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A Partnership model for Sustainable Transition

How Municipalities can use Practical Innovative Partnerships to be seedbeds for sustainable growth

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Partnered with

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Summary:

This thesis investigates the partnerships model Practical Innovative Partnerships (PIP) ability as a tool for Danish Municipalities to use their agency to create seedbeds for sustainable innovation. The main research question being: *How can the agency and governance of Danish municipalities be used through Practical Innovative Partnerships (PIP) as a seedbed for the development of a sustainable transition in the Danish building industry?*

Based in the theoretical approach Transition Theory, with the newer *situated transition space* and *seedbed* concepts applied a mix of primary data collected at a workshop, previous research on PIP, expert interviews, and secondary data from documents such as journal articles and legal proceedings are analyzed.

Each chapter of analysis set out to answer a sub-question to the main research question. Chapter 6 finds the state of the art is such that there is good evidence for the municipalities having a positive effect on sustainable development when engaged but that there also are several challenges to this. Chapter 7 finds that key elements of PIP can be used to aid the municipalities apply their agency to creating a seedbed for innovation. Chapter 8 finds that it is difficult to 100% ensure a sustainable outcome but that through honest collaboration with research, transparency in the projects, sharing of knowledge and not biting off more than you can chew the municipalities employ PIP to add to sustainable development.

Finally, all these findings are set together in discussion to conclude that through honest collaboration with research, transparency in the projects, sharing of knowledge and finding their space on the PIP spectrum in a given project, the municipalities can employ PIP to create a seedbed for sustainable innovation.

Thanks, and acknowledgement

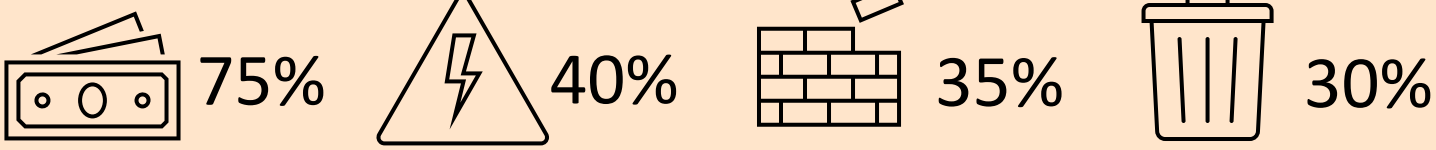
It is my hope that through my work with this PIP model, adding new tools, reaching out to a network of builders, municipal workers, researchers, and architects speaking with enthusiasm about this opportunity I have aided in making the use of this tool possible. Especially in my work and partnership with Juul & Hansen Architects, who have supported my experimentation and given me inspiration. The kind guidance of my supervisor Stig Hirsbak, who gave me new ideas and connections with GATE 21. And Mette Marie Nilsen from GATE 21 who believed enough in my ideas to give lend me time to hold a workshop with the Circular Builders project group. My supervisor Arne Remmen for his help in honing the description of what I am researching. Finally, to my family for lending a patient ear and a scrutinizing eye so that this project could be it best.

I am so thankful for all this support and hope that they along with anyone who reads this, or the manual also find inspiration in it.

Table of Contents

1. Problem Formulation

Denmark is one of many countries committed to reducing CO2 emissions and resource waste. An important field of focus has therefore become our buildings, from construction to use and maintenance to end of life, buildings are a significant contributor to CO2 emissions and resource waste (Regerings Klimapartnerskab bygge og anlæg, 2020). Much research has been done on how to convert to more sustainable building materials and practices. On how to reduce buildings energy needs and how to recycle materials. These are all important steps in building for a greener future but seem to be lacking in representation in the practical building projects of today where ridged processes, regulations and tender laws leave little room to experiment with the implementation of these innovative ideas in real world projects (Værdibyg, 2020). Tackling this will require investigating how to best support the use of new technologies without compromising on the safety and comfort that regulations aim to uphold. Therefor I would argue that there is a need for looking at the process by which a building goes from idea to reality. This approach to process can become a crucial tool for ensuring an innovative and sustainable outcome. Secondly, I would argue that municipalities require new tools to take hold of their agency to govern this transition. They are repeatedly pointed to as the spear head of this movement towards sustainable construction, but are also restricted by time, politics and money, so smart tools must be applied to work in this system.



In economic terms about 5% of the Danish BNP is used on building and construction, investments that among other is used for renovation and new constructions. More than 75% of Danish assets are bound to the built environment. This has led to a renewal of the existing building mass of about 1% yearly (Sattrup, et al., 2018). Setting this into perspective of the now ubiquitous numbers of the resource costs of the building industry in Denmark; 40% of the energy – 35% of the resources consumption – 30% of waste, the environmental costs of the industry and economic impact cannot be ignored (ibid). It is necessary to ensure a future

where these important building assets are sustainable in use and that the industry has the competences to build and renovate sustainably and circularly. Perhaps by facilitating spaces for the development of new innovative building practices and building networks the municipality can help make this happen. A model for this could be Practical Innovative Partnership. This model functions under the tender law (tilbudslov) and allows the municipal workers to take part in the innovation process. By using resources and time that would have been used in a traditional tender process under the procurement law (udbudslov) on collaborating with partners on the project, there is an opportunity to build competences in sustainable building practices in municipal building departments that might not otherwise have had the time.

This thesis builds upon prior research into the building process Practical Innovative Partnership (PIP), which calumniated in an project/internship report called "Evaluation of the Practical Innovation Partnership" (Darville, 2021a) and a memo that I delivered to the members of the PIP and GATE 21's Circular Builders group called "Praktisk Innovative Partnerskab: Evaluerende Notat" (Darville, 2021b). This is a new form of public-private partnership that Juul & Hansen Architects applied to the building project *Botilbud Søndersø* with Furesø Municipality as builders, Dansk Brand Institute as researchers and Jacobsen Huse as entrepreneurs. This was as far as I know the first attempt at building with this type of partnership model under the Danish tender law §12[1]. Working under this paragraph in the tender law allowed the municipality to choose their partners and skip on costs related to the tender process on the condition that these resources instead are used to focus on creating sustainable innovation and sharing their experiences (Darville, 2021b). I joined with Juul & Hansen Architects at the end of this project and was curious to investigate how it had gone

Project facts

Build: New · 2020-2021
Size: 992 m^2 · 1 floor
Economy: 22 mil. DKK
Team: Furesø Municipality · Juul & Hansen Architects · Jacobsen Huse · Dansk Brand Institut

[1] Tilbuds lov, used for building projects under 40 mil DKK

and to see if this model could have potential as a way for more municipalities to develop competences in sustainable construction. In this previous research I set out to answer the question: *How successful was the Practical Innovative Partnership in the project Botilbud Søndersø in creating new competences and innovations in green building processes for the participating parties? And how might this be further built upon?* (Darville, 2021a).

Through analysis of interviews, planning documents, meeting references, contracts etc. I found that the partnership in many ways was successful in setting goals and meeting them, but that vague language and unclear responsibility assignments also created difficulty for this PIP. External factors like legislation and regulations surrounding fire safety also made the implementation of innovative biobased solutions difficult. Although proved safe through trials there were still more issues then warranted in the certification stage (Darville, 2021a). This PIP was able to overcome such hurdles through open communication and trusting relationships, lifting everyone's competences during the process.

Tools like FRAME and a starting "Declaration of Intent" were key to making the partnership work. In the study I further add to the tool belt with the Value Compass and leadership structure that future PIPs can use to build a strong partnership and check in during the process. I have since been given a permanent position at Juul & Hansen Architects as a student assistant and continued the collaboration in this project as well getting advice, guidance and knowledge sharing from my colleges. This thesis moves beyond the narrow scope of one project to see how the PIP model can aid in a greater transition of the building industry.

But most importantly this study sets out to investigate how building up competences in smaller projects and partnerships can giving municipal builders the confidence to tackle all projects through a sustainable lens. Taking reasonability throughout the project and finding models for communication and collaboration between the different actors involved in the building, from construction to use. Municipalities can use their agency to provide the space for new networks and develop the competences of not only themselves but also those whom they collaborate with and those who share in the knowledge and experience that they municipalities can communicate. Thereby, a greater transition can be achieved. Municipalities can act as a gardener of sustainable innovation, providing a plot of land with a well-nourished seedbed from which new ideas and connections can grow. This thesis sets out to investigate how this scenario might become reality using PIP. So, the research question is as follows:

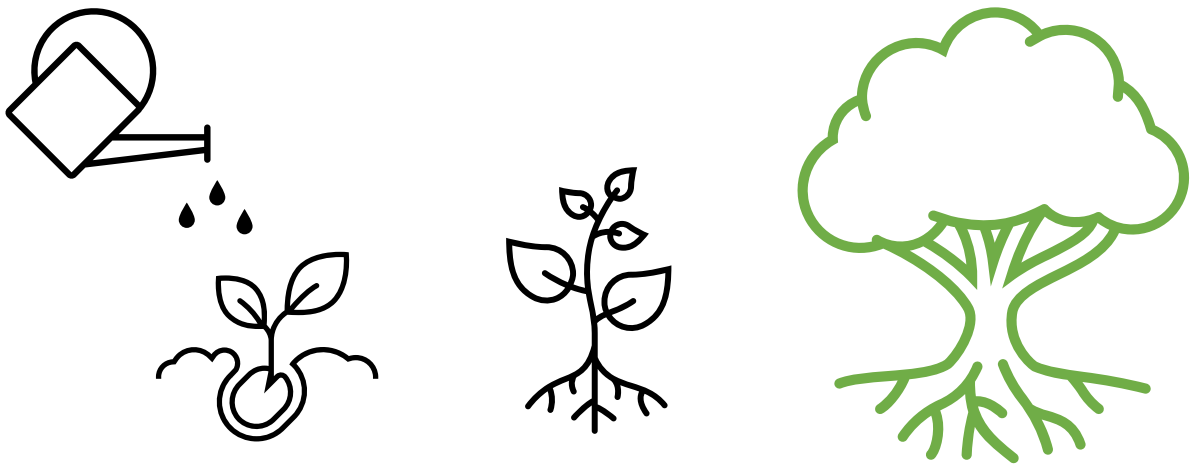
2. Research Question

How can the agency and governance of Danish municipalities be used through Practical Innovative Partnerships (PIP) as a seedbed for the development of a sustainable transition in the Danish building industry?

- What agency and governance ability do Danish municipalities have to affect the building industry today?
- What key elements from the PIP model are best suited to aid municipalities to apply their agency to the creation of a seedbed for innovation?
- How is it ensured that the outcome of a PIP is adding to sustainable development?

These are the main questions that this thesis sets out to answer. Looking into especially how the municipality can act and use their power or agency to do so. Analysis is split into three chapters each answering a sub question, with the first sub-question guiding the state of the art as it seeks to understand the state of things providing the needed background. The next two sub-questions look more into aspects of PIP and sustainability, together leading to the discussion and answer to the main research question.

The findings of this thesis are then distilled into a separate small Danish manual aimed at municipalities and advisors on how they might apply PIP in their work and take hold of the agency to create seedbeds for sustainable innovation becoming the gardeners of sustainable growth.



3. Theoretical Understanding

3.1. Philosophy of science

All good research is based on an understanding of the researcher's role in relation to the object of study and the world in general. Reflecting on this can be a vast philosophical task but by finding an existing philosophy to relate to helps (Egholm, 2014, p. 145). For this thesis it was important to understand how a new partnership model can move from local change to a larger disruption of the status-quo and empower municipalities and their network of collaborators to build more sustainably. Therefore, I have chosen to base this study in the understanding set out by Social Constructivism.

3.1.1 Social Constructivism

Social Constructivism provides an entry point to understanding the world and how one might analyze one's way to the root of a problem. The theory assumes that the world is made up of constructed understandings that can be challenged and changed. In other words, there is no such thing as an explanation that goes "that's just how it is and always has been". The ontological approach of social constructivism is understanding how a phenomenon is created in a specific context (Egholm, 2014). Attention is put to the way phenomena appear and the impact they have on their contexts. For the topic of this thesis, it means that the way municipal builders act and run a building process is derived for a history of policy changes, restrictions, traditions etc. Understanding how systems are created through history by people is important to then knowing how to move or change that system (ibid.). This knowledge can empower those who seek to challenge the status quo.

This thesis sets out to understand how municipal builders can harness their agency to push for a transition to more sustainable building practices. Understanding how their role has become as it is today and what movements are happening already will allow for better analysis of how the PIP model can be set to the task of giving this agency to the municipal builder. As

a researcher the perspective allows for deeper reflection and investigation of the socially constructed systems at play when running a public building project.

The epistemology of social constructivism is founded on the idea that knowledge always is colored by time and place, and is therefore changeable (Egholm, 2014, p. 145).

> "As a consequence, knowledge is considered both a result of the context and a tool with which to transform it. […] The studies are often inductive, as they take the specific context as a point of departure to define relationships" (Egholm, 2014, p. 145).

This thesis wishes to continue in the tradition that research should aim to empower social change for the betterment of the people and places studied. This thesis investigates how more sustainable practices can be implemented in the building industry and especially how the municipality can use their agency to bring different groups together to experiment and bring about this change. How to build with a more holistic and collaborative process and ensuring that the people who end using this building can benefit from the well thought out planning and sustainable innovations. Especially working with PIP should create the space to learn to collaborate in new ways with the goal and build competences for the betterment of our built environment and the impact it has on the earth's scarce resources. For this the social context is crucial and by applying the understandings from social constructivism that it is indeed social systems that shape our understanding and experience of the world, I hope to understand how this applies to this context. This study sets out to investigate a socio-technical system but the context in which they are placed and the agency of the actors with in it is important.

3.2 Reflection on the role of the researcher

This philosophical approach to how I research also leads to other questions of my role as a researcher. For one I do not believe that it is possible to be objective in my analysis but that through interviews, document analysis and looking for knowledge outside of myself that I can ensure a fair analysis of this topic. I am not without agency as I have a desire to aid in the development and implementation of PIP. Through my research I have sought to communicate with the actors that are necessary to make PIP possible, municipal builders, researchers, consultants, and the development network GATE 21. I am also further ensuring that my research

findings might find its' way to the right eyes by making a short Danish manual on how municipalities can use PIP to be seedbeds for innovation and sustainable development.
Furthermore, I am colored by my working at and with Juul & Hansen Architects who started working with what we now call PIP in their project Botilbud Søndersø in 2020, as introduced in the problem formulation. I have been given full autonomy over my research and am able to use my position at the studio to gain more insight into how the building process works and test any preconceived notions or misconceptions with them. Also, it gives me access to more actors in the building industry as they closely collaborate with entrepreneurs, municipal builders and participate in different architect networks. No one at Juul & Hansen Architects has edited in the statements and analysis in this study but rather contributed with knowledge both actively when I asked and passively through my observation and participation in meetings and the like.

With these philosophical understandings in mind, I choose my guiding theory for analysis. Sustainable Transition Theory fits into these philosophies as it also builds upon understandings from the past to understand the present situation and then further finds how the knowledge of past change can inspire future transitions. For how I applied this theory to this thesis analysis see section 3.3.

3.3 Sustainable Transition Theory/ Multi-level Theory

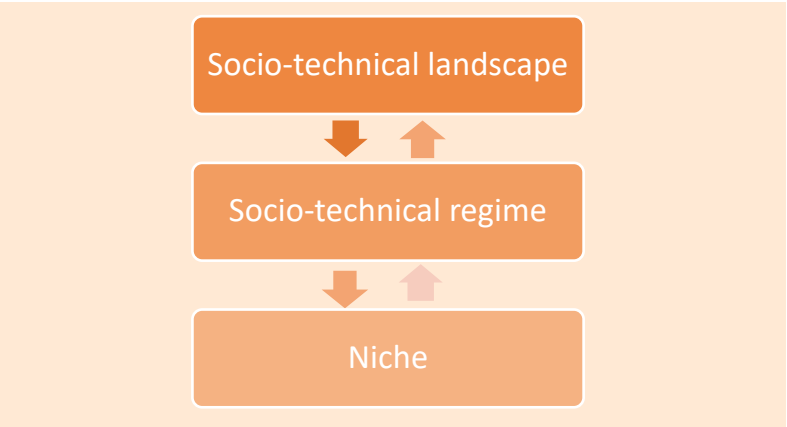


Figure 1 Multi-level model (Geels, 2004)

Sustainable Transition Theory contains the assumption that change through history adheres to certain patterns. The theory claims that transitions occur across different socio-technical layers. A shift is understood as "a nonlinear shift from one dynamic equilibrium to another" and is concerned "with grand societal challenges" (Loorbach, et al., 2017). Firstly, that the status-quo of a socio-technical system are the dominate technologies and practice, this is called the socio-technical regime. In the case of construction this could be the use of cement as a dominant material with technologies, regulations and practices made to fit so that using cement in construction is understood as the safest and most cost-effective material. Now if history has taught us one thing it is that few things are stagnant and unchanged, go back 100 years and cement and prefabrication was not in use in construction. So, what pressures inspire change in the socio-technical regime? One is from things above and out of the control of the regime to create a disruption in the status-quo. These are events such as financial crisis, war, climate change and the like. These are events that occur in what is called the landscape. If we return to the example of the cement in construction, then climate change has created a pressure to find less polluting methods to build with the re-introduction of materials like wood. A less drastic pressure of change is the gradual development and refinement of new technologies that grow to become impossible to ignore and are assimilated into the regime either by adapting to the practices already in place or by making a strong enough case to change them. The theory calls these socio-technical niches, an example could be that some entrepreneurs see the need for using less cement in construction and locally develop alternate solutions that then can be refined and compete to become the first to find the solution that can fit into the status-quo or successfully lobby to have barriers of entry removed. Such as that wood panels can be prefabricated similarly to cement ones and be done in a way that lives up to fire codes, thereby competing directly with cement. However, a short coming of the base model of Sustainability Transitions is that the agency of different actors tends to be downplayed (Sovacool & Hess, 2017).

3.3.1 Situated Transition Place

In this project understanding the agency of and governance of the municipality is important as I hypothesis that they can be facilitators for transition. So, a further understanding of the theory is needed. Development has been made to this transition thinking, which points to the agency of the regime to also facilitate a sustainable transition. Especially municipalities have an interesting role to play as builders, political authorities, and local planners.

> "Local projects can establish the framing for a reconfiguring of the local actor-networks and thereby function as facilitators of a beginning change of the socio-technical systems" (Holm, et al., 2014).

Holm, Stauning & Søndergård (2011) dubbed this a *situated transition place*, this is because the transition starts by a development in a specific situation yet still have a wider effect through the social and technical learning and development potential. In the case of PIP, a partnership and project will be situated in one local context and innovative solution for this, yet the competences that the partners acquire and the solution that is found may be applied in other situations and thereby aid in the sustainable transition of the regime. Thus, *situated transition place* can be understood as an analytical term which bridges transition processes that occur in a local context to that of the general socio-technical systems.

3.3.2 Agency and Governance

Another criticism is that it can be hard to be sure when something is a part of the regime or a niche especially when, as in this study, an established organization as a municipality play enters the dynamic of niche innovator (Sovacool & Hess, 2017). Finally, the theory tends to be stronger when it comes to analyzing past transitions, than to frame how a future transition may occur (Sovacool & Hess, 2017). Looking to the future is never an easy exercise but understanding the role of multi-level governance and the bridge between a local innovation and how this can become a situated transition place.

So, what does the understanding of multi-level governance aid to the analysis of municipalities as facilitators of transition? Well, its' important to understand that the municipalities exist in a hierarchy of governances as both an actor who governs but also who is governed from above by the Danish State (through building codes etc.) who in turn are governed by the European Union (building legislation and planning). This socio-technical network must also be addressed as PIP only can exist in light of these governances and it brings better

understanding to the actual agency of municipalities to enact the change that they have been charged with in many a report on the Danish road to a sustainable building practice.

> "Accomplishing urban low carbon transitions becomes a matter not only of policy, or 'niche' experimentation, but of the reconfiguration of socio-technical network – a process that is at once highly political and open to contestation and disruption" (Bulkeley, et al., 2011, p. 30)

The agency of the municipality can be further understood through Geels (2011) analysis of the role of cities in technological transitions in a historical context finds that cities primarily play three possible roles:

As a *primary actor* by establishing local transitions (e.g., incentives in local planning)

As a *limited actor* who only distributes national planning

As a *seedbed* for potential national transition (e.g., experimenting with new partnership models and building technologies)

It is especially interesting to see how the municipality can work as this seedbed for as Geels describes:

> "In these transitions, cities act as initial seedbeds for the creation of niches and the performance of entrepreneurial experiments with radical new technologies" (Geels, 2011, p. 22).

This is very much in line with the aims of PIP, where the municipality can use its' agency to support itself and other actors in growing new competences in sustainable construction along with the development of new technologies for public use. Being a communicator of its' findings and incentivizing entrepreneurs and scientist to participate in the creation of innovative solutions.

3.3.3 Summary

To surmise, this thesis theoretical view is grounded in the base assumptions of Sustainable Transition Theory yet brings into play furthermore recent developments to the theory, namely the concept of *situated transition place.* This leads to a more active understanding of the agency and governance roles of a multi-level socio-technical network. These understandings are then actively used in analyzing the data of this thesis, the collection of which is described in the next chapter.

4. Methods

This section of the thesis will dive into how methods were applied to the data needed for analysis. This is done in relation to the chosen theory's epistemological understanding that "knowledge is always colored by time and place, and therefore changeable" (Egholm, 2014, p. 145), described above. A mixture of primary and secondary data was collected, with a critical approach ensuring that they come from reputable sources or are the true reflection of the subject's opinion and experience.

4.1 Document Analysis

In this study that majority of document sources are secondary. Besides building on the findings and documentation of the prior project "Evaluation of the Practical Innovation Partnership" (Darville, 2021a), this study uses documents shared throughout the participation in the Winter Academy (see section 4.4), journal articles relevant to the subject, news articles about building partnerships and other such documents. This means that a large part of the documents used have already been analyse in the prior project were planning documents, meeting minutes, mail correspondence and other documents directly related to Botilbud Søndersø for contributed to adding context and depth to other collected data (Darville, 2021a). It is therefore also important that I am aware that these findings can be coloured by my perception and possibly by preconceptions. Also, more information and development to the PIP model has happened since this and it is therefore affected by the time in which it was written leading it to be a good base from which to work but cannot stand alone. With the philosophical understanding derived from Social Constructivism by which I am guided this perspective also applies to documents not written by me, meaning consideration of the context and significance of these documents has been in mind through work with all documents (Flick, 2014).

Many of the analyzed documents have been used in the background of the study. Setting this study into the context of other research and case examples of partnership models and municipal builders transitioning into leaders of sustainability in construction. This has meant that a critical approach to literature search has been taken. Asking the questions who is this

written for and why? Looking into the possible motivation and understanding what the document wants to communicate and why it is important to use documents in an analysis (Flick, 2014). Pulling on the advice and experience of those of my colleges that have worked directly with PIP has also aided in understanding documents related to this. Having documents shared to me from my supervisors and too be able to reflect upon found documents with them has also been instrumental to ensuring that I have a proper grasp on my fields of study and be able to cut away that which does not serve this thesis.

Understanding the status-quo of the municipal builders' abilities to build sustainably and in extension that of the Danish building market is crucial to my choice of Sustainable Transition Theory (Holm, et al., 2014). Document analysis has allowed me to establish this background and in turn be able to plan out how I would collect primary data. Being informed about the industry and what is moving in it was important to engaging with experts and planning a workshop. How the workshop data was collected and used is what will be discussed next.

4.2 Workshop

An important source of primary data was collected through a workshop held the 19th of April 2022. This workshop was facilitated through the non-profit partnership GATE21 as part of their Circular Builders project that gathered municipal builders from 9 Danish and Swedish municipalities to experiment with the use of circular building principals and be introduced to new possibilities. At the workshop Hannah Rosa Rash from Juul & Hansen Architects and Rikke Bojesen from Hørsholm Municiaplity (formerly Furesø) shared their experiences of working on PIP project from the role of respectively the chef architect and municipal builder. They then answered questions from the attending group leading into tasks and questions set out by me the researcher to collect data. During all of this I was also able to collect observatory data and ask impromptu questions of the participants while participating in the workshop activities. Notes were shared with me on the group that I was not a part of.

The workshop was held at the offices of GATE 21 in Albertslund with some of the participants of the workshop joining online through a smart screen where it was possible to hear and see the room the rest of the participants were sitting in. There was a total of 12 participants with 8 of the participants working in different municipality departments related to construction. The other participants were people related to the Circular Builders project, AAU, Juul &

Hansen Architects, and me. I have chosen to keep participants anonymous in the hopes that this would give a freer conversation and because it in my subsequent analysis is not important were the participants where from but rather the general opinion and experience that they represent. The group already knew each other from earlier meetings in the network but had not met in person before due to covid restrictions.

Before the workshop began, I shared what propose I wished to use the workshop for, about how I would like to take notes, pictures and use this in my project. The workshop proceeded after getting their content and assurance that their identities would remain private.

The workshop started with presentations by architect Hannah Rasch and municipal builder Rikke Bojesen, sharing their experience with doing a PIP project together (see slides in appendix for more). During their presentation I observed and noted questions that they were asked.

I then presented the work that I have done in evaluating and now further developing the PIP model with the idea of the PIP spectrum, something that seemed to awaken the interest of the participants. Again, I took notes on the type of questions that were asked, concerns and interests that were brought up, all of this is collected in the appendix folder *02_Workshop*.

4.3 Knowledge gathering through participation in Winter Academy

During the data-collecting process of this study I participated in the 2022 Winter Academy hosted by Concito at BLOXHUB. It ran with an introduction day 14th of March and then during the 21st -25th of March. The theme of this year was "The past as an approach in today's transformation for the future". The academy is specifically aimed at young professionals who are either newly educated or finishing their masters. This was an opportunity to meet with experts in the field of sustainable construction, architecture, planning etc. This was also a chance to speak with other young professionals to share experiences and receive advise.

Picture 1 Poster from event (vinter akademi, 2022)

First at the introduction day and then also throughout the week there was many lectures with experts in their field presenting their take on sustainable construction in Denmark now and into the future and how we can learn from and build upon knowledge from the past. Some notable speakers were Søren Nielsen architect and partner at Vandkunsten, Niels Bjørn consultant, author and podcast host, and Harpa Birgisdóttir professor in sustainable building at BUILD AAU see appendix *01_Winter Academy* for the full program and list of speakers.

Picture 2 Groupe photo of participants. I sit as the second from the left (vinter akademi, 2022)

The academy helped me build a large network of other likeminded young professionals that strive to create a more sustainable building industry. This also gave great insight into the type of real-world dilemmas that exist in this proustite from different fields in both the public and private sector.

For this thesis these experiences and notes taken during lectors and debates were a key component in understanding the status-quo of the building industry and its development of sustainable solutions today and in the past. An important focus for the academy was on affordable housing with public builders. We visited developments in Tingbjerg and Bella Høj as well as a restoration project on Thoravej 29 for an art house aimed at supporting socially weak individuals and artists. Case visits allowed for a rooting into real work that is happening in the name of this development and gave the ability to have discussions founded in the cases and how experience from these might be transferred to another project.

4.4 Expert Interviews and background Interviews

In the fact-finding phase of this research, I have spoken to and interviewed different experts within the realm of building processes and sustainability. Martin Visby Buchard (cand.tech.soc.) who is writing a phd on "Demonstrating systemic urban development for circular and regenerative cities" provided context and guidance on where to focus a process-based project and how these smaller projects can be a pre-curser for the possible larger projects under the tender law[2] following many of the same practices of early participation and trust.

Speaking with Mette Marie Nielsen who heads the Circular Builders project at GATE 21 was also a great way to get insight into the barriers and questions that are brought up when working with municipalities to implement sustainable building processes. This was especially helpful as lead up to the workshop I held in the Circular Builders project group. Getting to test assumptions and ideas against Ms. Nielsen's practical experience working with the representatives from different municipal departments related to building, aiding in ensuring I did not just build upon my own preconceptions (Flick, 2014). During the workshop itself I was able to further question and observe how these representatives (see 4.2).

These interviews all allowed for a level of depth and contextualization of my knowledge as well as pointing me in the right direction for where to find more data. How this data and that collected through other methods was applied to the different levels of analysis and the overall project structure is described on the next page.

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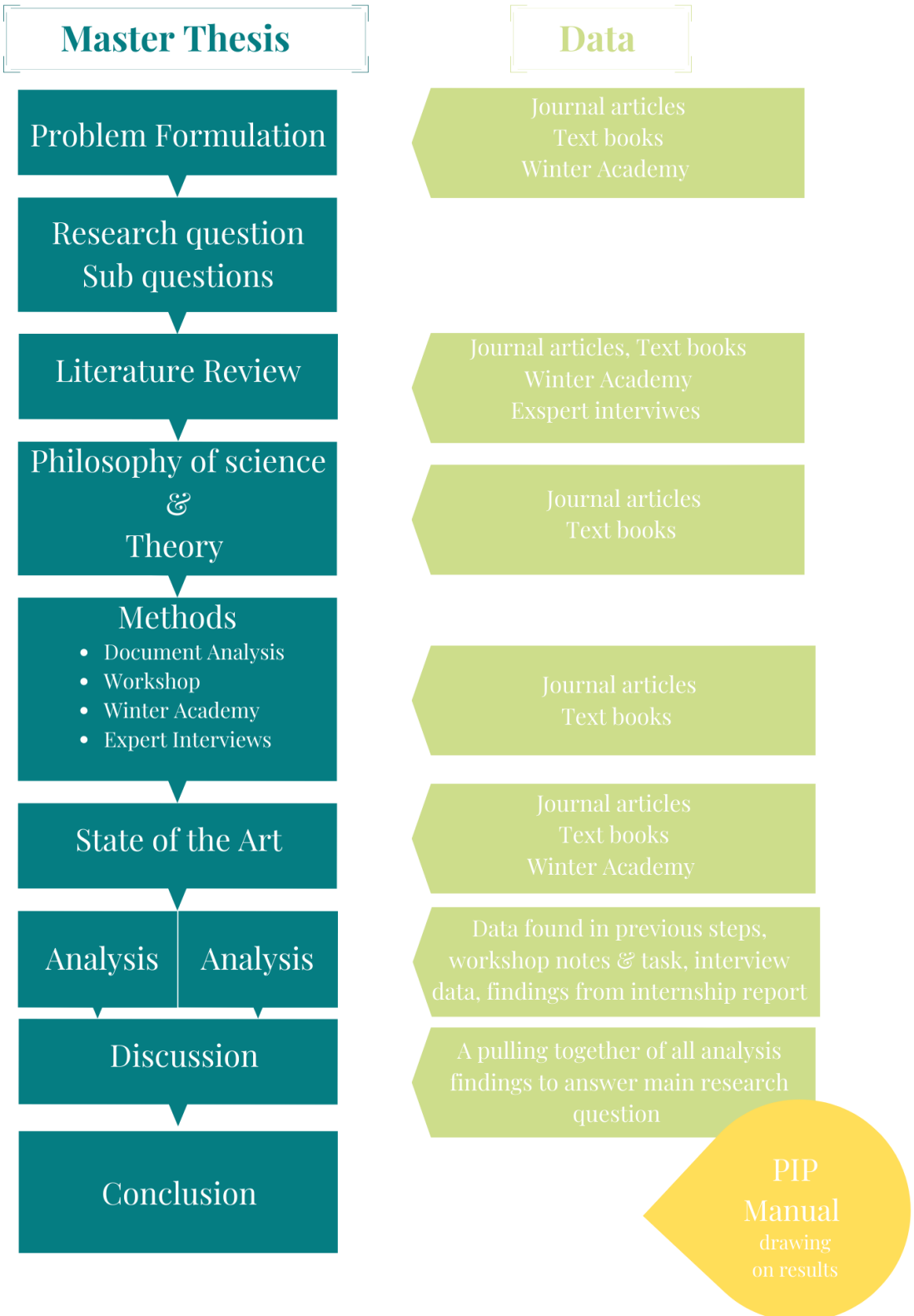
5. Project Structure



6. State of the Art: Municipalities as Actors in the Building Industry Today

In this chapter I will set this research into the context of the field of research concerning municipality's ability to affect sustainable development especially within construction. This is done with the use of journal articles on municipal governance and agency, a deeper look at the *seedbed* concept and a take on the movements in Danish regulation and strategies for sustainable construction. By this a picture of the status quo of the municipalities role in the building industry and other researched avenues of change can be set in the context of the PIP model. By this the first sub-question *what agency and governance ability do Danish municipalities have to affect the building industry today?* is answered.

6.1 The use of Danish Municipalities' Agency in today's Building Industry

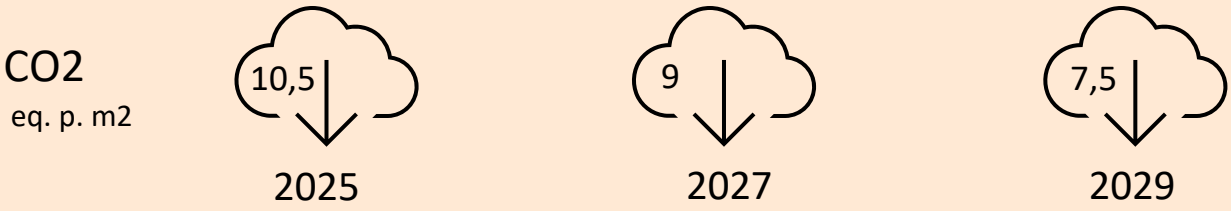
Firstly, diving into the status-quo for the agency and governance model at play for municipal builders today. But first a little history lesson on the municipalities' work with sustainability. Governance initiatives were at first characterized by having a narrow ecological perspective. Influenced by new sustainable strategies such as Agenda 21 municipalities began to take an active role in their sustainability efforts, however this was mainly with an environmental focus (Quitzau, et al., 2022). Thus, environmental experts were seen as the ones who worked with sustainability and did so in projects that were separate from the overall organization. This resulted in sustainability being seen in technical system optimization and facility management (ibid.). By the 2000s sustainability had moved up to becoming a major policy focus for governments, leading to a broader sustainability management scope. This was further aided by Agenda 2030's launch of the UN's 17 Sustainability Goals (SDGs), which pointed directly to the need for sustainable leadership through collaboration and partnerships (ibid.). This challenges the municipalities who still mainly have their sustainability expertise in an environmental perspective. This led to a shift were municipalities start working more with strategies for sustainability and need to navigate how they can act. So, what room is there to act today?

6.1.1 Regulations, Restrictions and Risks

The building industry is highly regulated with any project needing to live up to building codes, working codes, fire & static certifications, tender laws, and city plans. There is good reason for all this regulation as it ensures that buildings are safe both during construction and afterwards in use. This however also means that there are many binds to navigate when wanting to change the way you build. The system today is built up around methods and materials that are known and have proven then selves and is colored by lobbyism for large producers. This regulation is governed on different levels, with certain demands to e.g., tender law coming from EU policies, the Danish government setting increased energy efficiency and documentation decrees and municipalities deciding on local plans and running building projects. So, it's all a little complicated with many levels of reporting and documenting to keep track of.

There is a great power in these regulations, and they greatly color how the built environment looks. Since the oil crisis of the 1970's regulation increasingly focused on making energy efficient buildings something that has carried into regulations of today, where new builds are built to be very energy efficient (Holm, et al., 2014). There was however a lack of focus on the other elements of a building that are costly for the environment, namely the sequestered CO2 of raw materials used and wasted in the building practices of today. This need was addressed in 2004 by the European Commission who gave the CEN's Technical Committee 350 (CEN/TC 350) a mandate to "provide a method for the voluntary delivery of environmental information" (Anderson, 2012). Here after clear rules for how Environmental Product Declarations (EPDs) creating standards across Europe in the EN 15805 standards (P Huedo, et al., 2019). These motions created a data base that they could be applied effectively in Life Cycle Assessment (LCA) and Life Cycle Costing (LCC) models (Mirzaie, et al., 2020).

With the rise of LCA and LCC provided a means to document the long term environmental and economic costs that buildings have becoming a part of the general documentation in the building code (Indenrigs- og Boligministeriet, 2021). These have become a core tool in the transition to circular construction processes and circular economy. At the same time the idea is to lower the cap of allowed emissions with the following kilos CO2 equivalents per square meter:



These are just the general caps, more stringent caps of respectively 8, 7 and 5 kilos CO2 equivalent per square meter will be demanded to qualify for the Danish sustainable building class (Indenrigs- og Boligministeriet, 2021). The 26th of April 2022 a new hearing on further changes to the building code was made on adding a 12 kilos CO2 eq.p.m2 from 2023 and that manuals in how to report LCA data and other documentation for the new demands will be published in the fall of 2022 (Albrechtsen & Friis Jensen, 2022).

This is all to say that there are ongoing changes and adaptation happening to the building codes, that sustainability is being given more focus. But it can be difficult to navigate and keep up with all these changes and mean that municipalities can fall into more of a *limited actor* simply distributing legislation and strategies that are set out by the government. Yet if you look more into strategies that the government has commissioned, like that of *The Governments Climate Partnership for Building and Construction*, who made a report in 2020 with their recommendations for how to ensure a green transition pointed to the municipalities as being valuable actors to enact this change as a *primary actor* (Regerings Klimapartnerskab bygge og anlæg, 2020). So, let's take a closer look at how the municipalities fair under this mix of empowerment and restriction when it comes to enacting change.

6.1.2 Faster, Cheaper ….and Greener

So as mentioned in the little history lesson at the start of the previous section municipalities are today focused on making sustainability strategies, often based on the SDGs but putting these grand ideas into actions is not straight forward. In the study *Sustainability Coordination within forerunning Nordic municipalities – Exploring structural challenges across departmental silos and hierarchies* (Quitzau, et al., 2022) the questions of how two case municipalities, Aarhus (Denmark) and Växjö (Sweden), work to coordinate sustainability efforts and innovations internally across different disciplines and departments. It is found that it is a delicate process that is made challenging by the lack of communication and the many silos that exist within the municipalities, something that seems to be representative of the challenges

that many cross departmental sustainability efforts suffer from (ibid). Now this study focuses on projects run with one central sustainability coordinator that needs to engage with the different actors and get them on board and educated about the sustainability program. This thesis investigates a partnership model where responsibility is delegated differently but still needs to find these common points of understanding about what the sustainable outcome of the project should be. Also, it is important to understand the difficulty that can lie in working with several municipal departments on one project, such as a school building where the department in charge of education, building, operation, and others who may be relevant to the specific case. A main point that is made in the study by Quitzau et al. (2022) is that of working on how to communicate and relate to sustainability across departments:

> "The more interdisciplinary approach to sustainable goals, also intended in the SDGs, prove to be especially challenging, since both cases show that the soft service departments think in a different way compared to technical and environmental departments, and do not immediately see a clear link from their core activities to sustainability." (Quitzau, et al., 2022)

Through the analysis of this thesis how PIP can be used as a tool to breech some of these barriers in a practical project setting.

Another aspect of understanding the municipalities agency is to see this connected to a multi-level governance system. In the study *Moving from high-level words to action – governance for urban sustainability in municipalities* (Fenton & Gustafsson, 2017) investigates the multi-level governance needed to implement SDGs shape local actions on sustainability and what barriers and opportunities this gives. There exists a disconnect today were grand strategies for attaining sustainability are made at higher levels of governance trickling down to local strategies were SDGs play a major role in the shaping of strategies. But the resources needed to educate municipal employees in how to enact these goals in their work is lacking. Building competences in sustainable practices and opening doors to communicate across sectors takes time, and it is especially this that seems to be lacking in municipal projects today were being fast and low in cost tends to out weight sustainability. The study points to an important tool for meeting the challenges of today also lies in intra-municipal collaboration, exchanging experiences and learning from working with implementing SDGs (ibid.). This is an understanding that I in my research also have found and points to just how important that knowledge sharing

aspect of PIP is. Luckily this is something the municipalities are very willing to do, making them this great actor for broad change. So, let's look at how Danish municipalities are already putting this agency to work and how PIP can further add to this.

6.2 The Movement and Potential of Danish Municipalities' Agency

Municipalities can use their agency in different ways. When it comes to sustainability most every municipality in Denmark has a strategy for the future and many have stand out building projects where they can profile themselves on a high DGNB[3] score, Nordic Swan marking or other such profs of sustainability. There are different debates over the true sustainability of the buildings that live up to these certifications that we will not go into here, just rather seeing this as a desire to work with sustainable construction. A major way that these types of projects run today is using circular tenders or other tender models that ensure that sustainable criteria is met.

6.2.1 Experimenting in Tenders and Circularity

Especially 3 models for circular tenders have been used under the tender law giving municipal builders the ability to spend more time and focus on the tender phase of a project to collaborate with people from the industry to set up a strong tender (Dansk Arkitektvirksomheder, 2021). But in researching for my previous study, I found that this best applies to large projects with bigger budgets where PIP can fit into the niche of sustainable solutions for the many renovations and small building projects (Darville, 2021a). There is also the issue of these processes not necessarily leading to the development of new competences for all involved and take away the municipalities ability to invest in local development as local entrepreneur have difficulty wining these tenders.

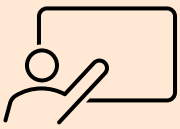
The municipalities have an amazing ability to facilitate local experimentation and innovation that needs to be cultivated more (Holm, et al., 2014) (Geels, 2011). There are different examples of Danish municipalities growing competences from smaller building projects into now doing large scale experiments with reuse of materials and sustainable building practices. A great one is Roskilde Municipality and the projects of developing the area Musicon. They can

[3] Deutsche Gesellschaft für Nachhaltiges Bauen: Sustainability certification for new builds and renovations widely used in Denmark through the Danish Green Building Conceal

now go in at take a more leading approach to their role as a builder and thereby ensure a smoother process with sustainable solutions being developed when problems occur. They are a great example of how building expertise is important. There are dangers in acting without the proper competences and this again highlights the need to share more knowledge. Also, that working with crucial building processes require the municipal building department to have greater competences within solutions, techniques etc. to effectively run these projects. There is here a potential to find a symbiosis between building competences through a smaller project under the tender law (tilbudslov) and then applying this in the formulation of a circular tender under the procurement law (udbudslov).

6.2.2 The Municipal Builder as a Match Maker and Disrupter

This brings us right back to the municipalities as a potential seedbed for innovation as described by the theory of a *situated transition place* (Holm, et al., 2014). Adding further to this understanding is how municipalities can use their governance to experiment, something that the study *Experimental governance: the role of municipalities in urban living labs* (Kronsell & Mukhar-Landgren, 2018) investigate where three possible roles for the municipality was highlighted indicated thus:

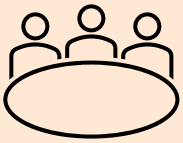


Promoter

1.Initiation, calling upon other actors to participate
2.Municipal leadership
3.Allocation of economic resources/ taking active participation in raising funding

Enabler

1.Opens acting space for other actors
2.Opens opportunities for collaboration
3.Municipalities participate but do not have an explicit leading role
4.Support via indirect provision of e.g., buildings



Partner

1.Participating in partnership on equal terms
2.Shared leadership
3.The importance of collaboration in emphasized
4.Municipality has a specific and explicit function
5. Partners are named

Figure 2 Indicators for roles of municipalities when using experimental governance quoted from (Kronsell & Mukhar-Landgren, 2018)

This study looks at 50 major urban living labs across Europe where this study will focus in on Denmark and how experimenting through one partnership model. Still I bring it up here to underscore that there is a research basis for the importance of the municipality as an actor who can and is facilitating change in different was, where this these investigates the power of doing this through a partnership. These partnerships are characterized by a shared leadership and is a common model for innovation. These can lift all involved something that was also experienced in the PIP project Botilbud Søndersø (Darville, 2021b).

6.3 Sub-conclusion

So, *what agency and governance ability do Danish municipalities have to affect the building industry today?* The answer is not totally straight forward, there are many tools that the municipalities are able to use and to some extents are to move in a more sustainable direction. But when it comes to smaller building projects and everyday practices the barriers of times, resources, competences, tender laws, and collaboration internally seem to provide too much of a block to then also reach out to the industry to innovate and push for change. Some municipalities have built the competences internally to take a leadership role, but there is still much untouched potential in becoming a strong partner and seedbed for innovation.

7. Analysis: The Application of PIP

Now that we have a better understanding for the context that municipalities act in and how their agency is and can be applied it is time to see how this reacts with the PIP. The PIP model as specific framing parameters, such as the ability for a municipality to choose their partners, more freely and save time on the tender process. In my previous research I also categorized specific tools and values that benefit the model. These will now be put to the test as I seek to answer the second sub-question: *What key elements from the PIP model are best suited to aid municipalities to apply their agency to the creation of a seedbed for innovation?*

This is greatly aided by the data collected during the PIP workshop that conducted from this thesis in the Circular Builders project at GATE 21.

7.1 A Run through of PIP tools

So firstly, building on the work done in the evaluation of the PIP project Botilbud Søndersø (Darville, 2021b) several tools were found especially helpful to making the partnership successful. Let us look at what those tools are and put them into perspective of the municipality using its' agency to be a seedbed for innovation.

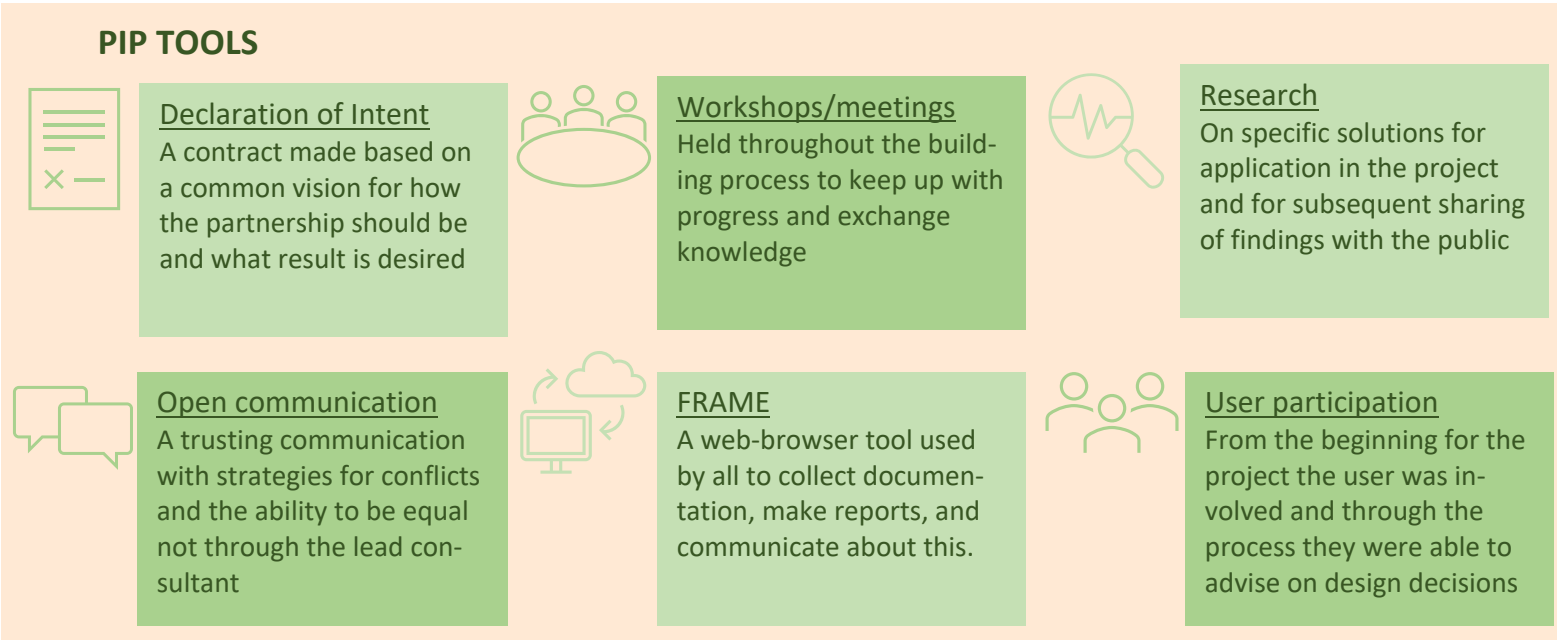


Figure 3 Recap of the most important tools for previous PIP project (own figure). The new PIP tool "Value Compass" is in 7.2.2.

7.1.1 Declaration of Intent

This tool was an important starting point for the PIP project giving everyone a time to meet and discuss the project before any final decisions were made. This is quince for the PIP process has there is not already a specified tender but rather a process through which the partners can bring their knowledge, desires, and visions to bear. Here the municipality works as a facilitator for partners to meet especially with the users and the operations teams. This also establishes the needed lines of communication and equality for the later steps in the process.

7.1.2 Workshops/meetings

Here is where competence building can really be worked on directly this could be getting a sub-contractor up to date on the sustainable building methods used. The municipality representatives can also be advised and taught about specific options for their project and researchers can collect data needed for analysis. At meetings updates and solution finding can be done in collaboration. This is a great tool for the municipality to support competence building locally.

7.1.3 Research

This is a pivotal element of a PIP project. Here the municipalities willingness to share findings an innovation with the industry at large. When research is given high priority and work in close collaboration with the project the municipality really facilitates an important meet of real-world problems with the world of theoretical solutions.

7.1.4 Open Communication

A tool for facilitating the meeting of actors who might not otherwise have in a traditional project. This also allows for the municipality to have more oversight as they can communicate directly with contractors, advisors, users etc. Traditionally a lot of communication would go through the project leader.

7.1.5 FRAME

More of a practical tool to keep all the different project steps, documentations and communications organized, does not have a direct application for the municipality´s agency.

7.1.6 User Participation

This is really where municipalities can shine. Municipalities are good at having communication with the end users and are also in charge of the operation and maintenance of the building. A way the municipalities can facilitate innovation through a longer perspective.

7.2 PIP as a Framework

Moving beyond the specific tools of PIP, seeing how the municipality's agency can work in the PIP framework is interesting. As discussed in the state of the art there seems to be a misalignment in the demands for sustainability and the number of resources and competences for the task. During the GATE 21 workshop the municipal representatives also highlighted then effect of the political cycle running 4 years at a time, with the nearing of the end of one political cycle often leading to extra pressure to build more so politicians can profile themselves at the ribbon cuttings (appendix, 02.4). This can lead to favoring fast construction projects like barrage buildings for daycares. Many of the participants also complained that they were not given the time to learn new sustainable building competences which in turn leads to choosing to build what you know to keep up with demand (appendix, 02.4). So, let's see how the PIP process might facilitate this building of competences within the given time and resources.

7.2.1 The PIP Process

Figure 4 A simplified model of the PIP process (made by author)

The main feature of working with the PIP process that differs from other models under the procurement law (udbudslov) are the maximum budget of around 40 million DKK needed to be under the tender law (tilbudsloven) and the ability to functions under §12 allowing partners to come together with no more than a comparative bidding process (appendix, 03).
This means that a lot of time and resources can be saved from an otherwise lengthy tender process and be reinvested in time for the partnership to together develop the project and experiment. This is also what can give the opportunity for the municipal workers to engage in competence building, not only within their own organization but also as facilitating the competence building in local industry by giving the space to experiment and build a new network of actors (Kronsell & Mukhar-Landgren, 2018) (Holm, et al., 2014). But what tool might allow the different actors needed to make this possible find common ground? Especially when it comes to building up an argument for local politicians, citizens, and expertise.

7.2.2 Values as a Bridge

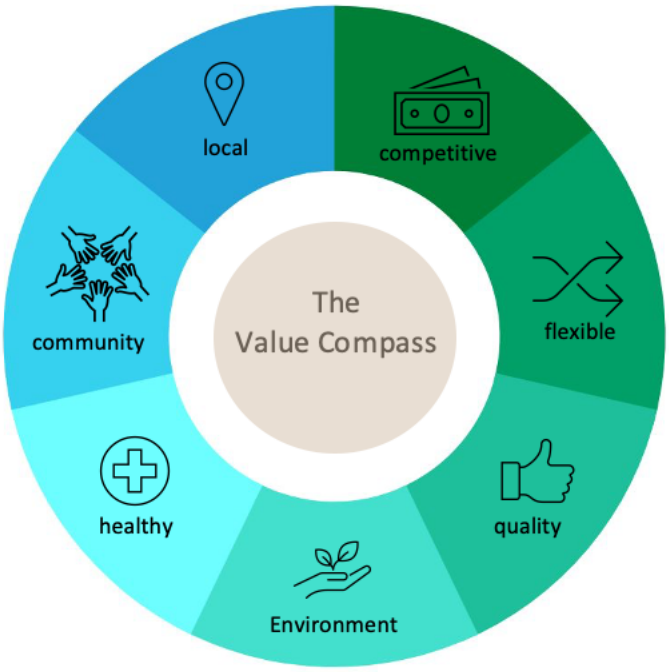


Figure 5 The value compass (made by author)

As a result of past analysis evaluating the PIP project *Botilbud Søndersø* I found that there had been some misunderstandings and confusion about the common goals for the project. This was especially due to the many different points of view and interpretations that being in different departments and expertise brought with it. Inspired by the ideas of architects as being able to convey values through more than monetary and environmental data (Sattrup, et al., 2018) and how working with values as a guiding principle can benefit planning (Dock, et al., 2012), I created a tool for working with values as a guiding force in a PIP project (appendix, 04). This tool can be used to bridge the communication gaps that can exist between actors or simply to give structure to conversations about the direction for the project. As a compass it can be used to check in through the PIP process to ensure that goals are being met. This tool is good for municipalities who have a clear vision for the values that they want to promote and translate those into a building project.

7.3 Sub-conclusion

So, *what key elements from the PIP model are best suited to aid municipalities to apply their agency to the creation of a seedbed for innovation?* Tools relating to values and finding common ground like the value compass, workshops, meeting, and the declaration of intent are great for the municipality to build up support and vision for projects prepping the "soil". Workshops, user participation and research plant the "seeds" for innovation and competence building. Centered around one little project the municipality can apply its agency to make these things possible. And finally, through sharing findings and experiences on to others "sprouting" further implementation of the innovations. These together make for a useful framework to apply the municipal's agency to create seedbeds for innovation with a PIP project being a situated transition space. But how to ensure that the outcome of PIP is sustainable and not just a convenient "loop-hole".

8. Analysis: Ensuring a Sustainable Outcome

There are many projects today that piggyback off the popularity of sustainable branding and knowingly or unknowingly participate in greenwashing. With a model like PIP there could also be a fear that this model could be used as a loophole to choose your own partners and just slap the label sustainable research project on there without fully engaging in it. Another issue could be that the lack of knowledge in the municipality could lead to running a project that is believed to be creating sustainable innovation without truly doing so. Or the local contractor might also because of a lack of knowledge is not able to lift the task asked for in the project. In this chapter we will take a closer look at this dilemma and answer the sub-question: *How is it ensured that the outcome of a PIP is adding to sustainable development?*

8.1 Sustainability as a Process

Working with the municipal representatives who participated in the workshop held in GATE 21's Circular Builders project was really eye opening. For one there was a lot of enthusiasm around finding new sustainable solutions and looking at the survey answers there was also positivity around working with researchers (appendix, 02.3 & 02.4). But a returning concern was the time given to be able to build competences and getting support from the municipality to try off new solutions models. Sustainable development however is not something that a short course can necessarily alone inspire. To change the practices today we move out into the unknown and experiment with solutions that both pull on the past and come as new inspiration. Sustainability is in development and transitioning with this is crucial (Holm, et al., 2014). Therefore, the municipalities should be able to bite off more than they can chew, but rather be given the tools to build up competences and critical thinking when it comes to finding the right partners, projects and innovation focuses on their PIP projects. A good way to do this is by growing experience from one project to the other and with each project learning the skills to be able to lead in other future building projects. Doing this as smaller experiments is helps build competences with less risk and variables. This means that a PIP project could fall different places on a spectrum of complexity for the municipality.

8.1.1 PIP Spectrum

Figure 6 The PIP Spectrum (made by author, 2022)

The PIP Spectrum is a model I created to present at the workshop to illustrate the potential of working with different levels of municipal leadership on PIP projects. It was something that the participants in the workshop were clearly interested in as it gives the municipalities a clear picture of how to engage with a PIP project depending on the internal competences, political vision, or other specifics for the project.

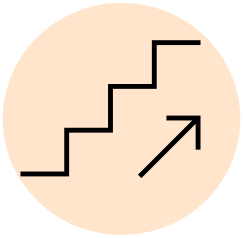
On one end is the *package solution*, this is the "simplest" for the municipality as external partners would bid for a coming project with a full package PIP. That means that there already is an architect, researcher, and lead entrepreneur sending a sketch for how the project could run and what innovation could be focused on. If the municipality is interested, they can then engage in the partnership and the project is shaped and together. This allows for the municipality to be able to pull on experience and experiences of its partners.

In the middle the *mixed approach* could be a municipality reaching out to one advising partner about doing a PIP and together they find the other partners, perhaps with the municipality asking that a local contractor will be a part of the project. This gives the municipality more freedom to shape the PIP but are still supported by an external partner and their network.

Finally, in the opposite end is the *do it yourself* approach to a PIP project. Here the municipality take a leading role finding all the partners and identifying the desired outcome and sustainable innovation for the project. These different approaches could also be seen as a staircase building up the competences from one project to the other taking a more leading role and knowing who they can reach out to as good partners in different building projects. Working in this way can help ensure a sustainable outcome as the municipality hopefully would not be discouraged after one project and growth through experience will have a lasting effect on all projects. By not biting of more than they can chew and being able to lead on their partners projects the municipality be sustainable from the start.

8.2 Change for the Sake of Change

Not a concept that is looked upon kindly, but we also cannot continue as we have. So how to change with purpose and not drag our feet in the development of sustainable solutions for building? One answer has been legislative change such as the new demands for CO2 reductions in the Danish building code BR18, but the survey done at the workshop showed that the municipal representatives have a varying opinion on if they are ready to meet these new demands. And they are not alone many contractors and architects also need to adapt to these changes, something participation in FBK[4] workshops and the Winter Academy made clear. So, to ensure that actions are not made without the foundation of knowledge working closely with researcher and experienced advisors that can bring their knowledge to bare is crucial. Being able to slow down the pace of a project just a little to give time for building a strong foundation and vision, in a PIP process the three months that would be used on tender creation, answers and evaluation can instead be used to work together as a partnership. This also means that the municipality needs to be critical of who they choose to partner up with. Reflecting on what competences that the department has and where support is needed in the development of a sustainable building project is a key part of this.



During the workshop it was also brought up that there is a need for more support for the municipalities to meet the challenges and barriers that today stand in the way of transitioning to more sustainable building practices. And it is true that as a political organization governed on multiple levels finding support can be complex (Fenton & Gustafsson, 2017). Moving up the ladder of change and ensuring that does not only apply to a few prestige projects can take more than good will in one department of political circle. As pointed out by Quitzau et.al. (2022) and confirmed by participants at the workshop there are sever communication issues within municipalities, something that makes working with intra-departmental sustainability difficult. Tools like the Declaration of Intent might be able to help facilitate paths to communication that were not already establish, but at the end of the day there needs to be a challenge of the work culture internally in many municipalities. Otherwise, the partners might just slip back in their silos.

[4] Frivillige Bæredygtigheds Klasse – Vulentary Sustainable Class, with I participated in the test of this new classification with the project Botilbud Søndersø on behalf of Juul & Hansen Architects

8.3 Possible Conflict of Interests

Outside of the issues that can arise with communication and the potential for PIP to be taken advantage of it is crucial to take a more critical look at the work with researchers and research institutions. Ideally this would be a carrying aspect of a PIP project, with the researcher taking leadership of the research process and aiding in keeping the partners on a sustainable path. But this also means that the researcher or research institute is ready to take on being a part of a practical project which is happening in the mess and unpredictability of the real world. As found in the evaluation of the project Botilbud Søndersø, it was especially this meet that was difficult. However, at the workshop it came up that the research partner DBI learned from the PIP project and are now engaging well in other practical research projects. This shows the potential for the competence building that can happen through a PIP project.

Still anytime that there is a question of who is paying for research and as here having the researcher be so closely invested in a project there is a possibility for conflicts of interest. In the case of Botilbud Søndersø 2.5 thousand DKK were given to the research and tests of the innovative material solution (appendix, 2.4). Being in a partnership should therefore be balanced by peer-review and other academic tools for ensuring the validity of results. The sharing of information and making solutions a part of the common technical toolbelt also aids in negating some of this. It is in a strong and transparent relationship with research that the municipality can aid the further spread of sustainable solutions.

8.4 Sub-conclusion

So, *how is it ensured that the outcome of a PIP is adding to sustainable development?* It is difficult to 100% ensure that the PIP model cannot be taken advantage of or that well-meaning partnerships might end up with a result that does not add to sustainable development. But so is the nature of venturing out into the unknown, you do not always end up at the destination you were expecting. But through honest collaboration with research, transparency in the projects, sharing of knowledge and not biting off more than you can chew the municipalities can make for a fruitful seedbed for innovation. By facilitating the meeting of new partners with a common goal of sustainability and sharing the results on to others there are many ways in which a PIP project can ensure its' aiding sustainable development.

9. Discussion & Conclusion: The Future for the Municipal Seedbed for Sustainable Innovation and Collaboration

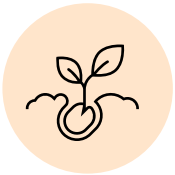
After all that analysis it is time to get down to the main research question for this thesis:

How can the agency and governance of Danish municipalities be used through Practical Innovative Partnerships (PIP) as a seedbed for the development of a sustainable transition in the Danish building industry?

To do this we must first draw together the findings from analysis of the sub-questions.

9.1 Recap of Sub-question Answers

First in chapter *6. State of the Art: Municipalities as Actors in the Building Industry Today*, an analysis of existing research on the municipalities agency in change making was conducted. In answer to the sub-question: *What agency and governance ability do Danish municipalities have to affect the building industry today?* It was found that there are models for how a municipality can take charge of the transition process today and evidence that the industry benefits from this. But also, that there was still much untouched potential as there also are many barriers to this that exist like restrictions of times, resources, competences, tender laws, and collaboration internally.



Then in chapter *7. The Application of PIP*, analysis moved onto the tools, values and process framing a PIP project to answer the sub-question: *What key elements from the PIP model are best suited to aid municipalities to apply their agency to the creation of a seedbed for innovation?* Here three categorize were formed those of soil, seed, and sprout. Tools like the Value Compass, workshops, meeting, and the Declaration of Intent allowed the municipality to use their agency to prepare the soil for innovation with a PIP project being a situated transition space. While the tools of workshops, user participation and research could become seeds for innovation and new connection. Finally, through sharing findings and experiences municipalities could sprout new innovations from their seedbed onto others. This all showed promise

for PIP being a tool to enable municipalities to apply their agency to making seedbeds for sustainable innovation, but it still left a question unanswered.

So, finally in chapter *8. Ensuring Sustainability* further critical analysis of the PIP framework was employed to answer the sub-question: *How is it ensured that the outcome of a PIP is adding to sustainable development?* It was found that it is difficult to ensure that PIP is not taken advantage of or that a project always arrives at a desired goal. But this is also part of the journey. Through honest collaboration with research, transparency in the projects, sharing of knowledge and not biting off more than you can chew the municipalities employ PIP to add to sustainable development. The creation of new connection and the building of competences both internally in the municipal departments and with their partners gives the potential for an added sustainable outcome that can continue to develop outside of the one project.

9.2 Discussion

There is a great potential in engaging the municipalities agency in the transition to a more sustainable building industry. But are the barriers too great? Working with a model that already fits into the system, as §12 of the tender law does, gives the possibility of to be able to fast track this transition. However, that also means that the municipalities need to be ready and willing to work together as partners in a new way, especially with research institutes. Luckily from the small sample I have spoken with and there are key actors in many municipalities who wish to take a more active role in the move towards sustainability. The task can still be daunting and there is no guaranty to get it right the first time. So, building up competences over time and through smaller projects can allow the municipalities to create *situated transition spaces* (Holm, et al., 2014) where new connections can be made, and experimentation can take place. This is to the benefit of both the municipalities own departments and all the others who participate in the partnership. By working repeatedly with the PIP model or by applying the competences won in other projects such as circular building or Private-Public Partnerships under the percurrent law (udbudsloven), it can be ensuring that competences are built among the municipal departments and with partners outside of the municipality a greater awareness and actionability is created.

That also means that the municipalities need to get support from their partners, especially if they are less experienced with building sustainably. Finding a strong partnership of experienced architects, entrepreneurs and researchers can be that first step down the path to sustainability. Being a facilitator of the meeting of sustainability experts and local partners, e.g., contractors, is also an important part of creating a seedbed for innovations (Geels, 2011). These new connections and built-up competences can have farther reaching effects (Holm, et al., 2014). Combining this with the knowledge sharing aspect of PIP makes for a useful tool to apply the municipalities' agency and governance towards a sustainable transition.

9.4 Final Conclusion

Practical Innovative Partnership has great potential as a tool for which the municipality can use their agency to create seedbeds for sustainable innovation. This is turn has the potential to spread into a movement into the greater transition of the socio-technical regime.

Yet it may not be possible to just jump into the deep end for most municipalities. There is a learning curb where competences need to be built up. This is where the model of looking at PIP on a spectrum is especially useful. The model could be turned into a staircase to ascend into becoming a competent builder and leader for sustainable construction.

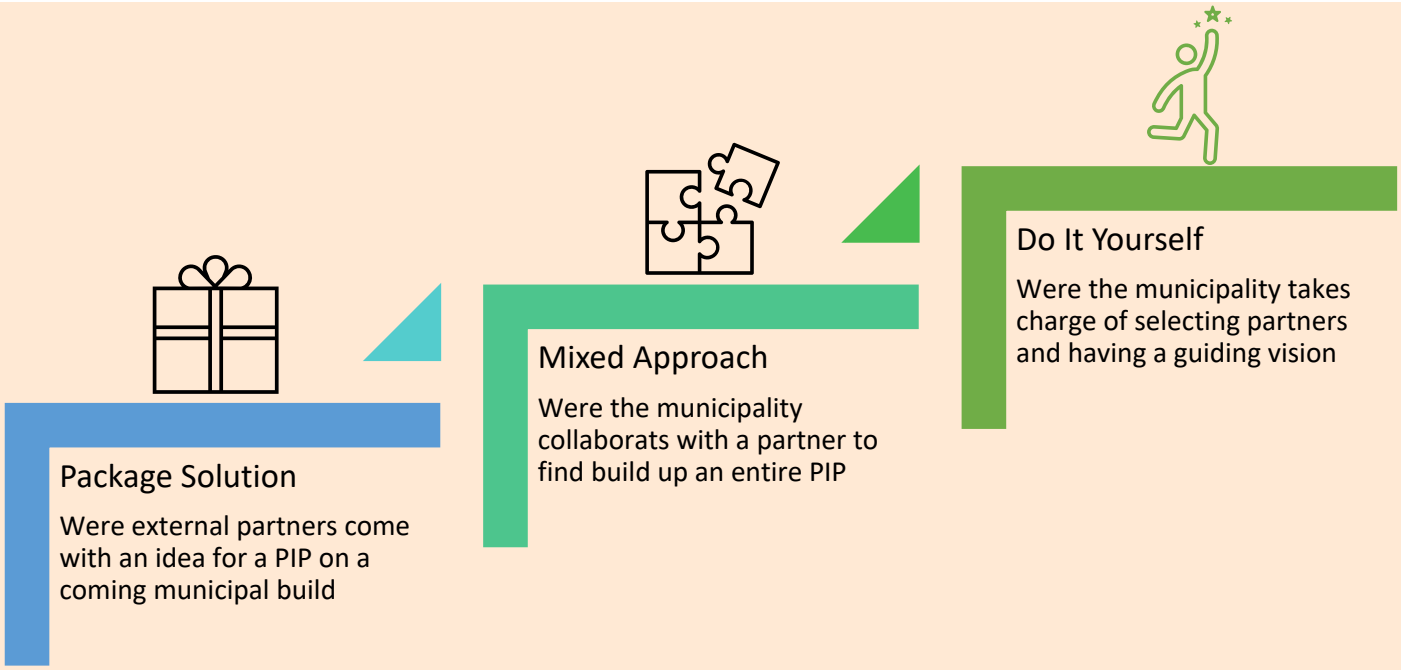


Figure 7The PIP spectrum as a staircase to signify the upward development potential (made by author)

Through honest collaboration with research, transparency in the projects, sharing of knowledge and finding their space on the PIP spectrum in a given project, the municipalities can employ PIP to create a seedbed for sustainable innovation. This can then go further to the application of these built competences in larger projects under the procurement law (udbudsloven) especially when working with models such as a Circular Tender as the municipality now is more aware of what type of demands to set out in such a tender. Or when working with Public-Private Partnerships the skills in collaboration and the network built through a PIP project can be helpful. These benefits can of course go both ways with the building community of partners being able to mutually benefit from collaboration in different types of projects.

10. Perspective: The Future for the PIP Model and How Findings can be Built On

For one, it would be interesting to see more real-world application of the PIP model. More cases for analysis with projects focusing on different areas of sustainable innovation would make for a better analysis of PIPs uses going forward.

These findings could also be built on by going further out in an actor network analysis, seeing how the project at Botilbud Søndersø and the competences built there have affected the partners and other collaborators subsequent work. With more time passed these kinds of analysis would be possible and this thesis along with the prior research evaluating a PIP project could work as a pin in time for which to compare to.

Looking more at the building process is also interesting especially when put into relation with the role of the municipality in a sustainable transition.

Seeing how the PIP model could apply in the contact of a private builder could also be interesting. There are also private builders who have ambitious around a sustainable transition and are willing to share their findings and they would have different possibilities and limitations than a municipality does.

Bibliography

Egholm, L., 2014. *Philosophy of Science.* 1st Edition ed. Copenhagen: Hans Reitzels Forlag.

Sattrup, P. A. et al., 2018. *Arkitekt dokumentér din værdiskabelse: sådan kommer du igang.* 1 ed. Copenhagen: Dansk Arkitektvirksomheder.

Darville, A. S., 2021b. *Praktisk Innovativt Partnerskab: Evaluerende Notat,* Copenhagen : Aalborg Universitet.

Darville, A. S., 2021a. *Evaluation of the Parctical Innovation Partnership,* Copenhagen: Aalborg Universitet.

Flick, U., 2014. *An Intriduction to Qualitative Research.* 5th Edition ed. Hamburg: Sage.

Holm, J., Søndergård, B., Stauning, I. & Jensen, J. O., 2014. *Bæredygtig Omstilling af Bolig og Byggeri.* 1 ed. Frederiksberg: Bogforlaget Frydenlund.

Holm, J., Stauning, I. & Søndergård, B., 2014. Kommunernes rolle i klimaomstilling af byggeriet. In: *Bæredygtig Omstilling af Bolig og Byggeri.* Frederiksberg: Bogforlaget Frydenlund, pp. 303-336.

Sovacool, B. & Hess, D., 2017. Ordering theories: Typologies and conceptual frameworks for sociotechnical change. *Social Studies of Science,* 47(5), p. 703–750.

Geels, F., 2011. The role of cities in technological transitions. Analytic clarifications and historical examples. In: H. Bulkeley, V. Broto, M. Hodson & S. Marvin, eds. *Cities and low Carbon Transitions.* London: Routledge, pp. 13-28.

Bulkeley, H., Broto, V. & Maasen, A., 2011. Governing Urban low carbon transitions. In: H. Bulkeley, H. M. Broto & S. Marvin, eds. *Cities and low Carbon Transitions.* London: Routledge, pp. 29-41.

Regerings Klimapartnerskab bygge og anlæg, 2020. *Anbefalinger til regeringen fra Klimapartnerskabet for bygge- og anlægssektoren,* Copenhagen: Dansk Byggeri.

Quitzau, M., Gustafsson, S., Hoffman, B. & Krantz, V., 2022. Sustainability coordination within forerunning Nordic municipalities – Exploring structural challenges across departmental silos and hierarchies. *Journal of Cleaner Production,* 335(130330).

Fenton, P. & Gustafsson, S., 2017. Moving from high-level words to local action— governance for urban sustainability in municipalities. *Current Opinion in Enviomental Sustainability ,* 26(27), pp. 126-133.

Dansk Arkitektvirksomheder, 2021. *Vejledning til cirkulært udbud,* Copenhagen: Dansk Arkitektervirksomheder og Dansk Advocater.

Kronsell, A. & Mukhar-Landgren, D., 2018. Experimental governance: the role of municipalities in urban living labs. *European Planning Studies,* 26(5), pp. 988-1007.

Albrechtsen, T. & Friis Jensen, C., 2022. *Nye krav til beregning af bygningers klimapåvirkning og grænseværdier i bygningsreglementet.* [Online] Available at: https://denmark.dlapiper.com/da/nyhed/nye-krav-til-beregning-af-bygningers-klimapaavirkning-og-graensevaerdier-i [Accessed May 2022].

Indenrigs- og Boligministeriet, 2021. *Forslag til Lov om ændring af byggeloven (Bemyndigelse til fastsættelse afkrav til bygningers klimapåvirkning m.v.),* Copenhagen: Indenrigs- og Boligministeriet.

Dock, M. et al., 2012. *Värdeprogram: Västra Dockan,* Malmö : Stadsbyggnadskontoret & Dockan Exploatering AB.

Loorbach, D., Fratzeskaki, N. & Avelino, F., 2017. Sustainability Transitions Research: Transforming Science and Practice for Societal Change. *Annual Reviews,* pp. 599-629.

P Huedo, D., López-Mesa, B. & Mulet, E., 2019. Analysis of sustainable building rating systems in relation to CEN/TC 350 standards. *Informes de la Construcción,* 71(556).

Mirzaie, S., Thuring, M. & Allacker, K., 2020. End-of-life modelling of buildings to support more informed decisions towards achieving circular economy targets. *Int J Life Cycle Assess,* Volume 25, p. 2122–2139.

Anderson, J., 2012. *ConstructionLCA.* [Online] Available at: https://constructionlca.co.uk/2012/02/20/centc-350-and-en-15804/ [Accessed 25 May 2022].

Værdibyg, 2020. *Forskning og uddannelse i byggeriets processer,* København: Værdibyg & Realdania.