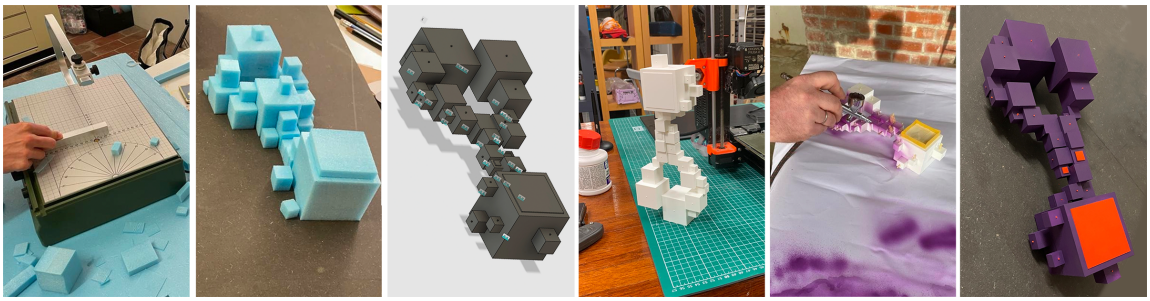
The Key to the Future – Mapping Sustainable Energy Production

KAY SCHRÖDER, Hochschule Düsseldorf
STEFFI KOHL, Zuyd University of Applied Sciences
JULES SINSEL, TU Eindhoven



CCS Concepts: • **Human-centered computing → Information visualization**.

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1 MAPPING SUSTAINABLE ENERGY PRODUCTION

Climate change and the transition to a more sustainable future have become increasingly urgent issues in recent years. It is an essential topic of global concern, and data physicalizations are a useful tool for communicating complex sustainability data to the public. Physicalizations, which are physical representations of data, offer a unique and engaging method of presenting complex data [4]. Various recent studies have investigated the use of interactive three-dimensional stereoscopic displays [3, 5, 7, 8, 10**?**] and physical data presentation techniques [1, 2, 4] to represent data in physical forms, including 3D models or tangible interfaces.

In this paper, we present *"The Key to the Future"*, a data physicalization project that visualizes sustainable energy production data in Limburg, a province in the Netherlands. The project aims to raise awareness of the progress made in renewable energy production in the region and highlights the potential for other regions to follow in Limburg's footsteps by transitioning towards a more sustainable economy. Research in the region shows that the local population thinks sustainable development is important. They understand sustainable development at an abstract level, but there is limited understanding of sustainable development at the level of concrete actions [9]. Raising awareness for the intitiatives of the region is an important step for behavior change as those who are more aware of sustainable development actions

are significantly more likely act sustainably [6]. One of the main challenges of using physicalizations with sustainability data is balancing the need for accuracy and detail with the need for accessibility and visual appeal.

2 THE DESIGN PROCESS

The design process for this physicalization project underwent a rigorous and multi-stage approach to achieve a visually compelling and informative representation of renewable energy production in Limburg. The initial idea was to create a key-shaped object that would showcase the difference in renewable energy production for each municipality in Limburg between 2010 and 2020 through cubes of varying sizes. One of the challenges faced was developing a scale that would enable the viewer to easily differentiate between the largest and smallest cubes as the share of renewable energy grew around 700% in the investigated time-frame. To overcome this obstacle, rapid prototyping was used to experiment with different sizes and arrangements. The team utilized a wire foam cutting machine to cut the cubes from insulation foam plates, allowing for quick and easy testing.

Once the size and arrangement of the cubes were finalized, the team focused on the visual encoding of the data by generating a 3D model in Houdini. To determine the size of each cube, data on renewable energy production per inhabitant from 2010 and 2020 was collected from the Central Bureau of Statistics. The size of each cube was scaled proportionally to the amount of renewable energy produced, with a smaller cube on top indicating the amount produced ten years ago. The final design generated in Houdini was transferred to Fusion to create a printable 3D model. After printing, the model was painted using an airbrush. The cubes representing the data from 2020 were painted in purple, while the cubes representing the data from 2010 were painted in orange.

3 IMPACT

"The Key to the Future" generated significant impact as it was picked up by multiple news outlets, and presented during the Dutch Design Week, effectively raising awareness and promoting the importance of sustainability in the region and beyond. As demonstrated by "The Key to the Future" project, context plays a critical role in influencing the design of a physicalization. The design process must consider the audience, the data being presented, and the overarching message being communicated. Balancing accuracy and accessibility can be a challenge, but a rigorous and multi-stage approach, incorporating ideation, iteration, and prototyping, can overcome this obstacle. "The Key to the Future" successfully communicated the progress made in renewable energy production in Limburg and highlighted the potential for other regions to transition towards a more sustainable economy. Overall, the project showcases the power of physicalizations to raise awareness of sustainability issues and promote behavior change.

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