



Foto: FONA/photothek

Das Kopernikus-Projekt ENavi

**Financing models for energy efficiency in public infrastructure:
Experiences from Germany and neighbouring countries**

Aleksandra Novikova | IKEM & University of Greifswald

Kateryna Stelmakh, Irina Stamo, Julie Emmrich | IKEM

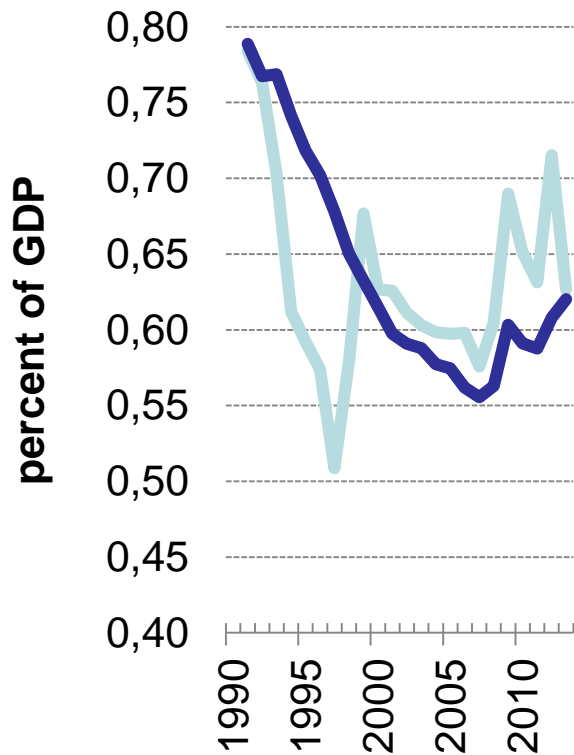
Matthias Hessling | European Lighting Expert Association (ELEA)

Why focus on financing municipal projects?

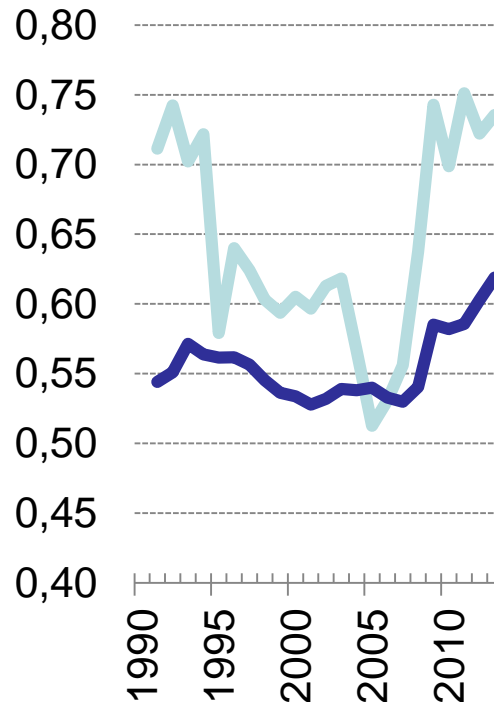
- *Investment plan for Europe “Juncker plan”*
 - *aims to strengthen Europe’s competitiveness and to stimulate investment*
 - *explicitly mentions the role subnational authorities*
- In EU, regional and local authorities manage the majority of public investment
 - In 2013, they carried out 55% of public investment
- The government expenditure in 2013 was
 - EU: 46.3 % of GDP or EUR 6.9 trillion
 - Germany: 44.2% of GDP or EUR 1.4 trillion

Municipal investment in Germany

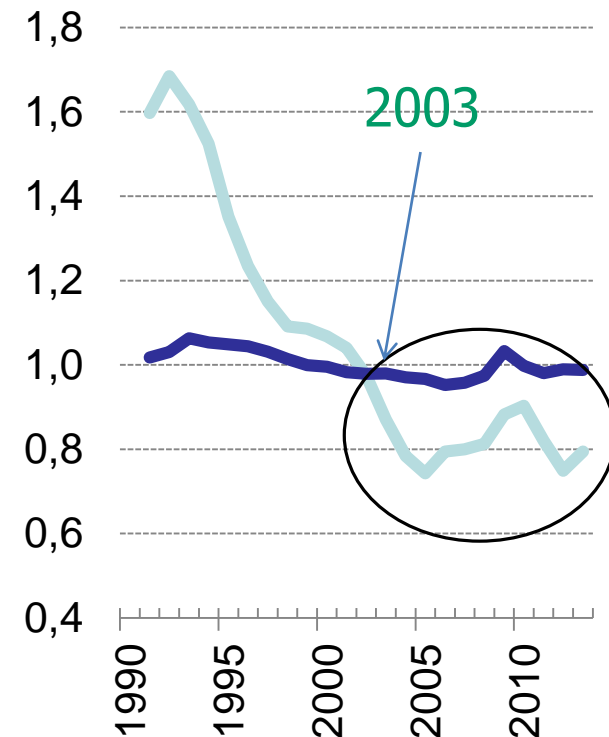
Bund



Länder



Gemeinden



— gross fixed capital formation
 — depreciation

3

Aims and tasks

Aim

- Assist municipalities on financing energy efficiency and low carbon upgrades of
 - Street lighting
 - Public buildings

Tasks

- Extensive overview and analysis of financing models used to finance the upgrade of the public infrastructure.

Methodology

Interviews via Phone and E-Mail

- Ministries, utilities, municipalities, cities, EU funds, other IFIs, etc.

Model overview structure

- Key actors and their roles
- Projects that could be financed
- Advantages and disadvantages

Online Survey

- Sent to 34 associations of municipalities and 300 other stakeholders.

Furthermore

- Literature review
- Screening project websites
- Screening database

Conducting individual case studies

- Model context
- Projects scope
- Involved stakeholders
- Implementation experience
- Outcomes

Review of identified models

Self-financing

- Budget allocation
- Internal contracting
- External revolving fund

Debt-financing

- Concessional loans
- Commercial loans
- Bonds
- Institutional investors

Financing by a private contractor

- Simple contracting model
- Contracting with forfeiting and waiver of defense

Financing through energy savings (EPC)

- Guaranteed savings model
- Shared savings model
- Other energy performance contracting

Leasing or concession to a private partner

- Leasing
- Concession to a private partner

Project finance

- Special purpose vehicle (SPV)

Financing by utilities

- Energy Efficiency Obligation Schemes
- On-bill financing

Financing by citizens

- Crowdfunding

Self-financing

Revolving funds



Intracting

Architecture

- Internal organisational units act as contracting partners
- Municipal establishes a fund or trust from own funds
- Fund/ trust finances projects without interest rate or additional costs

Other features

Projects financed by this model:

- Municipal infrastructure projects, e.g. buildings or street lightning

Jurisdictions that applied this model:

- Conceptualized in Germany, now started throughout EU (France, Italy, Croatia...)

Advantages

Municipalities:

- can reuse capital
- do not need external capital
- cooperate within their units
- pay no interests on capital

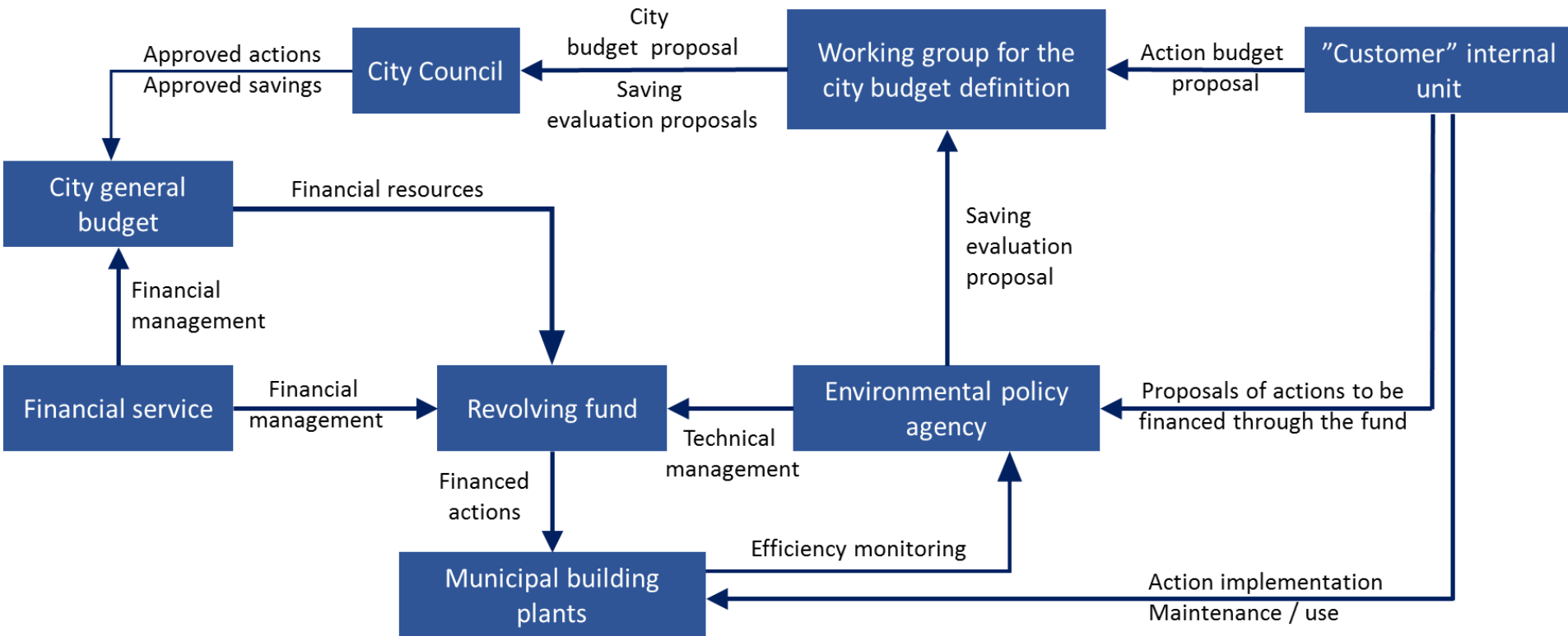
Disadvantages

Municipalities:

- carry fully up-front cost
- bear all project risks
- may face lower project efficiency vs when the upgrade is delivered by private actors

Udine, Italy (2014-...)

- Initial funding of 32 kEUR by the city
- Energy savings from funded projects are also redirected to the fund



External fund with multiple financiers

Architecture

- Revolving fund uses external funding sources and lends to municipality units
- Becoming self-sustaining, finance running costs by services fees & interest rates

Other features

Projects financed by this model:

- Scale and type depends on available funds and priorities

Jurisdictions that applied this model:

- National level funds: BGR and HRV
- Municipal level: The Hague, NLD

Advantages

Municipalities:

- Have a wide range of financial resources by being open to private investors
- Allow private investors to be part of urban development projects

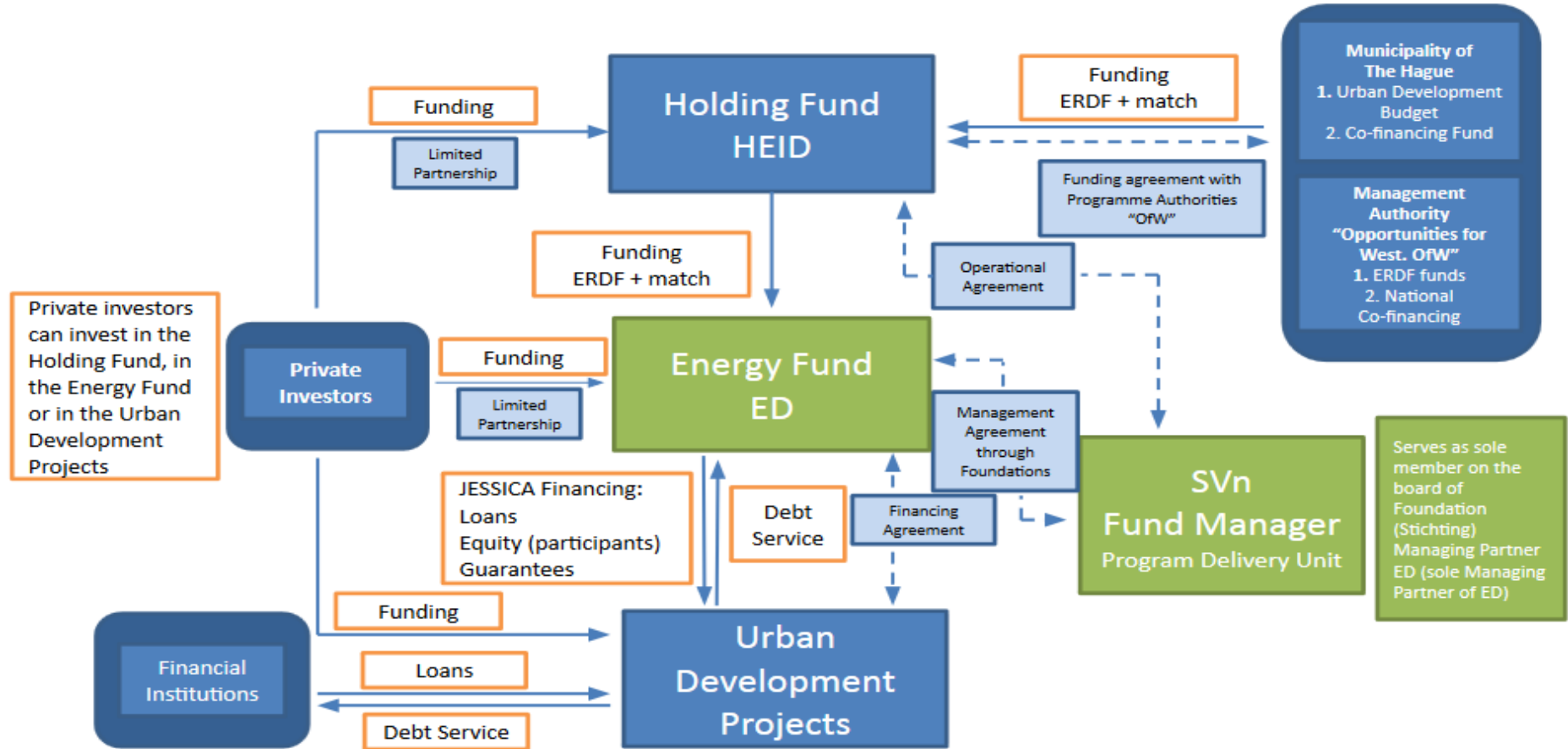
Disadvantages

Municipalities are confronted with:

- Higher complexity in the initial setup and high cooperation between stakeholders
- Political concerns, given private entity management of public and private funds

The Hague (2013–...)

Source: <https://www.svn.nl>



Debt-financing

Bonds



Issuing bonds

Architecture

- Municipal bonds are issued by the local government or their agencies
- Bonds can be certified as *green bonds* by an independent institution

Other features

Projects that can be financed by this model:

- Any project, if the municipal has access to a bond agency

Jurisdictions that applied this model:

- Gothenburg (SWE) & Varna (BGR)
- Not common in Europe

Advantages

Municipalities:

- Can issue bonds autonomously or in cooperation with bond agency
- Get low interest rates compared to commercial bonds or loans

Disadvantages

Municipalities:

- Need to prepare extensively and costly
- Need a good credit rating, if acting autonomously

Gothenburg's Green Bonds (2013-...)

Project overview

- Gothenburg implemented its Green Bond Program in 2013
- Raises capital for climate change and environmental projects

Project scope

- Eligible projects include: mitigation, adaptation/ resilience and environment
- Projects are selected by the city office and approved by the city executive board

Financing structure

- Bonds are issued on the capital market, any mainstream investor can buy them
- 1st bond issued accounted for 56 mEUR
- Total capital raised 0.46 bEUR in 2016

Implementation & outcome

- Gothenburg was the first city to issue green bonds
- Since 2013, 11 projects have been funded

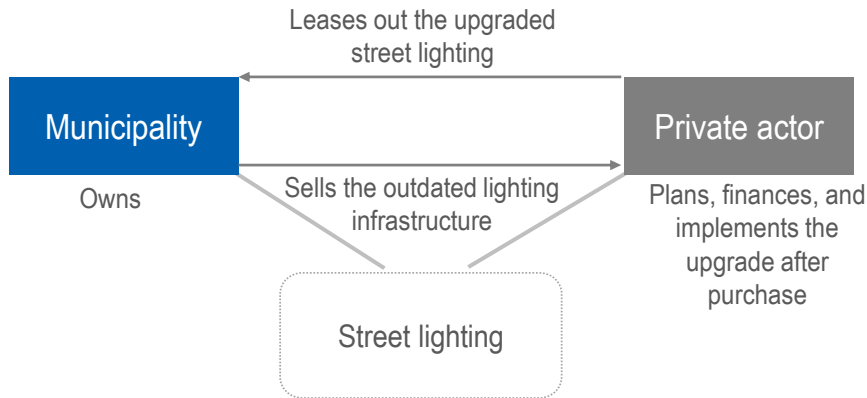
Public-private partnerships

Energy performance contracting (EPC), leasing, concession,
project finance, etc.



Leasing

Architecture



Advantages

Municipalities:

- Spread financial risks and costs over time
- Outsource technical risks to the private sector
- No debt increase but new infrastructure

Other features

Projects that can be financed by this model:

- Suited for projects with high initial investment and high budget restrictions

Jurisdictions that applied this model:

- Not very common in EU, applied in Italy

Disadvantages

Municipalities:

- Suffer higher costs in the long-term compared to self-financing
- Have no direct control over the assets

Cesena (2015-2027)

Project overview

- Its objective is to decrease energy consumption by 30-40%
- All existing and new street lights shall be upgraded to LED

Financing structure

- The municipal pays a leasing fee to the contractor, which in turn upgrades the street-lighting infrastructure
- At expiry ownership is transferred back

Project scope

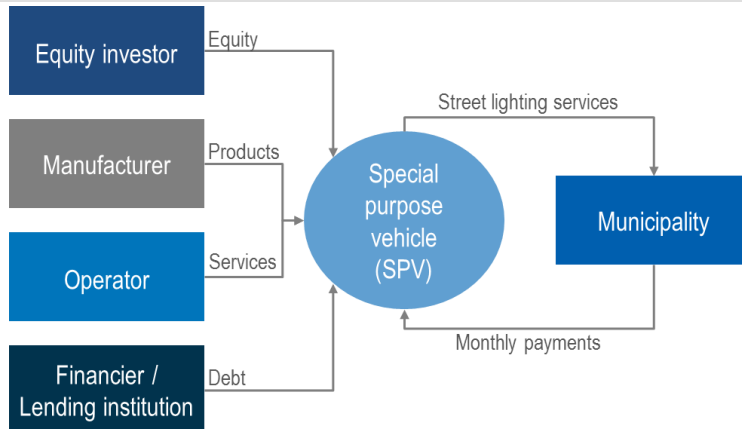
- Out of the 21 k luminaries ownership of 15.8 k was transferred to the contracting partner in 2010, renewed in 2015
- The contractor is responsible for maintenance, control and management of the network and upgrading it

Implementation & outcome

- The municipal has created an investment plan together with the contractor
- In 2010-2017, 2.3m EUR were spent to upgrade the oldest 4.9k luminaries

Project finance

Architecture



Advantages

Municipalities:

- Leverage capital from the private sector
- Can carry out projects off balance-sheet
- Can contract for financial penalties, if targets are not achieved

Other features

Projects that can be financed by this model:

- Large projects with investment costs over 20m EUR and duration 20-25 years

Jurisdictions that applied this model:

- Applied within the EU in Italy and France

Disadvantages

Municipalities:

- Suffer high transaction costs when implementing the SPV
- May suffer administrative costs

Case study: Birmingham (2007–2035)

Challenge

- Implementation of the Birmingham Private Financing Initiative (HMMPFI) under the SPV Financing Initiative (PFI)

Financing

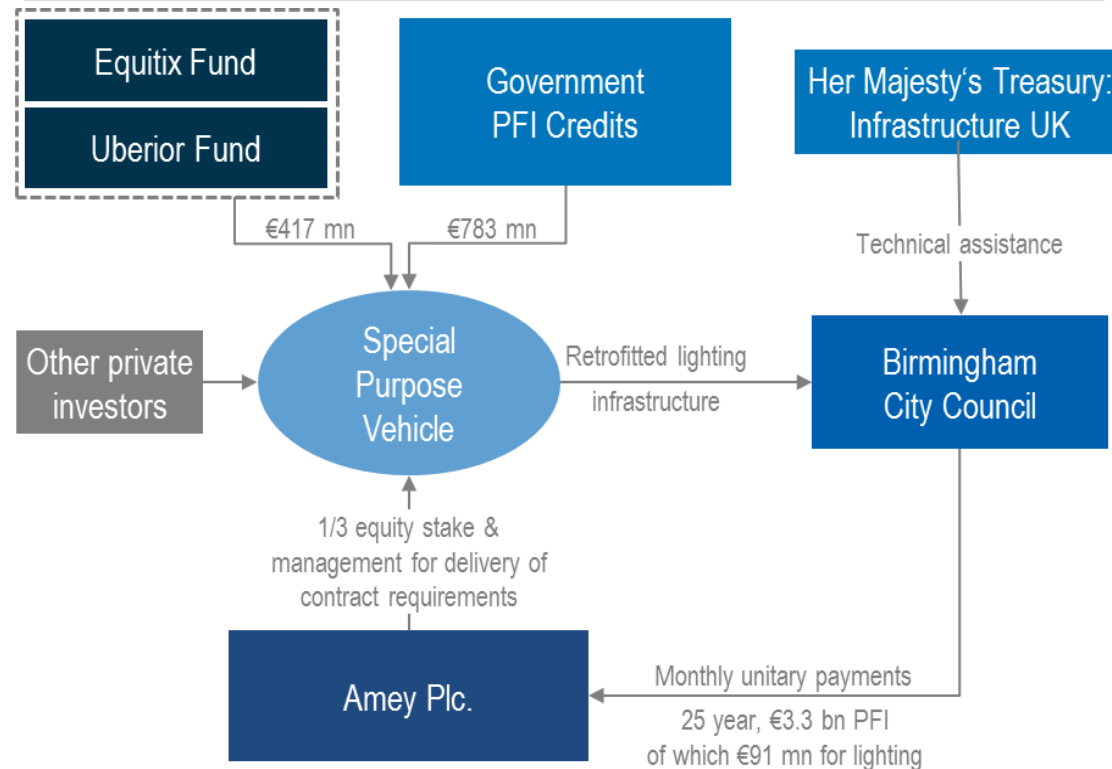
PFI credits

- 783 mEUR from the UK gov
- 417 mEUR from the Lloyds (Uberior Fund), Equitix Investment Fund and others

Project scope

- Upgrading, management and maintaining of 97k streetlights for ~91m EUR
- The results are still to see

Contracting



PFI - Private financing initiative

Financing by utilities

On-bill financing



On-bill financing

Architecture

- The utility provides a loan to the municipality, which pays it back through its energy bill - based on energy savings
- The municipality can oversee and require specific technology use for upgrades

Other features

Projects that can be financed by this model:

- In principle easy to implement and set up for small to medium investments

Jurisdictions that applied this model:

- Not common in the EU

Advantages

Municipalities:

- Can easily set up and implement an on-bill repayment model
- Repay their loan via their energy bill, not suffering additional administrative costs

Disadvantages

Municipalities:

- Need to repay their loan long-term, having it on their own balance-sheet

California, USA (2004-ongoing)

Project overview

- The utility Pacific Gas and Electric (PG&E) provides zero interest rate loans to municipalities in northern California
- Southern California Edison (SCE) has a similar scheme for southern California

Project scope

- PG&E and SCE each provides loans between 5-250 kUSD to public institutions
- To qualify for a loan, estimated savings have to be enough to repay it

Financing structure

- Loans are payed back monthly via the energy bill
- Loans are refinanced by estimated energy savings by the efficiency measures

Implementation & outcome

- As of 2016, several hundred projects have been realized
- More than 180 k luminaries were upgraded by on-bill financing of PG&E

Kontakt

Name Aleksandra Novikova
Funktion Senior research associate
E-Mail aleksandra.novikova@ikem.de

Institute for Climate Protection, Energy and Mobility
Magazinstr 15-16
10179 Berlin
www.ikem.de