCE OF SCALES RECTORY AND CHURCH. | | | ONLY CATHOLIC CHURCH OF WINTERSWIJK.<br>DIFFERENCE BETWEEN HUMAN SCALE (RECTORY)AND LARGE SCALE (CHURCH) ON ONE PLOT. | TRANSITION FROM PROFANE TO RELIGIOUS. | GREEN ON THE SITE. |
| SKIN (EXTERIOR) | ORIGINAL 1868 BRICKS. | NEO-GOTHICAL FACADES, BUTTRESSES AND TOWER.<br>EXTENSION TIMELAYERING VISIBLE: WINDOWS, DIFFERENT BRICKS. | | | | WELL MAINTAINED BRICKWORK. | | VISIBILITY OF SPECIFIC TIME LAYERING IN A CATHOLIC CHURCH. | | |
| STRUCTURE | | RHYTHM OF THE STRUCTURE.<br>FIRST STONE VAULT OF WENNEKERS. | | | BIG SPAN FOR FLEXIBLE USE. | | STRUCTURE BRINGS THE RHYTHM TO SPACE AND FACADES AND IS DECORATED. | | | |
| SPACE PLAN | | RELATION OLD AND NEW PART OF THE CHURCH AND DEVELOPMENT (TIMELAYERING) | | | WIDE AND OPEN SPACE. SPACE FOR MANY PEOPLE.<br>DIFFERENT ATMOSPHERES BY SHAPE & DIMENSIONS.<br>DAYLIGHT INFILTRATION. | | THE STAIRS OF THE RECTORY. | | SPATIAL SEQUENCE PROFANE TO RELIGION. | |
| SURFACES (INTERIOR) | | ORIGINAL CEILING OF THE RECTORY. | | | USE OF CATHOLIC SERVICE.<br>ACOUSTIC RESONANCE. | 50'S PLASTERWORK. | ORNAMENTS IN AND OUTSIDE (ENTRANCE) THE CHURCH. | | | |
| SERVICES | | TOWER CLOCK. | | | | | | | | |
| STUFF | OLD CHURCH PEWS. | OLD ORGAN.<br>OLD DOORS IN THE RECTORY. | | | OLD ORGAN.<br>LARGE NUMBER OF SEATS. | | STATUES, PAINTINGS AND 14 STAGES OF THE CROSS. | | ALTAR, STATUES OF SAINTS, TABERNADE, 14 STAGES OF THE CROSS. | |
| SPIRIT OF PLACE | | NEO-GOTHICAL EXPRESSION THROUGH MATERIALS, VAULTING AND DECORATION. | | | MEETING PLACE. | | | | HIGHT OF THE SPACES.<br>DAYLIGHT INFILTRATION.<br>VERTICALITY. | |

## FRAMEWORK OF EXISTING VALUES - TYPICAL CATHOLIC CHURCH

Legend

- Monumental value (assessment is project depending)

| | AGE VALUE | HISTORICAL VALUE | INTENDED COMMERERATIVE VALUE | NON-INTENDED COMMERERATIVE VALUE | USE VALUE | NEWNESS VALUE | RELATIVE ART VALUE | RARITY VALUE | RELIGIOUS VALUE | OTHER RELEVANT VALUE |
|---|---|---|---|---|---|---|---|---|---|---|
| SURROUNDINGS | | MATCHES HISTORICAL STREET PATTERN AND URBAN SURROUNDING. | | | ACCESSIBILITY FROM URBAN SURROUNDING | | | | THE CHURCH IS VISIBLE FROM FAR AWAY BY HIGHT AND A SYMBOL FOR CATHOLICISM. | |
| SITE | | | | | | | | | | |
| SKIN (EXTERIOR) | BRICKWORK AND NATURAL STONE. | NEO-GOTHICAL FACADE ELEMENTS (BUTTRESSES, POINTED ARCHES AND TOWER). | | | | WELL MAINTAINED BRICKWORK. | | VISIBILITY OF SPECIFIC TIME LAYERING IN A CATHOLIC CHURCH. | | |
| STRUCTURE | | RHYTHM AND VERTICALITY OF THE STRUCTURE. | | | BIG SPAN FOR FLEXIBLE USE. | | STRUCTURE BRINGS THE RHYTHM TO SPACE AND FACADES AND IS DECORATED. | | | |
| SPACE PLAN | | | | | WIDE AND OPEN SPACE.<br>CAPACITY FOR MANY PEOPLE.<br>DAYLIGHT INFILTRATION. | | | | SPATIAL SEQUENCE AND CENTRAL AXIS PROFANE TO RELIGION. | |
| SURFACES (INTERIOR) | | VAULTED CEILING. | | | ACOUSTIC RESONANCE. | | NEO-GOTHICAL OR RELIGIOUS ORNAMENTS IN AND OUTSIDE THE CHURCH. | | | |
| SERVICES | | TOWER CLOCK. | | | | | | | | |
| STUFF | OLD CHURCH PEWS. | OLD ORGAN. | | | OLD ORGAN.<br>LARGE NUMBER OF BENCHES. | | STATUES, PAINTINGS AND STAINED GLASS | | ALTAR, STATUES, PAINTINGS, STAINED GLASS AND OTHER RELIGIOUS OBJECTS AND ARTIFACTS. | |
| SPIRIT OF PLACE | | NEO-GOTHICAL EXPRESSION THROUGH MATERIALS, VAULTING AND DECORATION. | | | MEETING PLACE. | | | | ELEMENTS COMPOSING RELIGIOUS ATMOSPHERE:<br>HIGHT OF THE SPACES.<br>DAYLIGHT INFILTRATION.<br>VERTICALITY. | |

Image 04. Comparison of the character of the Jacobuskerk with a typical character of the typology of Catholic churches.

remained limited, it does contain the essential information regarding Cradle to Cradle to gain sufficient knowledge and understanding of the framework of Cradle to Cradle. This understanding is applicable in other heritage projects including the typology of Catholic churches. Therefore the framework of circularity created by this theory is referential. Within this graduation project, the theory has resulted in a practical framework of references that were considered specifically interesting by me as designer in the specific and design process and project context of the Jacobuskerk. From these references some sustainable aspects are applicable depending on the designer and the aim of his design. The theory of the concept of Cradle to Cradle being this wide in its variety of approaches involving not only the building environment but also the economy and society, makes this concept of circularity highly suitable for any context of an architectural project. Because heritage is a department of the building environment that is particularly not in line with the circular concept, as it uniquely embodies its values in the existing product aspects, it is a building department that holds specific challenges for a circular building environment to exist in the future. By facing this particular contradiction of circular heritage, this graduation project hopes to motivate and spark more architects to further research the possibilities of circular heritage within the building typology of Catholic churches but also other building typologies and disciplines within heritage. In this, the graduation project of the Jacobuskerk can be used as reference for the opportunities of circularity within heritage regarding the ways of thinking about and experience heritage as well as more direct approaches of how to implement circular design perspectives within heritage.

In any heritage project, close communication by constant reflection on the framework of existing values is essential during the design process. In the project of the Jacobuskerk an additional framework is strictly involved in the design process aside from the generally present framework of existing values. It is essential that this additional framework is in balanced relation with the framework of existing values can be reached. Constant reflection of the relation between the two frameworks, for which the design process of the Jacobuskerk forms a referential example, is inevitable to reach a balance between a new framework to implement and an existing framework to preserve or enhance, without damaging the valuable existing character. By considering the additional framework to form a set of new principles and aims to implement through design interventions (framework of Cradle to Cradle) and considering the framework of existing values as controlling framework and context that the new design interventions have to fit in to, new design motives can be implemented in a coherent and blending balance with the existing character of heritage. This approach of the conversation of comparison between the framework of existing values and an additionally influential framework, is applicable for the typology of Catholic churches and any other heritage project were an additional framework is involved.

In regards to the design concept, for a building to contain a function that specifically creates awareness of circularity not only in the building environment but also the position and influence of circularity in the behavior of society the economy, is something that can and should be integrated within other buildings as well, both in existing and new buildings. A shift to a circular future starts with awareness in the concept and needs of circularity. Heritage buildings with a highly valued position of status are exceptionally suitable to communicate this circular ecological importance as a language for a heritage building to communicate towards its surrounding environment and society. As buildings of heritage all have in common is that they are all in their own unique way are highly valued and appreciated buildings of which the existing monumental status and identity has a specific position in its environment. Therefore the design concept of an building of heritage to utilize the existing identity and status of the building for an additional communication can be applicable for any project of Heritage, whether this is within the typology of Catholic churches building or another typology within heritage. The project of the Jacobuskerk can form a direct or less direct point of reference for other heritage buildings. The specific design concept applied in the Jacobuskerk to utilize the existing identity and status of the church to communicate the need for attention for circularity, by embedding this in the function of education center specifically focusing on circularity is quite literal and might not necessarily a realistic and normal function outside from education purposes of the graduation project. However, literally or less literally embedding the communication of circularity in a design by a new function, in the architecture itself, or in another creative way can be applicable for other buildings of heritage.

By reflecting more specifically on the integration of circularity in the design of the Jacobuskerk through the three main design principles, a more detailed set of aspects can be composed for the applicability within the typology of Catholic churches.

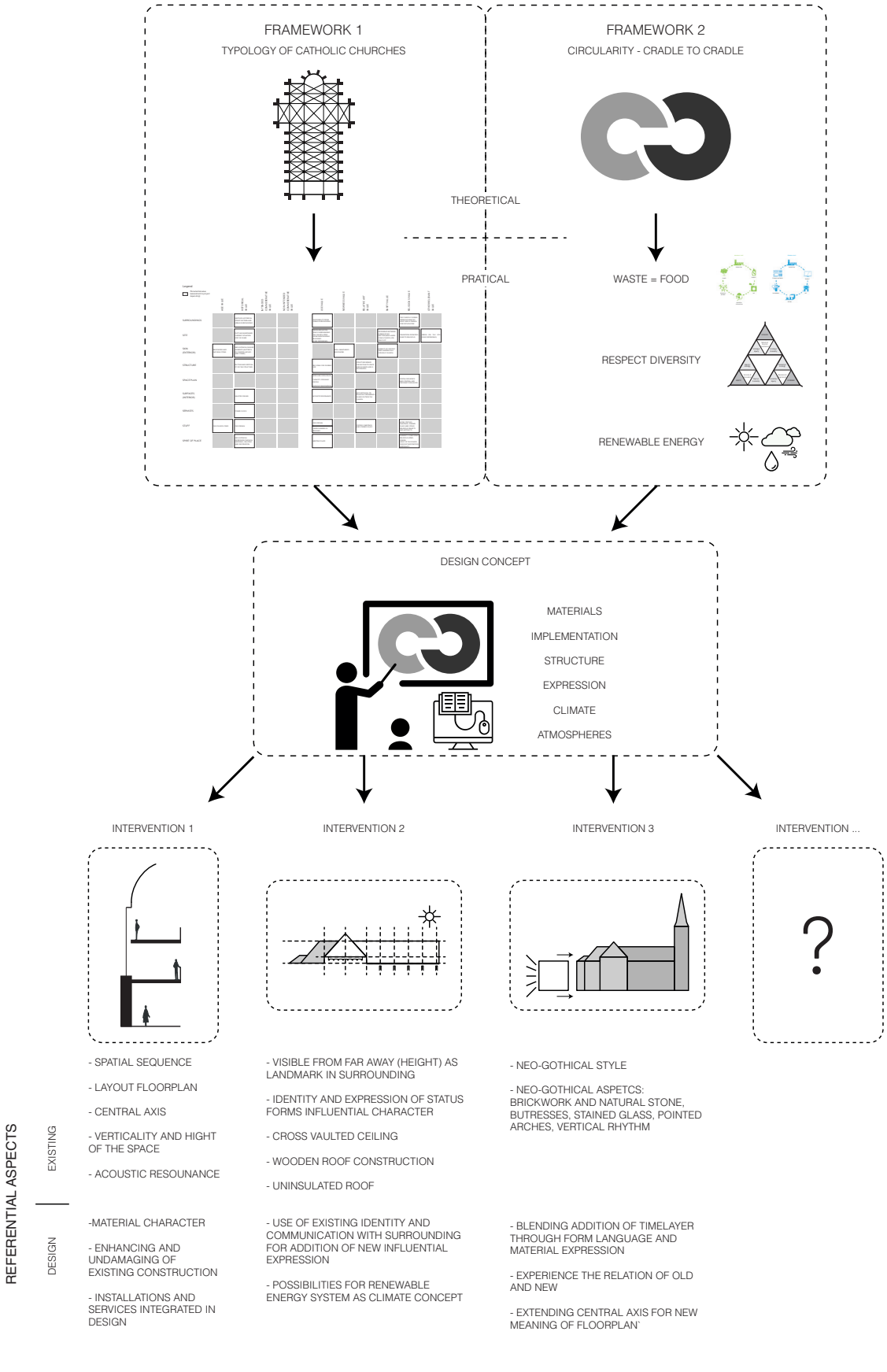



Image 05. Research-based design method.

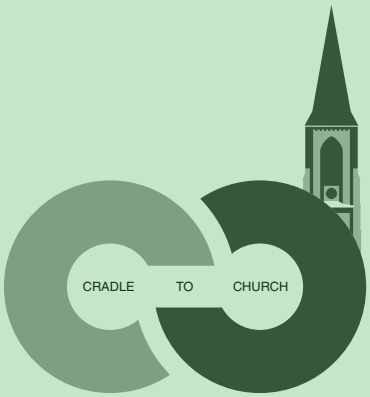
The first intervention being the implementation of new floor levels inside the church to create a diversity of atmospheres that form a stimulative learning environment for any user type, within the existing spatiality of the church, is generally applicable through the relation with the typical layout of the floorplan of Catholic churches. As the spatial sequence and layout of the floorplan is typical for Catholic churches due to its religious role, a typical approach of implementation in relation to the typical church layout is generally possible, in combination with verticality and high spaces the introduction of new floor levels to create diversity of stimulating atmospheres and facilitate the floorspace needed for a new function in the church. It is typical that the layout of the floorplan of a Catholic church is composed of a tower, narthex, nave, aisles, transept and central axis to the altar in the choir and the apse. With the approach as applied in the design of the Jacobuskerk, of integrating new floor levels in the aisles that are connected with the narthex so that its function as routing and circulation area can be maintained, and simultaneously leaving the nave free of floor levels maintaining the central axis while enhancing the verticality of the space, is therefore an approach that can also be used for other Catholic churches. This typical characteristic of the floorplan of Catholic churches is taken into account within the design of the new floor levels of the Jacobuskerk in relation to the general existing value of the spatial sequence and verticality. Further adaptability for other Catholic churches is taken into account for the design of the new floor levels in for example the materials characteristics (light weight, flexible and generally accessible), the demountable connections of the different materials and elements, a balanced over dimensioning of the construction to ensure flexibility in using conditions and function, a secluded construction principle to not rely on the existing structure and leave it untouched including the integration of the new foundation with replacement of a new floor to install insulation and possibly floor heating as existing Catholic churches typically have neither insulation nor reliable heating.

The second intervention being the implementation of a greenhouse on the attic to utilize the existing iconic identity and status through the exterior expression of the church, by communicating an additional language of expression as new ecological icon, is generally applicable through the shared identity of Catholic churches and the general construction of the roof. Catholic churches are typically an embodiment of the status and influence of the Catholic religion. The expression of the church towards its surrounding is therefore referential for Catholic churches and can be used to communicate an additional expression and meaning by utilizing elements of the exterior building skin such as the roof. Possibilities of extending on the facades of the church is not generally possible through value assessment or the spatial density around the building plot. Implementing a new roof however is structurally in most churches possible if also allowed by the vaulting that is typically present containing high value. The integration of a new floor level on the roof story is depending on the structural possibilities and the adjustment of the hight of the roof or a minimal occupational zone, without damaging consequences to any highly valuable existing characteristics such as the expression and composition of the church. The roof is typically composed of a wooden construction with slates as exterior finish, which is generally not of high monumental value and therefore offers opportunities. Specifically utilizing these opportunities for the implementation of a greenhouses on the attic of churches by replacing the roof is referential to other churches as the identity and status of churches is generally suitable for this additional language of a new ecological expression. However for the implementation of a greenhouse, such as applied in the design of the Jacobuskerk, to be realistically referential, the complexity of a realistic climate in the climate system of the greenhouse should be taken into account. In regards to the design of the Jacobuskerk the climate solution of the greenhouse is strictly formed for educational purposes. It should be noted that the implementation of a greenhouse on the roof of a church is generally possible but result into building physical risks and difficulties regarding aspects such as condensation and overheating. Applied in relation to the wooden construction of typical church roofs, this should be particularly taken into account in designing a suitable climate system in relation to the church.

The third and last intervention being the extension at the rear end of the Jacobuskerk to create a new relation with the context and new volume as extending floorspace on the existing in a blending relation with the existing, which is in the case of the Jacobuskerk is formed by an new expression of an additional time layer in relation with the existing time layers of Wennekers and Koldewey, is generally applicable through the typical Neo-Gothical identity of the exterior of Catholic churches. Generally applying within the typology of Catholic churches this Neo-Gothical style of the exterior is that this characteristic aspects is highly valued. In the specific case of the Jacobuskerk, there is the additional time layer of the 1950's extension that due to its lack of historic and age value enables exceptional and unique opportunities for yet another extension to be made on the church without damaging the highly valued Neo-Gothical expression of the facade. Similar opportunities can be considered in relation

to other Catholic churches in aspects that lack high value such as areas of repair or extended volumes, noting that this is project depending. That the design proposal of the extension of the Jacobuskerk is formed with a particular expression by using glass bricks of a new circular time layer, is a specific design feature deriving from the specific character of the Jacobuskerk. Aside from the specific design solution of the particular characteristic of the two time layers of the Jacobuskerk, the relation between the existing values and the approach of reaching a blending relation with the existing can be applicable for the typology of Catholic churches but also for other building of Heritage. For the design of the extension of the Jacobuskerk this blending relation is tried to be reached through the use of glass bricks, is a design choice that is specifically based on the influence of the brickwork in the blending character of the two existing time layers. However, the brick characteristics of the existing two time layers are deriving from shared characteristic of the Neo-Gothical style typically featured by Catholic churches. In relation to an applicable design solution, typically shared characteristics of the Neo-Gothical style are for instance the use of brickwork and natural stone, buttresses, stained glass windows, pointed arches and vertical direction in a clear compositional rhythm. Utilizing these shared characteristics in a design solution for an extension onto an existing facade could enable the intervention of an extending volume to be generally applicable within the typology of Catholic churches. The eventual expression created for the extension of the Jacobuskerk should be considered as a very specific design solution as it is largely derived from a specific perspective of circularity regarding the functioning of the facade as solar chimney within the very specific climate concept, and the composing of a visual relation between the exterior surrounding context and vegetation in the interior of the extension.

The implementation of a new building as extension onto an existing building inevitably results into the designing of a new entrance between the new and the existing. The approach of the design of this entrance in the project of the Jacobuskerk is strongly depending on the acoustical criteria of the lecture hall in the extension and the symbolism of the new circular time layer. However, the approach of positioning of the entrance in relation to the existing typical layout of the floorplan, by designing it as a continuation of the central axis placing the entrance centrally in the apse of the choir at the back of the church, is an aspect that is generally applicable for other Catholic churches. In the typical layout of the floorplan of Catholic churches the apse formulates the end of the central axis and the end of the church, exceptionally noticing that an ambulatory or other spaces behind the apse of a Catholic church are essentially private sections meant for the priest and does not belong to the publicly accessible area within the church. The perspective of the apse no longer being the official ending of the church when the function of the church changes is debatable, as this is depending on the religious perspective regarding the apse such as the position of a highly valued altar or other religious relics along with the embedded religious spirit of place. These are aspects that can contain sensitive values and are generally critical in relation to the approach and design behavior of an intervention which is project depending for some churches within the typology of Catholic churches. However, as heritage strategy and approach of such an intervention, the design of the Jacobuskerk can be used as reference towards other Catholic churches.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