

# Denmark - DOLL Living Lab, Copenhagen

The DOLL (short for Danish Outdoor Lighting Lab) living lab was established in 2013 just a few km off the Copenhagen city center, with a key focus on energy efficiency and smart outdoor lighting. Presently, the DOLL living lab is a technology lab based on community digitization, smart city, and Internet of Things (IoT). This living lab allows to demonstrate on a scale of 1:1 how new technology could help cities to become smarter, more sustainable, more liveable and to respond to the climate goals developed by the Danish Government together with the regional local levels of governance.

The Danish Energy Agency, anchored in the Danish Government, offered the opportunity to run a number of green labs, a program they introduced back in 2013. The Danish Energy Agency initiated DOLL together with GATE21. The DOLL living lab is Europe's largest living lab for the development of tomorrow's LED lighting and Smart City solutions, in Hersted Industrial Park in Albertslund.

GATE21 develops innovation projects to answer the public challenges within the topic of green transitions. GATE21 has built a strong triple-helix organisation for green transition over the past ten years and has become a common platform of 45 municipalities, 2 regions, 40 private companies and 10 universities in Greater Copenhagen. They have 90 partners and members including 39 partner and member municipalities and have achieved a strong foundation in 83 percent of the municipalities in the Capital Region of Denmark and Region Zealand.

## Description

The site of the DOLL living lab is located in the city of Albertslund, which is an industrial commercial area of 1.5 km<sup>2</sup>. This includes more than 50 sites with Smart City-technology (in 1:1 scale) and more than 12km of road and bicycle lanes. It is a real-life environment to which more than 10,000 people daily commute to work. It is a common ground to start testing ways of collaboration between the different partners. A number of different companies have a section of 200-300 meters in one street in the DOLL living lab, where they put full 1:1 scale solutions. Some have more sections in the lab to demonstrate more cases. It is tried to install the different use cases next to one another in the area, so that when they bring delegations around the area, they can demonstrate/make the cases very visual. This is a quite unique offer to the decision-makers because it helps to bridge the knowledge gap for the cities. GATE21 is operating and maintaining all physical installations.



GATE21 offers a collaboration agreement running for a minimum of 3 years to “clients” that want to develop a solution and product. GATE21 helps them to install their solutions, by providing them some finances and by providing delegations. Each year, the companies pay a member fee per use case. For example, if a company would like to have a light case in the lab, they pay a fee; if the same company would like to have another case on traffic lights, they pay another fee. They get a key and access code to the visitor centre and can use their facility for free as part of the agreement.

Beyond the DOLL living lab, GATE21 has been involved in over 151 projects. They are presently running 56 projects within the field of mobility, circular economy and resources, sustainable energy and smart cities. In the frame of DOLL, they are running presently around 10 projects, next to their case development activities. These are externally funded projects.

In 2015, with new funding from the national Energy Agency, the DOLL expanded its focus smart lightning to smart urban services and includes now also other smart city technologies such as ITS, environmental management, and waste management. This is developed in partnership with among other private companies, which include predominately medium-sized companies, yet also bigger and more international-oriented companies are included in the ecosystem.

Considering the topic of mobility, intelligent traffic lights are included in the DOLL living lab. Another mobility project set up in cooperation with DOLL is the LINC project. The main aim of this project is to test and demonstrate an autonomous shuttle bus to establish a first – last mile connection to a newly established light rail across the outskirts of Copenhagen. The shuttle service is tested at the campus area of the Technical University of Denmark as well as at the DOLL site.

The way the DOLL living lab works is sorted within verticals. This includes lightning, which is the main focus of the living lab, yet as well waste, ITS traffic solutions, environmental monitoring, buildings and project development. The horizontal layers include the testing, demonstration, and the support of different activities from different projects that can boost the development and funding. Gate21 and the DOLL living lab create a partnership ecosystem, supported with market dialogues.

Each time a physical component is installed in the lab it is tried to set a sensor management system on top of the physical solution that allows to look into the data, go behind the solution, and work with it at a more intelligent level.

Likewise, in this “systems and platforms” layer is tried to identify the opportunities of interoperability between solutions. In addition, what is done with the physical components (e.g., lighting, waste, etc.) should be linked to political decision-making and political goals. This will help city management not only to create more transparency, yet also knowledge for decision-making, strategies and related

action plans.

## **Business model – Funding**

The DOLL living lab was initially established with funding from the Danish Energy Agency, the capital region and a neighbouring region. For the first two years, DOLL was funded with 15 million DKK from the Green Lab DK under the Energy Agency and supported by the Capital Region Growth Forum as well as the Region Zealand. DOLL has subsequently received a grant from the Green Lab DK of 5,77 million DKK to set up Smart City Solutions (SUS). DOLL living lab started as a project within Gate21, and gradually created its own business model. Presently it is not dependent on a single major funding or project. They have different resources streams such as partner fees as well as project-based funding.

## **Improvement cycle**

The living lab has been particularly successful in having a high retention rate, meaning that the partners who were involved from the very beginning, are still active in the lab. What happens over the years is that they come back and upgrade, or they make reinstalments, or make new cases with partners where they experiment with new combinations of partnership, technology and solutions.

The DOLL is a platform where “clients” can also enter to improve their marketing, create more visibility by having their stories told. DOLL brings forward interesting cases based on close collaboration with the partners.

Creating their own business model behind the lab was considered crucial and it was experienced as a big step being no longer dependent on the initial funding. A continuous critical challenge is to keep the lab’s high level of relevance for all stakeholders. Another critical aspect is to stay interesting for the living lab partners and maintain the level of engagement throughout the years. this is dependent on many things, such as the strategic direction or just simply how the business of the partners is developing.

Key critical factors are the relevance of the lab: to stay on top of the development; to keep the full engagement with the partners; and to have projects running in the lab with both funding and the opportunity to work at the forefront of the development.

## **References**

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- <https://www.linkedin.com/company/doll-living-lab/?originalSubdomain=ke>
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- Interview with Teddy Sibbern Axelsen and Anna Thormann (1/12/2020)
- Photo (DOLL Linkedin page)