

Newsletter 5 | June 2022
Climate Challenge Laboratory | Building 313

From SDGs to sustainable solutions

Theme: Thought on sustainability
from vision to practice

DTU Campus Service
Technical University of Denmark

From SDGs to sustainable solutions

How do we develop and construct the Climate Challenge Laboratory in the most sustainable way? In the fifth newsletter, we focus on DTU and the consultants' efforts to translate the DGNB system and the UN's 17 Sustainable Development Goals into concrete solutions. Systematic screenings of the project, synergy, and a visit to the Open Air Museum can be the way to a more sustainable construction.

The Technical University of Denmark (DTU) needs to be a role model for research in and development of technologies that promote a sustainable change in society. We are counting on the Climate Challenge Laboratory to be the setting for breakthroughs in research on sustainable energy technology.

DTU's vision is also expressed in our sustainability policy, where we commit to working to meet the UN's Sustainable Development Goals when developing the campus, renovating buildings, and constructing new buildings. And what makes more sense than exploring and testing how sustainably we can plan and build a high-tech laboratory building for climate research?

In this newsletter, Nadia Sander Strange, who is an advisor on SDGs and CSR at Christensen & Co Architects, and Jonas Vendel Jensen, who is a senior specialist in Indoor Climate, Energy Design & Sustainability at the engineering firm MOE, talk about our work with the DGNB system and the SDGs. Finally, as usual, there is information regarding construction works and a status on the construction project.



Specialists in sustainability. Nadia Sander Strange (left), SDGs and CSR advisor at Christensen & Co Architects, and Jonas Vendel Jensen (right), senior specialist in Indoor Climate, Energy Design & Sustainability at the engineering firm MOE, oversee the work on sustainability in the Climate Challenge Laboratory. Photo: Christensen & Co Architects/MOE.

"We balance between the DGNB system, and the ambitions expressed in the sustainability vision's success criteria. Here we use the SDGs to recap continuously in the process."

– Nadia Strange Sander, SGD-advisor, CCO

More than DGNB Gold

In the Climate Challenge Laboratory, DTU aims to build as sustainably as we can when constructing laboratories for elite research. In the sustainability vision for the building, we have formulated a set of success criteria that set the bar high - regarding both environmental and social sustainability.

DGNB Gold is the baseline. In addition, DTU strives to achieve DGNB Heart and to live up to the UN Sustainable Development Goals as well as working with target for carbon emission and the voluntary sustainable class. How are these ambitions expressed? Where can we see and experience them in the building?

JVJ: DTU's vision is that the Climate Challenge Laboratory will be more than just a workplace. The building must be full of life so that it becomes an ideal place to work. The Heart Room (theme of newsletter 4, ed.) is an example of how social sustainability has pulled the building's design in that direction.

Concerning environmental sustainability, we have analysed the building's expected performance on, e.g., carbon footprint and choice of materials all the way back in the outlining phase. We have a methodical approach, so it's something that is continuously processed, even when we refine the design. At each new phase, we've had an analysis period where we

zoomed in on parts of the building's environmental sustainability, e.g., the construction structure, the façade construction, the floors, etc.

You write that DGNB is an evaluation tool and that the SDGs are translated into a process management tool. How does that work?

NSS: We balance between the DGNB system, which has some very specific things to live up to, and the ambitions that are expressed in the sustainability vision's success criteria, e.g., universal design, design for disassembly, and indoor climate. Here we use the SDGs to recap continuously in the process. In this way, the DGNB system and the SDGs complement each other well.

One example is universal design. In the DGNB system, universal design is about accessibility, but universal design is much more than that. It is also how we design spaces so that people with different needs and disabilities thrive in the building. So, we point to the broad approach to universal design with the SDGs and make sure that it fits in the DGNB system as well.

DGNB

DGNB is a tool and a system that evaluates the qualities of a building or urban area within environment, economy, technology, process, and social. DGNB is based on the UN's definition of sustainability.

All new DTU buildings are required to achieve at least DGNB Gold. In the Climate Challenge Laboratory, we work to achieve DGNB Heart, which was created to promote health and well-being in future constructions.

FN's 17 Verdensmål

The UN Sustainable Development Goals were adopted by the world's state and government leaders at the UN Summit in New York on September 25th 2015. Towards 2030, the goals will set the course for a more sustainable development for both people and our planet.

The SDGs represent 17 goals and 169 targets. They target, among other things, eliminating poverty and world hunger, ensuring good education and health for all, and a more sustainable economic growth. In their sustainability policy, DTU have committed to contributing to meeting the goals.

"Our analysis becomes an extension of the certification system. And it's not just a talk about the SDGs, but a very exact conversation about specific points in the subdivisions."

– Jonas Vendel Jensen, engineer, MOE

Is it new for you to work that way?

NSS: Yes, we started with the approach on building 112, but it was in the form of a dialogue I had with the DGNB auditor. In the Climate Challenge Laboratory, we have worked systematically with it. Just as we evaluate at the phase transitions, we pressure test our solutions between two systems that work with sustainability in different ways. We collect this work in the sustainability screenings.

DGNB is becoming a quite common way of working with sustainability in construction. Jonas, you have the task of evaluating the DGNB system. What value, in your opinion, does it give to work with the SDGs as well?

JVJ: The DGNB system looks at the things that DGNB has chosen. With the SDGs as a process tool, we can explore other possibilities and incorporate them if we see their potential and they can be valued. You might say, boldly, that we can close the gaps in the DGNB system. Our analysis becomes an extension of the certification system. And it's not just a talk about the SDGs, but a very exact conversation about specific points in the subdivisions.

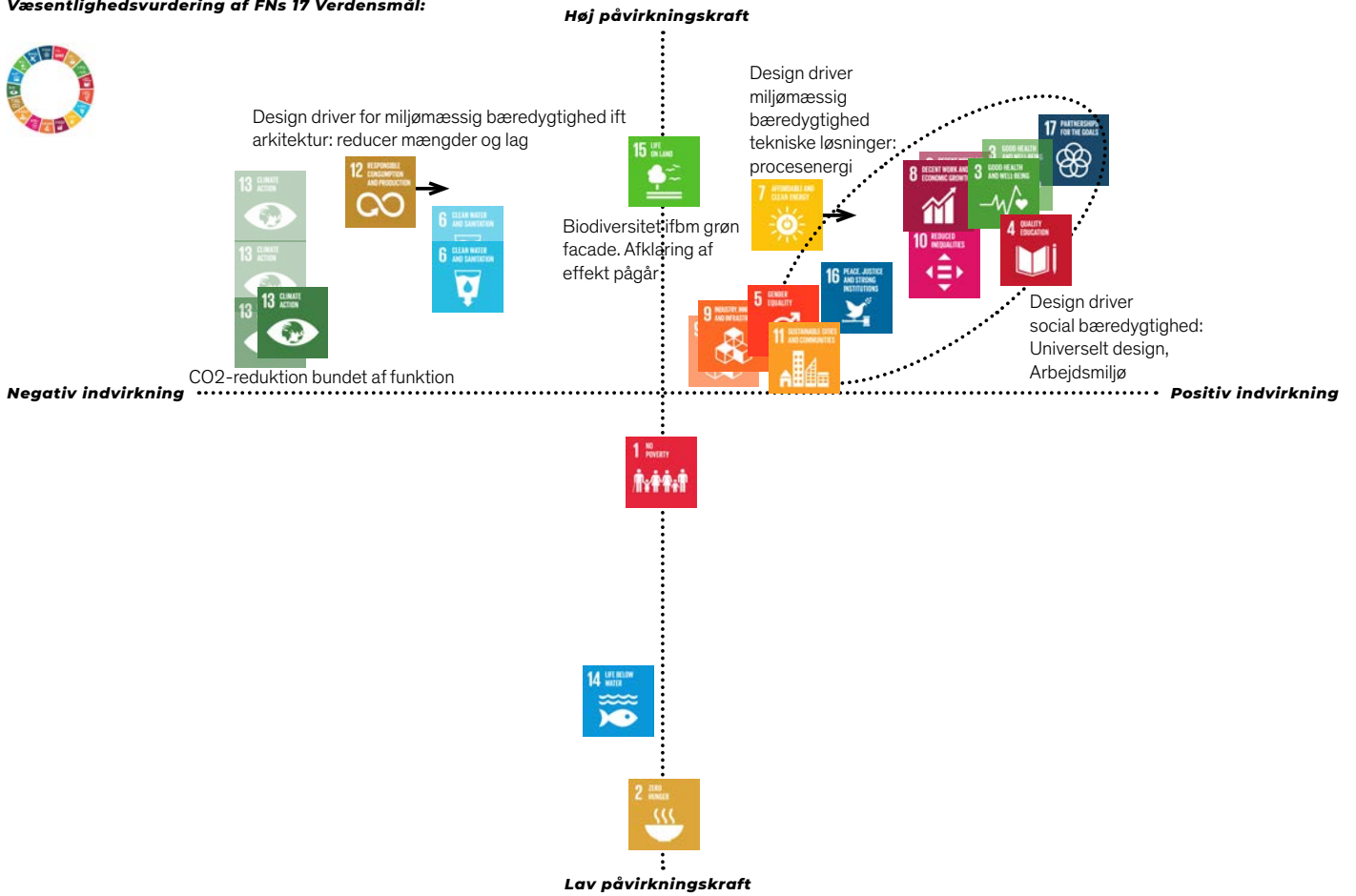
From SDGs to window membranes

Can you give an example of something that you discussed based on an SDG that influenced the choices that were made?

NSS: In SDG 12, Target 5 to minimize waste, we have focused on design for disassembly. How can we reduce future waste? We've discussed that a lot. Early on, we identified several focal points that we wanted to incorporate into the design, and in each phase, we came closer to concrete solutions. We have continuously examined how far we can get with design for disassembly.

As an example, the windows in the laboratory building will be built with membrane instead of joints. This means that all windows in the laboratory part will be easier to take out and that they will not need cleaning afterwards. It is relatively common in office buildings, but a rare solution in laboratories – and it will reduce both the waste and gassing from the joints to the indoor climate. Hereby, we also address

Væsentlighedsvurdering af FNs 17 Verdensmål:



Screening for sustainability. At each new phase, the consultants on the Climate Challenge Laboratory analyse the project's sustainability - based on both the DGNB system and the SDGs. Illustration: Christensen & Co Architects

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Biodiversitet - grøn facade & gårdrum			●	●								●	●		●		
universelt design inkluderende Ark. og sociale zoner			●	●	●			●		●	●						●
Arbejdsmiljø og flow i laboratorier			●		●			●	●	●							●
Design for disassembly & genbrug								●				●	●				
Reducer affald og minimer mængder												●					
Træbyggeri - reducer CO2							●					●	●		●		
Reducer energiforbrug - passivt design / fx. proces energi							●					●	●				
Indeklima - undgå fugt, lim og maling			●	●				●								●	
Certificering - fx. EU blomst, Fsc PEFC			●					●								●	
Bæredygtig byggeplads			●			●	●	●	●			●	●				

From goal to solution. Each of the 17 Sustainable Development Goals have specific targets. The consultants examine how DTU can best meet the goals in several focus areas, such as biodiversity, universal design, design for disassembly, and indoor climate. Illustration: Christensen & Co Architects

SDG 3, Target 9 on reducing deaths and disease from chemistry.

JVJ: It takes courage to make this decision, because we're used to grouting and its density, but this is much cooler. By doing this, we solve so many things and we can achieve more qualities by having the courage and saying, "This is what we'll do - because it's the right thing to do". And this is the right thing - it's the right thing now and in the future for this kind of project.

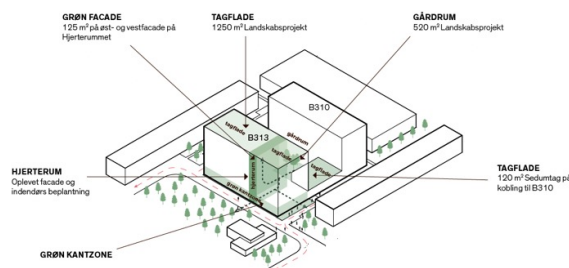
NSS: This is precisely where the SDGs can do something different from the DGNB system. With DGNB we can regulate the things that happen but considering what we cannot do and the derived solutions - that's super difficult to pick up on and implement unless you do it systematically, and here the SDGs work really well. That's why we use DGNB as an evaluation tool, and the SDGs as a process management tool.

Have any of the sustainability screenings resulted in you implementing more or new solutions?

JVJ: The early screening showed that a focus on indoor climate provides a significant sustainability boost and so, comfort cooling was incorporated into the Climate Challenge Laboratory as one of the first projects at DTU. Furthermore, the technical installations were projected based on robustness analyses considering climate data.

Are there any solutions that you have changed or de-prioritized in connection with the screenings?

NSS: In the process, we focused on biodiversity, which is one of five principles in DTU CAS' sustainability strategy. This resulted in many conversations, both internally in the team and with DTU CAS. Do we work with greenery to create social sustainability by giving the users a view of the greenery or is it also about giving plants, animals, and bacteria better living conditions through our initiatives? How can you make green façades, and what should they be able to do? For example, we worked on how to water the green façade. Here, we landed on a principle where, for a large part of the year, we can make do with the rainwater that seeps down through the green outdoor terraces.



Biodiversity. Although the Climate Challenge Laboratory is located on a plinth area, there is a focus on biodiversity. In the process, various options have been explored, such as the ideal green façade, a small water environment, a natural landscape in the courtyard, an experimental roof surface, and acoustic panels made of eelgrass. Illustration: Christensen & Co Architects.



The green façade. The atrium appears as a clear motif in the façade and is characterized by transparency and green hanging gardens. The green façade provides both indoor and outdoor experiences and allows for a great diversity of plants and potential new habitats. Illustration: Christensen & Co Architects.

In the big picture, we're probably not going to save the world with the biodiversity strategy for the Climate Challenge Laboratory. It's not that many square metres, but the building is part of a larger ecosystem, in which Jægersborghegn is important. We help support this ecosystem. Finally, it makes sense to make the building's users aware of DTU's sustainable ambitions and show them that we do as much as we can. Here, 'the experienced sustainability' also plays a role - that the building is perceived in a certain way. The exposed CLT elements (the wooden structure, ed.) in the office building will give a special sensory experience. This is also part of the sustainability principles.



Experienced sustainability. Sustainability can't only be calculated and assessed. We humans must also be able to perceive nature. Therefore, the green façade has been designed so that the users experience the green from inside the Heart Room and get a sense of what a nature space with a high diversity of plants can look like. Illustration: Christensen & Co Architects.

The Open Air Museum has the answers

In the last three to four years, it has become more popular to work with sustainability in construction. Which of the solutions you work with in the Climate Challenge Laboratory do you expect to have the greatest impact in relation to sustainability?

JVJ: If we start with the environmental perspective, there is no doubt that in the future we will focus on how we construct our buildings, with what materials and how we document the sustainability of the materials - both the choice of materials and the entire life cycle, even after the end-of-life of a building. Next year, when requirements for the CO₂ load of buildings are introduced in the building regulations, I think we need to find good alternatives for e.g., aluminium facades that have a high CO₂ load. We can see that these goals, which will be set from next

year, will be difficult to achieve with a traditional understanding of construction.

Socially, there is much to be gained from universal design if one is to create the ideal research and learning environment. Very early in the design process, you must look at how the building supports it, and this may require input from specialists in the field. Then there's the third part - the economic sustainability, which indicates whether the solutions you implement are robust for the future. They will be if you choose the right materials and the right design, so you don't have to rebuild it.

NSS: That's why flexibility has been built into the construction so that the generic house can meet some future needs that aren't there right now. But even though we work with design for disassembly, it is important that we do not only work to reduce the CO₂ that will be emitted in 50 years. We also need to reduce CO₂ emissions now. We need to work on both if we are to mitigate climate change. That is the embedded CO₂ now and the derived CO₂ that comes when the life of the building or material has ended.

Are there any new solutions being developed in the Climate Challenge Laboratory that can help change things on a larger level?

JVJ: In this project, we mainly work with known solutions and technologies, so that we work on the basis of a very high level of knowledge. I see that as a quality. When you build one-of-the-kind, there's a huge risk that people overlook.

We're in a phase where we are collecting data and knowledge that we can share. Because one thing is that new requirements are being developed and set up in working schedules. Another thing is making the projects after these schedules. That's the real pressure test.

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We need to get much better at sharing the knowledge that is being generated right now in construction, so we learn what the future CO₂-targets should be."

— Nadia Strange Sander, SGD-advisor, CCO

NSS: Right now, we need to build a new knowledge bank in construction so that new standards can be set. To do that, we need a certain amount of data, and that's what we contribute to with the voluntary sustainability class. We need to get much better at sharing the knowledge that is being generated right now in construction, so that we learn what the CO2 targets should be in the future.

Hopefully, at some point, we will also work with what could be called 'embedded biodiversity', because there is a potential in looking at how our materials are produced.

We also need to rediscover some building engineering traditions that allow us to use our materials longer. Design for disassembly also existed in the old days. It may not be a very sexy story to have a historical foundation and an experience that builds on many years of knowledge, but we need to rediscover the traditional building principles.

"Today, you can revisit all the old solutions for wood construction at the Open Air Museum in Lyngby.

There is a lot of quality in the old methods, which the construction industry is starting to realise again."

– Jonas Vendel Jensen, engineer, MOE

JVJ: We left those principles behind in the 1950s-'60s when construction really took off. Today, you can revisit all the old solutions for wood construction at the Open Air Museum in Lyngby. Alternatively, you can do a literature study - most design for disassembly solutions are already well described in the literature. In fact, I think a lot of people would benefit from doing that. There is a lot of quality in the old methods - and that's what the entire construction industry is starting to realise again. When talking about circular economy, there is some quality in how to put materials back into play.

That sounds like a confrontation with innovation and the idea of leading the way?

NSS: Obviously, we will not be making laboratory buildings based on buildings at the Open Air Museum. It will be the translation of a traditional way of doing things into a new way of understanding. It's not that there's no innovation in it, but coming up with something completely new that's never been done before, is kind of... It's almost a slightly old-fashioned way of thinking.

After all, there is not one building that can move everything from one day to the next. It's a collaborative exercise for the entire building industry - to pool the existing knowledge and raise the standard. We need to move together as a society.

Basic information

Construction work

MT Højgaard has finished excavating and has established secant pile walls, which are concrete walls that equalize the different levels between Building 310 and Building 313 at basement level. MT Højgaard has started to obtain offers from subcontractors in e.g. on shell structure and facades.

Status on the project

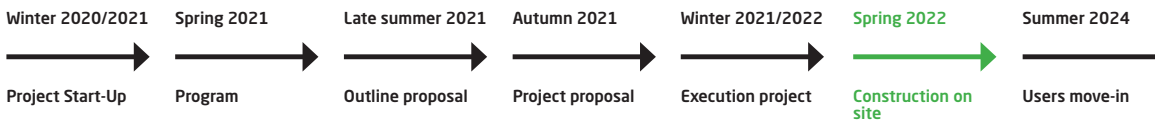
The consultants have handed in a completed audit project on 9th of June. Now the consultants have finished designing and have started to adapt the project with the different user groups. They are expected to complete after the summer holidays. The building has been pre-certified for DGNB gold.

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Time schedule



Construction site

