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Zijlstra, H.

#### **Publication date**

2021

#### **Document Version**

Final published version

#### **Published in**

LDE Heritage Conference on Heritage and the Sustainable Development Goals

#### **Citation (APA)**

Zijlstra, H. (2021). The Power of Ten: The KaDEr Project and the Influence of Education in Real Cases. In U. Pottgiesser, S. Fatoric, C. Hein, E. de Maaker, & A. Pereira Roders (Eds.), *LDE Heritage Conference on Heritage and the Sustainable Development Goals: Proceedings* (pp. 476-492). TU Delft OPEN Publishing.

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# The Power of Ten: The KaDEr Project and the Influence of Education in Real Cases

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## Abstract

*The KaDEr research project is looking for possible changes in the policy to preserve built heritage in a sustainable way for the province of Gelderland. From 2017 to 2021, TU Delft conducts this research project. A lot of disciplines of TU Delft are involved from the Faculty of Architecture. The Heritage & Architecture (HA) is in the lead. Four themes are addressed for research: energetic sustainability, financial perspective, functional usability and securing knowledge. Theoretical and analytical research is worked out about the more general aspects of current and future policy and strategies. The perspective for the future is made by practice in four Living Labs on different scale levels. Various tools and methodologies are tested, analysed and improved through eight sub-studies. One of the related research questions for the Living-Labs is: How can student design projects for real cases change the solutions for these projects in practice? So, educational design projects from HA are integrated in the Living Labs. Around ten students (the next generation) work in teams on the subjects. In academic education projects this is not daily practice. The TU Delft HA group developed their own methodology to incorporate practice, technology, design and cultural value aspects in their education program (Clarke & Zijlstra & De Jonge, 2019). At this moment (half way the KaDEr project) some conclusions can be drawn from the results of the students. They can make a difference in practice when dealing with heritage. Buildings that were planned to be demolished will remain like in Zutphen and new insights are provided for preserving historically important aspects in the Reuversweerd estate. The province of Gelderland is enthusiast and in the lay-out for the policy framework in future this way of working will be incorporated in the strategy to safeguard a more sustainable approach on the preservation of built heritage including the ideas of the next generation of architects and researchers. For the TU Delft HA group it gives input to upgrade their education program for the next years as well.*

## Keywords

*Heritage, policy, education, design, Living Lab, estates, urban, KaDEr*

## 1 INTRODUCTION

This paper is about an initiative to anchor education more in research and the other way around. The importance of synergy between the two academic disciplines is emphasized with every review of research and education at the university. The KaDEr project that the Delft University of Technology (TU Delft) is carrying out for the province of Gelderland has proved to be a great opportunity. In addition to a positive influence on researchers and students, it appears that results from education can have an impact on research projects in reality but it shows a positive effect of addressing real cases as projects in education as well. This has been successfully used in Living Lab related cases, where education influences the final results (advice for new policy) of the research. The research project runs from 2017 to 2021<sup>1</sup>. So, a first prognosis of its conclusions is part of this paper. This paper will first discuss what the KaDEr project entails from the goal and the research approach. Within the framework of the KaDEr project, it was decided to link four Living Labs to a number of research questions and research cases. Here theory is linked to practice to arrive at

1

For more information see (Zijlstra, 2018) and website TU Delft: and Four Living Labs help restore Gelderland's heritage <https://www.tudelft.nl/en/2017/bk/four-living-labs-help-restore-gelderlands-heritage/>

insights that can be included in future provincial policies. The educational projects are all linked to the Living Labs. Secondly the methodology of education at TU Delft and the Heritage & Architecture (HA) group in particular and the relationship with the research is described and placed in a wider theoretical framework. The basis for education is formed by the method developed by HA over time and will be improved based on the results of projects like KaDEr. This will be briefly discussed in order to understand the embedding of the projects in relation to the context of education at TU Delft. Finally, some of the concrete results of the linked education projects in KaDEr will be described and illustrated. The influence of the outcomes on the research results of the KaDEr project and the influence on the education methodology of HA is summarised in the final conclusions.

## 2 RESEARCH GOAL

In 2017 the KaDEr research project for the province of Gelderland started with a team of four main researchers from the section Heritage & Architecture / Faculty of Architecture and the Built Environment of the TU Delft. The aim of the collaboration between the TU Delft and the province of Gelderland is to define an adjusted framework based on the way in which the province of Gelderland acts up to the preservation of built monumental heritage in a sustainable way and asks to come up with new innovative policy ideas. Scientific research will be carried out into whether and if a paradigm shift will take place in the future. TU Delft investigate together with the province of Gelderland which changes are necessary to imbed sustainability in the preservation of heritage. The classic, object-oriented restoration mission will have to make place for sustainable and therefore future-proof management, in which the following sustainability themes will be leading: 1 energetic durability, 2 financially healthy perspective, 3 functional use and 4 knowledge safeguarding in the long term. In this process sustainability is placed in broad perspective and is looking for the right balance between monumental values and technological possibilities. In addition, the financing and the exploitation per object, in conjunction with the environment, must provide a healthy future perspective for the owners and users. For every building a future proof functional use is essential. The safeguarding of craftsmanship and the transfer of knowledge is needed to invest in future generations to preserve heritage. A conscious choice has been made to address some and not all of the Unesco Sustainable Development Goals (SDG): Affordable and clean Energy, Innovation, Sustainable Cities and communities, climate action, life on land, quality education and partnerships for the goals<sup>2</sup>.

## 3 RESEARCH APPROACH

The KaDEr project basically consists of four parts: framework, Living Labs, education and safeguarding of knowledge. For the framework the general policy of the province of Gelderland is analysed by theoretical and historical data research. After two years of investigating the general data, facts, figures, existing frameworks and general policy counterpoints have been investigated. This led to a set of findings and advice published in the midterm review report (Zijlstra, 2018).

Many disciplines at TU Delft are involved in the research: more researchers from the three Heritage & Architecture (HA) Chairs (Heritage & Design, Heritage & Technology and Heritage & Values) got

involved just like researchers from other departments: Technology - Building Physics, Climate Design and Sustainability, Management and Landscape Design. A team of fifteen researchers of TU Delft work together. Every Living Lab has a coordinator from the Heritage & Architecture section. After the two first years of research with a more general focus eight sub-studies were linked to the four Living Labs: 1. Energy scan 2.0 for churches, 2. Post-insulation of the architectural layer, 3. Design Atlas Baaksebeek & IJsselvallei, 4. Church vision Winterswijk, Aalten, Oost Gelre, 5. Assessment model for sustainability measures, 6. Energy transition 2030, 7. Design Atlas Geldersch Arcadia and 8. Financial feasibility of churches. Fig. 1.

Concerning the framework, conclusions are presented in a final report. The Living Labs each receive a digital accessible document in which experiences are shared. The education is shared with a wide audience through exhibitions and a final publication. The sub-studies, two by two linked at the Living Labs, will be summarized in a book or report. Others will be worked out in separate trade editions as well (Design Atlas Baaksebeek, IJsselvallei and Geldersch Arcadië and on Churches: The Eusebius church in Arnhem an evaluation of the restoration process). In September 2021 the entire project will be festively concluded with a manifestation as a closing event. Results are presented in a series of publications, various exhibitions and a conference. The basic characteristic of the KaDer project is that we are able to make interim adjustments to the approach of the research in order to remain up-to-date and to include interim findings in the next research phase. It is a cyclical and self-learning process instead of a linear process. Fig. 2. In this way we will provide a framework for the new policy for Gelderland in 2021 with regard to the sustainable preservation of built heritage and advise a working method to follow projects in practice and to steer policy accordingly.

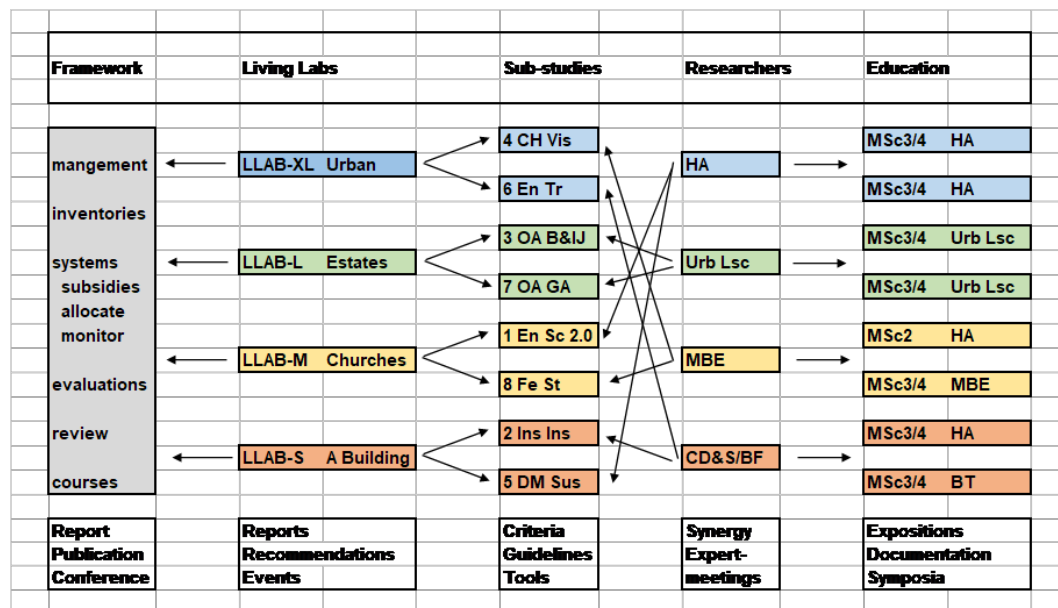


FIG. 1 Diagram of the KaDer research project: Living Labs, sub-studies and education projects. (source: Hielkje Zijlstra)

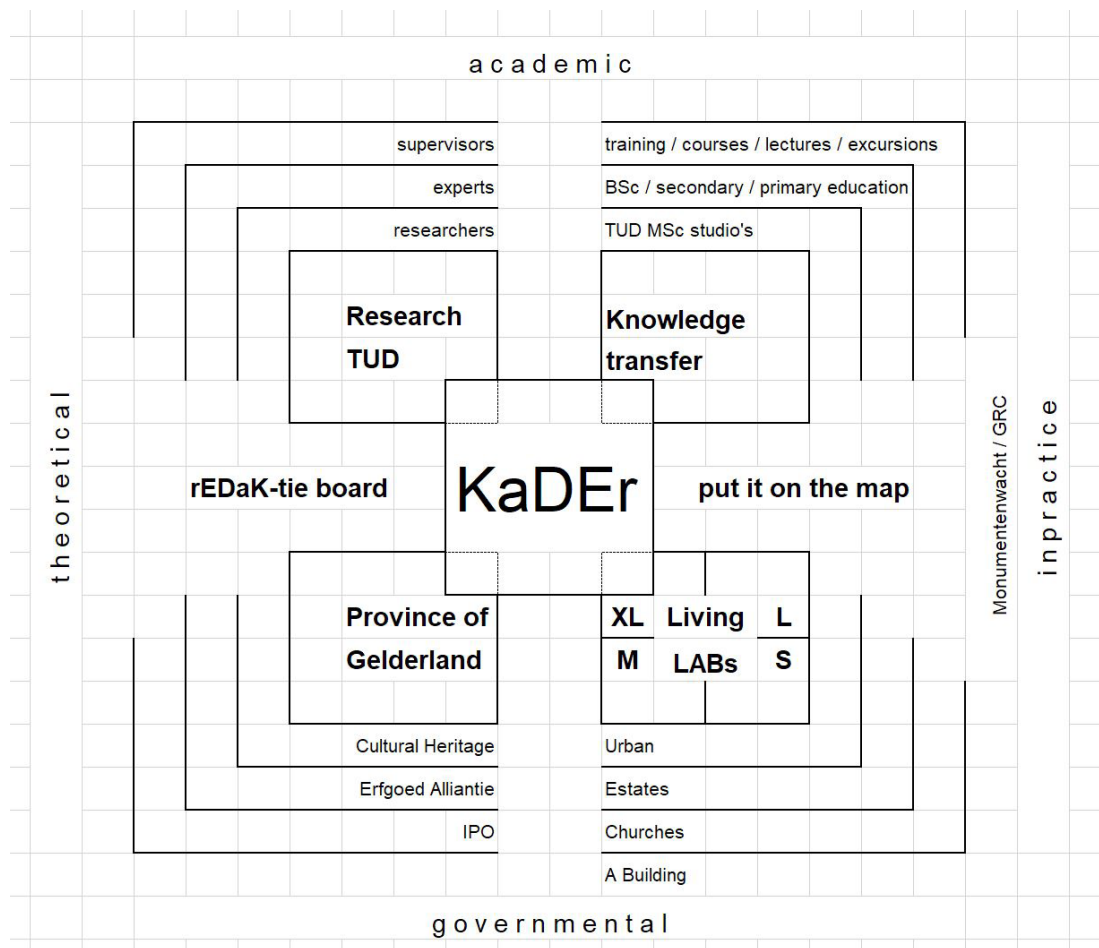


FIG. 2 Diagram of relations and circular system of the KaDER research project. (source: Hielkje Zijlstra)

## 4 LIVING LABS KADER PROJECT

The four Living Labs form the backbone of the KaDER research. In the Living Labs, practice is linked to policy. At the province, policy has been translated into programs, subsidies and projects. So, conversely, following these projects is the way to test whether policy leads to what they had in mind. Within the KaDER Living Labs current policies are investigated, analysed and evaluated. Subsequently, recommendations are formulated for future policy in which sustainability is paramount in maintaining monumental built heritage. In Gelderland we see that sustainability is a guiding principle on a small and large scale. An important part of the provincial policy is the expansion of subsidies for the preservation of heritage (Provincie Gelderland, 2019). Evaluating cases in practice is important to discover the effects of providing provincial grants. To measure and assess this effect, analysis is needed. A choice was made, in close consultation with stakeholders and the province, which projects were eligible for this. This choice is based on the four research themes of this research in general and the locations of the projects. Depending on the scale area (XL-L-M-S), a case is being monitored in a Living Labs. Here we can follow "live" what has been or will be achieved in the projects. Because afterwards the process is difficult to fathom, walking along with an ongoing

(living) practical situation is essential. In addition to content, the process plays a major, determining role. To improve partnerships and incorporate young people in learning cases education is an important component in the Living Labs. The following activities are carried out in four Living Labs:

#### 4.1 4.1 LIVING LABS – XL – URBAN

- Zutphen
  - Redvelopment of historical part of the inner city: Nieuwstad / Klein Vaticaan. The Catholic enclave with some buildings will be redevelop (schools, church, rectory, retirement home, etc)
  - Projects are monitored: schools quarter and Nieuwstads church
  - Education: Graduation studio MSc3/4 2017-2018 (20 students)
  - Education: MSc2 studio churches 2019 (28 students on 3 Churches)
  - Erfgoedwerkplaats (heritage workshops) GRC and clinics with monumentenwacht (monument watch) Gelderland<sup>3</sup>
- Winterswijk
  - Redevelopment of the Jacobus church, industrial area and culture cluster
  - Graduation studio MSc3/4 2019-2020 (12 students)
  - Collaboration on the Church Vison for three municipalities (RCE, 2019)
- Elburg
  - Monitoring plans for a sustainable heating plan for five monumental buildings in the historical centre
  - Design the roadmap for the Energy transition 2030 (Spring 2020)

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Monumentenwacht Gelderland (Monument Guard Gelderland) The foundation Monumentenwacht Gelderland is a private organization, supported by the province, for the preservation of cultural heritage. Monument Guard Gelderland is mainly concerned with independent architectural inspections of monuments. Emergency repairs are immediately carried out during the inspection. In addition, Monumentenwacht Gelderland increasingly provides additional advice to owners of monuments. As a partner of the province of Gelderland, the Monumentenwacht Gelderland is involved in projects in the field of quality assurance, historical building fragments and a restoration training. <https://www.monumentenwacht-gld.nl/>. Gelders Restauratie Centrum (GRC) is the Education institute of the province of Gelderland for craftsman in the building profession <https://geldersrestauratiecentrum.nl/>. GRC facilitates courses on site of Reuversweerd: <https://erfgoedwerkplaats.geldersrestauratiecentrum.nl/>

## 4.2 LIVING LABS – L – ESTATES

- Baaksebeek and IJssel vallei area + Gelders Arcadië
  - Participation in the Interreg project Innocastle with expert meetings, etc.<sup>4</sup>
  - Design Atlas Baaksebeek, IJssel vallei area and Gelders Arcadië
  - Education: MSc2 studio Baaksebeek 2018 (9 students)
  - Education: Graduation studio MSc3/4 2019-2020 (11 students) + workshops and exhibition with the University of Torino Italy.

## 4.3 LIVING LABS – M – CHURCHES

- Nieuwstads in Zutphen, St. Maartens in Tiel and Walburgis church in Arnhem
  - Monitoring and Education MSc2 studio churches 2019 (28 students)
  - Expert meetings and symposium (11 December 2019)<sup>5</sup>
  - Evaluating Energy plans for churches (subsidized by the province) and design a guideline for future use: Energy Scan 2.0
- Eusebiuskerk Arnhem
  - Monitoring en evaluating the restoration and sustainable redesign process
- Stevenskerk Nijmegen
  - Monitoring en evaluating the restoration and sustainable redesign process

## 4.4 LIVING LABS – S – BUILDING

- Reuversweerd
  - Monitoring en evaluating the restoration and sustainable redesign process
  - Erfgoedwerkplaats (heritage workshops) with GRC
  - Education: Graduation studio MSc3/4 2018-2019 (5 students)
  - Education: Msc2 building assessment exercise 2018 (26 students)
  - Advices on different technical aspects of the execution
- De Groote Noordijk Wilp (mirror project for Reuversweerd)

## 5 EDUCATION LINKED TO LIVING LABS

One of the objectives of the KaDEr project is to safeguard knowledge. This involves building up, collecting and sharing knowledge. The extra dimension that TU Delft can give to this is that, by linking educational projects to the case studies in the Living Labs, education is also part of conducting research. By giving ten free spirits of the next generation architects / researchers a concrete design assignment that is based on a practical case, possibilities are explored that can have far-reaching consequences and impact. The educational projects are therefore directly linked to Living Labs. The themes of the KaDEr research are also leading in education. The aspects 'energetic durability' and 'functional use' in particular are central to this. There is a synergy between research and education. A new generation of architects provides ideas that results in new insights. Students are involved in everyday practice and people from the KaDEr project participate in education. The researchers from the Living Labs are also involved as teachers. Teams of two or three teachers

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<sup>4</sup> Interreg Innocastle project INNOvating policy instruments for historic CASTLES, manors and estates see: <https://www.interregeurope.eu/innocastle/>

<sup>5</sup> For programm and documents see website TU Delft: <http://homepage.tudelft.nl/20j9u/>

are always working from the three different domains of Heritage & Architecture (Design, Technology and Values). The teachers, researchers and other stakeholders from KaDEr are involved in education by participating in conversations, sharing knowledge, reflecting critically during (interim) presentations, giving workshops, organizing excursions, giving lectures, contributing to publications and facilitate exhibitions.

## 6 HERITAGE & ARCHITECTURE (HA) EDUCATION METHOD

In this chapter at the development of the HA education approach will be explained and secondly the current HA method. The TU Delft has a long history in education in Architecture (McNamara, 2014, 56-65). It retrieved the second position in Architecture Schools in the QS World University Ranking in 2020<sup>6</sup>. Most of the publications on the education at the faculty of Architecture at the TU Delft focusses on the Architecture that concerns new build project (Smienk & Niemeijer, 2000). Also, internationally the focus for now in Architecture is mostly on new built buildings (Staal ea, 2004, Himmelreich and Blätz 2005, Angéli and Hebel, 2008, De Bleeckere ea 2009, Ockmann and Williamson, 2012). Conservation is taught as disciplines for building technicians, like in Antwerp and Leuven<sup>7</sup>. The combination of architectural design at heritage buildings is taught exclusively at TU Delft. Over the years dealing with existing buildings integrated in architectural design projects becomes common sense. In the conclusions of this paper the influences of the lessons learned from the KaDEr project to improve the HA educational approach in future for the next / next generations is formulated.

### 6.1 THE HA EDUCATION APPROACH

The Heritage & Architecture (HA) approach on educational projects aims to increase in complexity over time and stimulate individual independent growth (Clarke & Zijlstra & De Jonge, 2019). Current conservation education at the TU Delft flows from long tradition. It evolved from addressing traditional architectural restoration practice (the maintenance of the status quo through the classical restoration and maintenance perspectives), to one of addressing conservation through adaptive reuse as a valid and proven method. An important milestone in this process was the creation of <sup>®</sup>MIT in 2006. <sup>®</sup>MIT continued to teach restoration, but addressed research and education in Modification, Intervention and Transformation of the built environment. These areas defined the field of enquiry of three chairs according to levels of scale: Modification focused on the use of materials and technology, Intervention on adaptive reuse and redesign of a building, and Transformation investigated the urban structure. These scale levels structured the design education: students were expected to undertake analyses of a building, its urban context and its technology. This analysis included the history of the design and the architect/s associated with the building, as well as changes that were made or occurred over time. The past and present served to inform the student's choice for a new program for the building, providing a springboard into the future. The investigation into values was implicit to this process, but experience soon highlighted the need to make values an explicit part of the both investigation and education. The transition from <sup>®</sup>MIT to HA in 2014 maintained the wide focus on scale levels, but restructured in three domains that together form HA: Heritage and Values,

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<sup>6</sup> See: <https://www.topuniversities.com/node/294502/ranking-details/university-subject-rankings/--2018/architecture>

<sup>7</sup> See: <https://www.uantwerpen.be/en/study/education-and-training/master-conservation-restoration/programme-info/> and [https://onderwijsaanbod.kuleuven.be/opleidingen/e/CQ\\_52688406.htm#activetab=diploma\\_omschrijving](https://onderwijsaanbod.kuleuven.be/opleidingen/e/CQ_52688406.htm#activetab=diploma_omschrijving)



Heritage and Technology and Heritage and Design. These three chairs collaborate both in education and research, forming an integral focus on both the tangible and intangible.

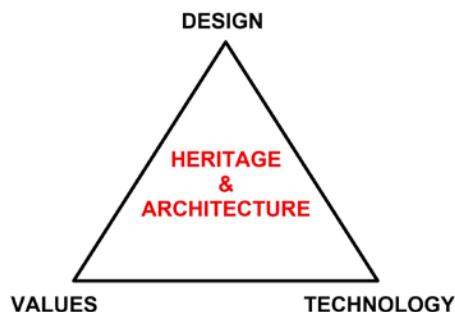


FIG. 3 The Heritage & Architecture triangle (source: Hielkje Zijlstra)

At HA we now expect our students to develop design proposals based in an understanding of the building, its technology and values. Further, the design should also result from the application of technology and present an active response to values. The HA approach is underpinned by the urgency of adaptive reuse, not only as an economically viable strategy, but as an essential strategy to limit environmental impact, nurture social resilience and contribute to the triple bottom line of sustainability. Education at HA is embedded in broader social thematic because "...architectural heritage education is essential to understanding sustainability, the social context and sense of place in building design" (UIA/UNESCO, 2011). HA does not shy away from demographic challenges presented by changing inhabitant profiles of for instance social housing in the Netherlands, and changing conceptions of value, space, time and reality. But the complexity of adaptive reuse within a real-world socio-economic and environmental scenario can prove to be too challenging for students. As educators we need to be able to guide students through their first and repeat adaptive reuse exercises that serve as basis of their architectural education. We have over time developed an educational program as well as a methodology to assist students, who are novices, to demystify the process of analyses for valuation and adaptive reuse design and guide them in their design decision-making. So, we can conclude with Ana Pereira (chairholder of Heritage & Values): *"Heritage is important for our personal and collective experiences, also for future generations. It is not sustainable to only keep the pearls and make those more sustainable,"* (TU Delft, 2020).

The HA educational process aims to increase in complexity over time and stimulate individual independent growth. With this in mind, an education matrix was developed collaboratively by the three HA chairs, progressing from group work to individual exploration. HA focuses on Masters-degree education. The Masters education spans two academic years, the first year dedicated to the MSc 1 and MSc 2 as distinct courses. The MSc 3 & MSc 4 together form the graduation project. In all these courses, HA presents students with a choice of at least two studios, of which one always focuses on the built legacy of the twentieth century. We always select sites for investigation where a real-world question exists, often in collaboration with outside institutions or property owners. In the MSc 1 many of our students are introduced to build heritage as theme for the first time. Many are international students for whom this is their first course at the TU Delft. We therefore select not overly complex buildings for them to study and modulate. They are also assisted by the presentation of a predefined brief and delimitations [20 weeks]. The MSc 2 is based on (group-) research. It focuses on specific topics and typologies, for instance obsolete churches, industrial heritage or ideas such as the mid-twentieth century Dutch Neighbourhood idea or the problem of depopulation,

for which individual designs are developed [10 weeks]. Cases selected for the foundation courses (MSc 1 and MSc 2) are chosen to include pre-existing valuation reports or building-archaeological reports to expose students to values as concept and form first responses as a designer that include values as an informant.

In the MSc 3/4 individual graduation project, more complex situation study sites are selected. This can take the form of a complex urban location or a more wicked adaptive reuse problem for which students need to develop a proposal that balances conservation with adaptive reuse. MSc 3/4 students are required to develop their own appropriate briefs, based in the analysis of the urban context, building and its values, as well as the social-cultural and economic and environmental context of the project. The education process develops from independent analysis on the basis of separate realms (Architecture, Building Technology and Values) to, at the MSc 3/4 level, integrating these into a single position on the inseparable values presented by the physical fabric, intangible qualities and associations of the case at hand (Kuipers & De Jonge 2017). The final aim is a design based in a defined transformation framework that in turn is supported by critical analysis, synthesis and reflection, often through scenario-based iterative testing of design ideas. Student proposals are often presented to owners/municipal authorities, monuments care officials and communities, who provide real-world feedback to their hypothetical proposals. Communication is essential, also to present the evidence-based choices and logical argumentation that led to the proposed reuse interventions.

A challenge we face in our educational practice is that the HA courses form part of the larger Architecture track of the Faculty of Architecture. Students are free to migrate between the various Master courses, which means that not all students participate in all the HA courses in sequence. Often students enter the HA MSc 3/4 without having undergone any of the HA MSc 1 or MSc 2 courses (or having participated in the BSc 5/minor course presented by HA in the faculty-wide bachelor). This freedom enriches our design studios because students bring with them knowledge from different disciplines, but conversely provides HA with a dilemma in terms of educational continuity. It mandates a back to basics position at the start of each of the MSc 1, MSc 2 and MSc 3/4 and challenges staff to assist students to develop defensible evidence-based positions and cohesive design proposal in, in for instance the MSc 3/4, a period of 40 weeks. Group work at the start of each course has proven to be especially useful to bridge this gap.

## 7 RESULTS FROM THE EDUCATIONAL PROJECTS ON THE KADER PROJECT

Various educational projects have now been carried out within the KaDER project: MSc1, MSc2 and MSc3/4 graduation projects. There has always been good cooperation between the requesting party (the province, the local government or owners) and the bidding party (students and teachers at TU Delft). Most of the time we as HA succeed in addressing actual projects but the interaction with the stakeholders is not so intense. It is always time consuming and not clear what the student's ideas could contribute to reality. At the KaDER project we turned it around. So, the interaction with owners, architects, municipality and the province was organised more frequently as part of the partnership in Living Labs. Two projects will be discussed in this paper and some of the concrete results of two projects will be explained in more detail. First the project, the location and the requested products are briefly described and then a number of results that have brought about a change in working method or perception.

## 7.1 LITTLE VATICAN ZUTPHEN

The Klein Vaticaan Education project is a graduation studio in MSc3/4 as part of The Living Lab - XL - Urban: Zutphen. Zutphen is a medium-sized city in the east of the Netherlands with 50,000 inhabitants and includes 43 km<sup>2</sup>. It has a historic centre with many monuments. It is traditionally a Hanzestad (Hanseatic City). Fig. 4. Around 1300 an extension to the city was planned: De Nieuwstad. Part of this was filled in by the Catholic community: a church, a rectory, three schools and a retirement home. Some of these buildings will be redeveloped (when vacant) or restored in future. A joint project team has been started by the municipality of Zutphen. The KaDEr project follows the processes for the redevelopments. The Klein Vaticaan in the Nieuwstad was chosen as an educational project to run from September 2017 till July 2018. 20 students investigated the district and choose a building as an individual design assignment. First, a thorough analysis took place from architectural, technical and values point of view. Fig. 5. This led to design principles and the determination of the position as an architect in relation to Heritage & Architecture. A new program was planned and the design worked out architectural and technological. So, technical and functional sustainability are carriers of the project. In particular, the functional sustainability, the reprogramming of the buildings, is central to this project and provokes discussion. The plans were presented to stakeholders at various times. At the end of the 40 weeks a symposium took place in Zutphen in which all parties and interested people participated. The plans were also exhibited in the town hall during the summer of 2018.



FIG. 4 View on the historical centre of the city of Zutphen (source: Hielkje Zijlstra)

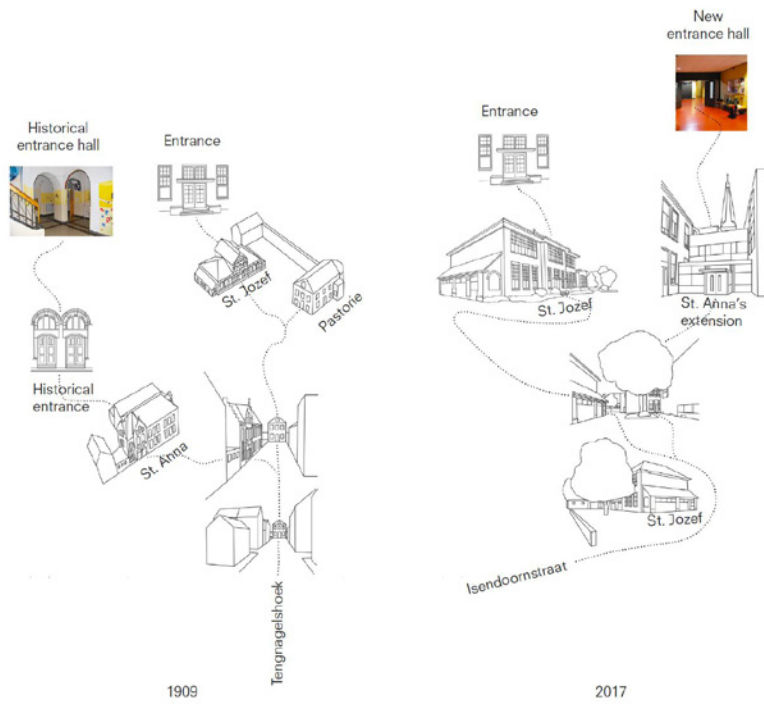


FIG. 5 Analyses of the schools district in the Nieuwstad in Zutphen by two students (source: Birda & Bakker, 2017)



FIG. 6 Baudartius college Zutphen, one of the vacant buildings in the near future (source: Hielkje Zijlstra)



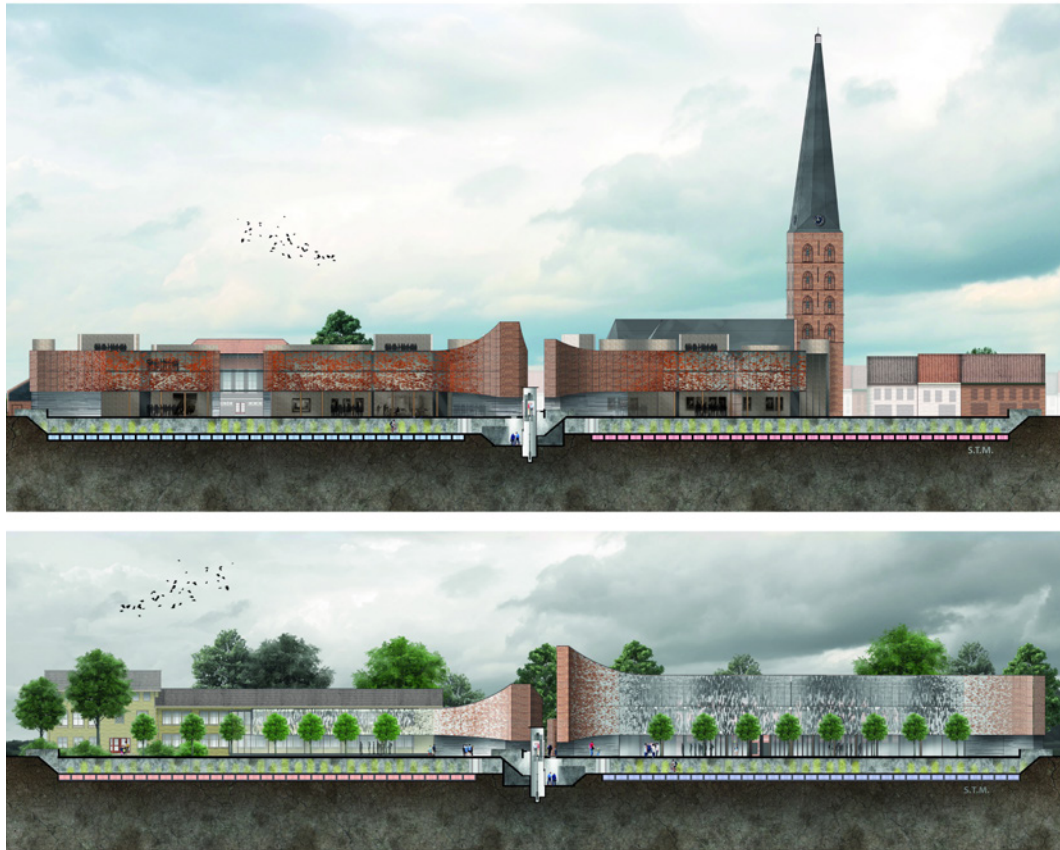


FIG. 7 MSc3/4 TU Delft education project Isendoornstraat Zutphen including Baudartius College (source: Marijnissen,2018)

Various students have chosen the vacant schools as the subject of their plan. It is particularly striking that the Baudartius College, a building from the fifties of the 20<sup>th</sup> century, was the chosen object of redesign by five of the twenty students. Fig. 6. During the exploratory excursion in 2017, the alderman indicated that this building would not be considered because it was nominated to be demolished Fig. 7. The valuation of post-war heritage was not yet up to date in Zutphen. In the meantime, the students' plans have become so inspirational that the building of the Baudartius College has been put on the list to be designated as a municipal monument from the post war period. There are also various initiatives to designate the building again as a school, a residence for artists and an art gallery or for heritage related activities.

## 7.2 REUVERSWEERD BRUMMEN

The Reuversweerd education project in Brummen is a graduation studio in MSc3/4 as part of the Living Lab - S - Building: Reuversweerd. The Reuversweerd manor was built around 1830 in a neo-classical style with stately and symmetrically decorated facades. It was expanded in 1921, creating an L-shaped floor plan. In the Second World War, the Germans confiscated the house and installed a radio monitoring station. The liberators bombed the house for that reason. The owner was shot by the Germans as a revenge action one month before the liberation in April 1945. From that time on, the house has been vacant and is, partly due to war damage, in a technically bad condition. Fig. 8 and 9. The associated farm has expanded and remained functional over time. Nevertheless, the main building still shows part of the original interior finish with richly decorated stucco ceilings, fireplaces, panelling and wall frames. Reuversweerd has a new owner since 2017. He is going

to restore the building to a residential and retreat centre. Students worked on this project from September 2018 – July 2019 as part of their graduation project. Five students examine the main building, outbuildings and gardens. Fig. 10. New programs were planned and further elaborated. The construction and interior design in particular require attention. Here too, presentations and discussions are organized during the design and at the end. Fig. 11. In December 2019 the plans were exhibited in the hall of the house of the province of Gelderland in Arnhem.

In particular, the owner and the architect of the Reuversweerd project were not sure how to deal with the war damages that are prominent in the building. Because it is one of the last buildings to show this, agencies such as the Cultural Heritage Agency and the Gelders Genootschap are concerned about the way in which this will be visible in the interior and exterior after the restoration. The students submitted a collection of ideas on how to deal with this. The owner will use their ideas. Based on the imagination of the students, a number of solutions are chosen that will be implemented over time: partly maintaining the impacts in white-finished walls in the stairwell, in a few places healing the damage whereby the cracks remain visible like a Japanese Kintsugi object and to frame the damage, creating a still image that requires appropriate attention. Fig. 12 & 13. Also ideas about a watch tower, linear connecting walking path and the entrance at the backside of the main house will be 'copied' in the real plan.



FIG. 8 Reuversweerd exterior in 2017 (source: Hielkje Zijlstra)



FIG. 9 Reuversweerd interior in 2017 (source: Hielkje Zijlstra)

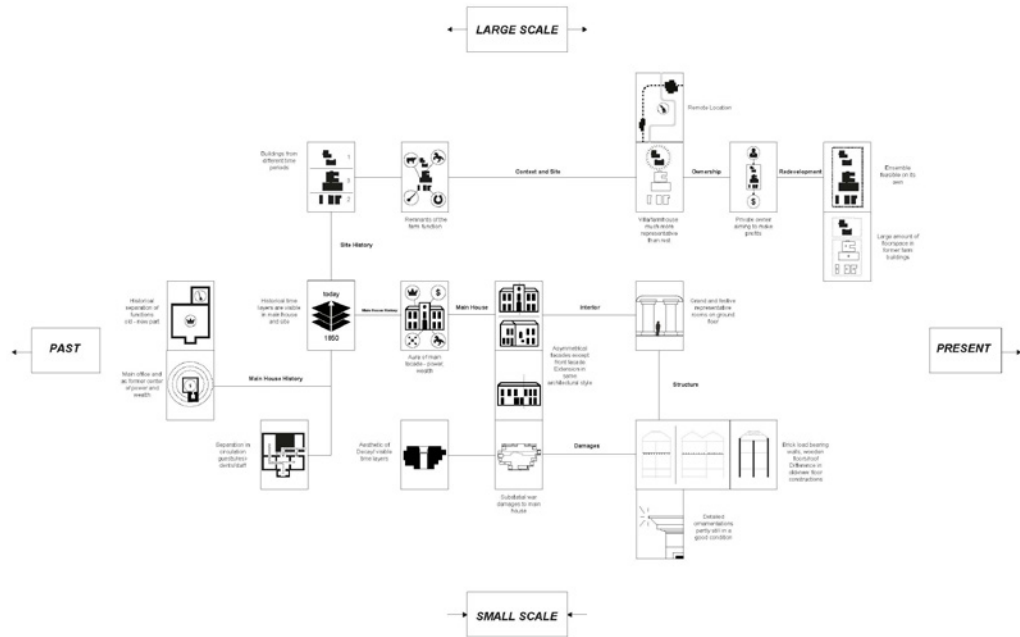


FIG. 10 Analyses by students Reuversweerd (source: Düber & Bianchi, 2018)





FIG. 11 Site visit with students at Reuversweerd (source: Hielkje Zijlstra)



FIG. 12 Plan Youri Slaghekke war damages repair in a Japanese Kintsugi way (source: Slaghekke, 2019)





FIG. 13 Plan Johannes Düber war damages framed like pieces of exposed art (source: Düber 2019)

## 8 CONCLUSIONS

The KaDER project has offered the TU Delft the opportunity to anchor education in research and to reconsider our education methods in relation to research and practice. In addition, research has not only generated subjects and interaction for education, but with their design's students contributed to new insights for institutions and owners. A substantial contribution was made to Living Labs of the KaDER research project. By engaging a next generation of architects and researchers in training on existing issues and current projects, insights were gained, opinions shifted and concrete solutions were outlined. By linking the research to the Living Labs, not only in a passive form of research (monitoring, analysis and evaluation), but in an active form (design, discussion and participation) worked well. The province of Gelderland embraces this approach. One of the conclusions of the KaDER project as a whole is that this method will be perpetuated by the province of Gelderland in their policy from now on. So, the teamwork will continue after 2021. For the development of the education method of HA it helped as well. The interaction with stakeholders in practice is very useful, but must be organised very well. there must be something to be gained for all parties. This needs to be organised very well on forehand to profit from this partnership. For the HA education method the research part will be addressed more seriously in the graduation studio brief. It will be more than analysing. Actual themes will be formulated to influence design and research from both ways. We started to work on that. From September 2020 on the HA MSc3/4 graduation studio's will be more research based, heritage related and design driven.

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