Case study: Heidelberg, Germany

Background:

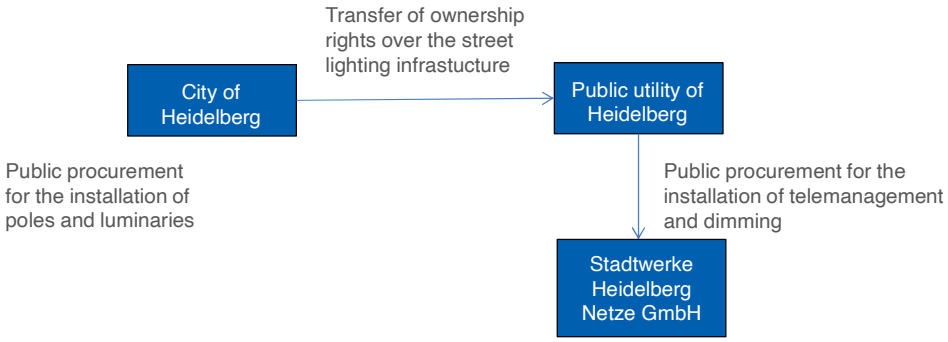
Heidelberg is a small to medium-sized city in Southwest Germany. Between 2012 and 2017, the city's population grew from 138,000 to 150,000 people. In order to accommodate the population growth, in 2008 the city of Heidelberg began to convert land once occupied by a railroad terminal into a modern green district. The area, known as Bahnstadt Heidelberg, has a maximum capacity of 12,000 persons. Energy-efficient and smart street lighting concepts were one of the central elements incorporated into the development (Heidelberg Bahnstadt 2014). Although these concepts were not required to fulfil specific energy-efficiency requirements, they were subject to the guidelines of DIN 13201 on road lighting (Herb email com.).

Project timeframe: 2008-2025.

Key stakeholders:

The model did not incorporate any external stakeholders, such as external capital providers or ESCOs. The City of Heidelberg and the municipal utility company, Stadtwerke Heidelberg Umwelt GmbH, supplied the entire upfront investment. Stadtwerke Heidelberg Umwelt GmbH owns and invests in the procurement and installation of poles and luminaires integrated into the telemanagement system, and the contractor for the installation is Stadtwerke Heidelberg Netze GmbH.

Figure 3: Operation and financing of smart lighting in Bahnstadt Heidelberg



Source: Authors' own figure.

Financing structure:

The City of Heidelberg financed the initial costs of street lighting infrastructure, including the cost of the design, purchase, and installation of poles and luminaires. After their installation, the City transferred the ownership, maintenance, and operation rights to its public utility. The utility financed additional energy-efficiency measures, such as telemanagement and dimming systems. The utility reaps all financial benefits of the project, including the costs saved through maintenance and operation of the upgraded infrastructure technology (Herb email com.).

Project scope:

The expansion of Heidelberg Bahnstadt has paralleled general development of the district. It is likely that, by 2025, more than 1,000 luminaires will be installed over a distance greater than ten kilometres.[2]

[2] https://www.swhd.de/de/Imageprojekte/Bahnstadt/Licht/Licht.html

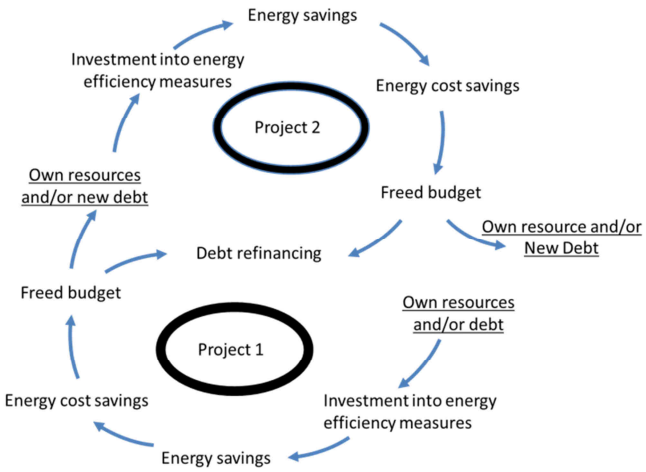
Project implementation and outcomes:

The street lighting concept relies on light-emitting diode (LED) luminaires, the telemanagement of street lighting levels, and dimming technology. At night, light output reaches 100% on bike paths when pedestrians or bikes pass by and dims to 30% when streets are not in use. In all streets, the lighting dims incrementally based on traffic. Overall, the concept saves up to 75% of the electricity costs of conventional alternatives. In 2013, the concept received the Auroralia Award at the annual international Auroralia competition, and the public utility of Heidelberg was the 2016 recipient of the German Green Public Procurement Award.[3] The public utility of Heidelberg invested a total of €3.5m in the project, which is projected to save nearly €120,000 in electricity costs over its estimated 30-year life span as compared to conventional alternatives.

2.2. Financing using revolving funds

To minimise the burden on tax payers, the public sector can establish a revolving fund to multiply available capital. Figure 4 illustrates a revolving fund organised for energy efficiency projects. A municipality invests capital (e.g., equity or debt) into a project (e.g., a street lighting upgrade). The project saves energy, which translates into energy cost savings that free up some of the budget resources previously used to cover utility bills. These funds, in turn, can be used to repay the initial investment and/or reinvest in new projects, thus creating a revolving model.

Figure 4: Capital flow in a revolving fund



Source: Authors' own figure.

Revolving funds can be created in multiple ways and at different levels. For example, although these funds are typically organised at the national level, they can also be established under municipal, regional, or national governments. The design and implementation of municipal revolving funds has been successful in several cases.

Another option is whether to set up an internal fund, fully financed through money from the internal municipal budget, or an external fund, financed through public resources and external funds from donors, financial institutions, and private investors. For project implementation, municipalities can rely on their

[3] https://www.swhd.de/de/Imageprojekte/Bahnstadt/Licht/Licht.html