training

Financing models for energy-efficient urban street lighting

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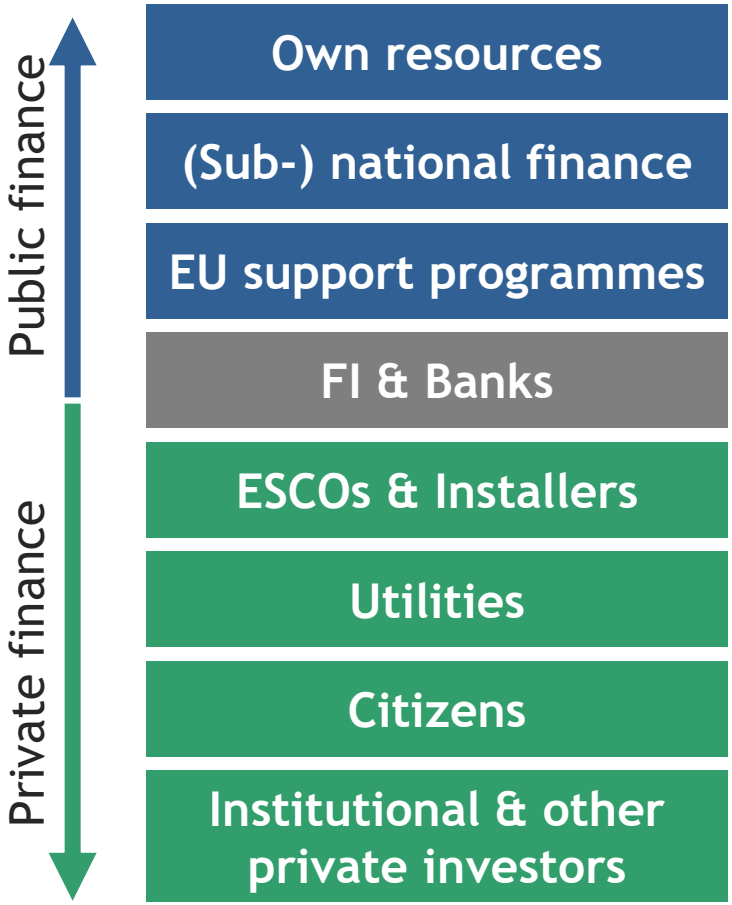
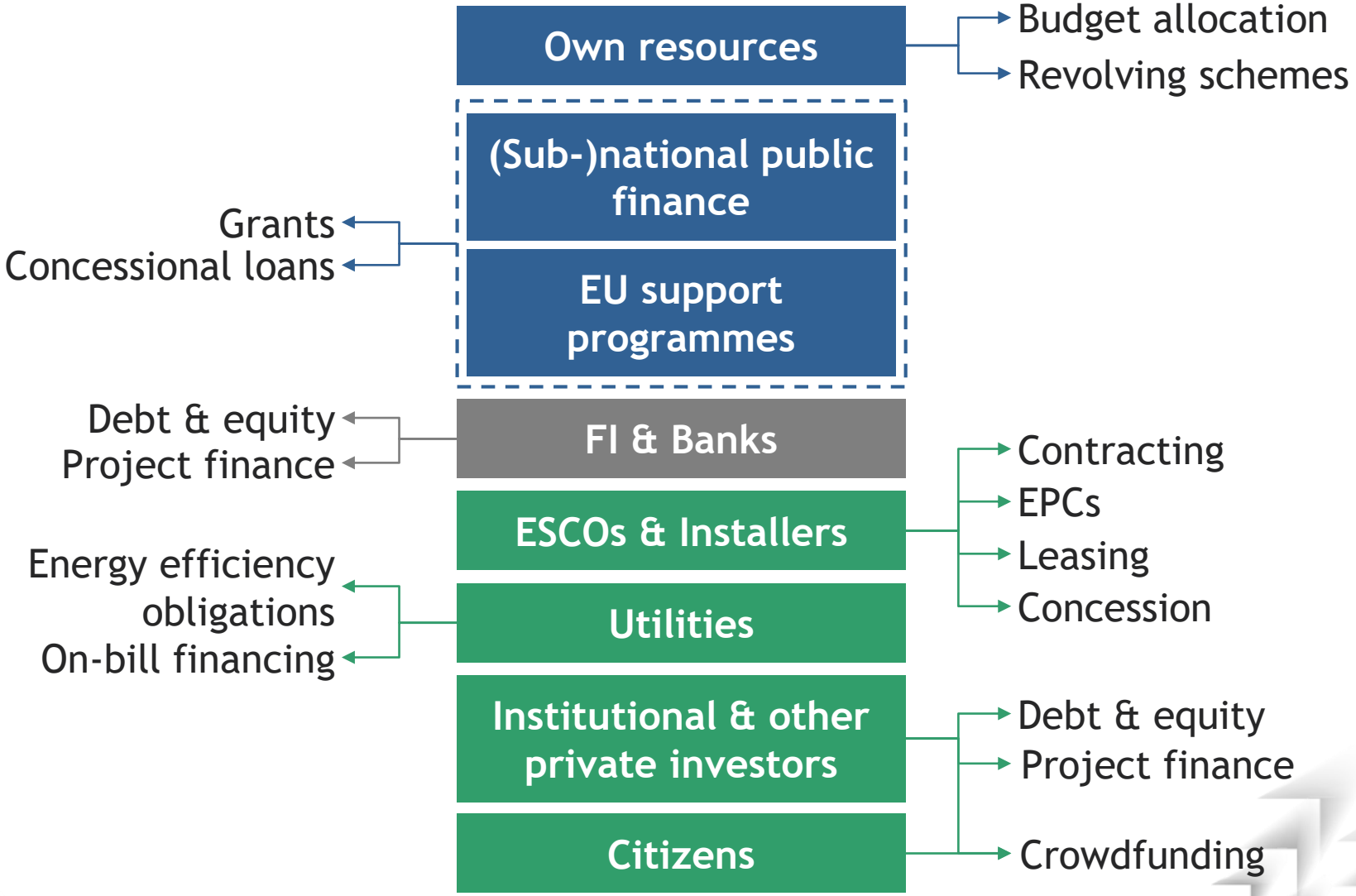
Funding sources - recap



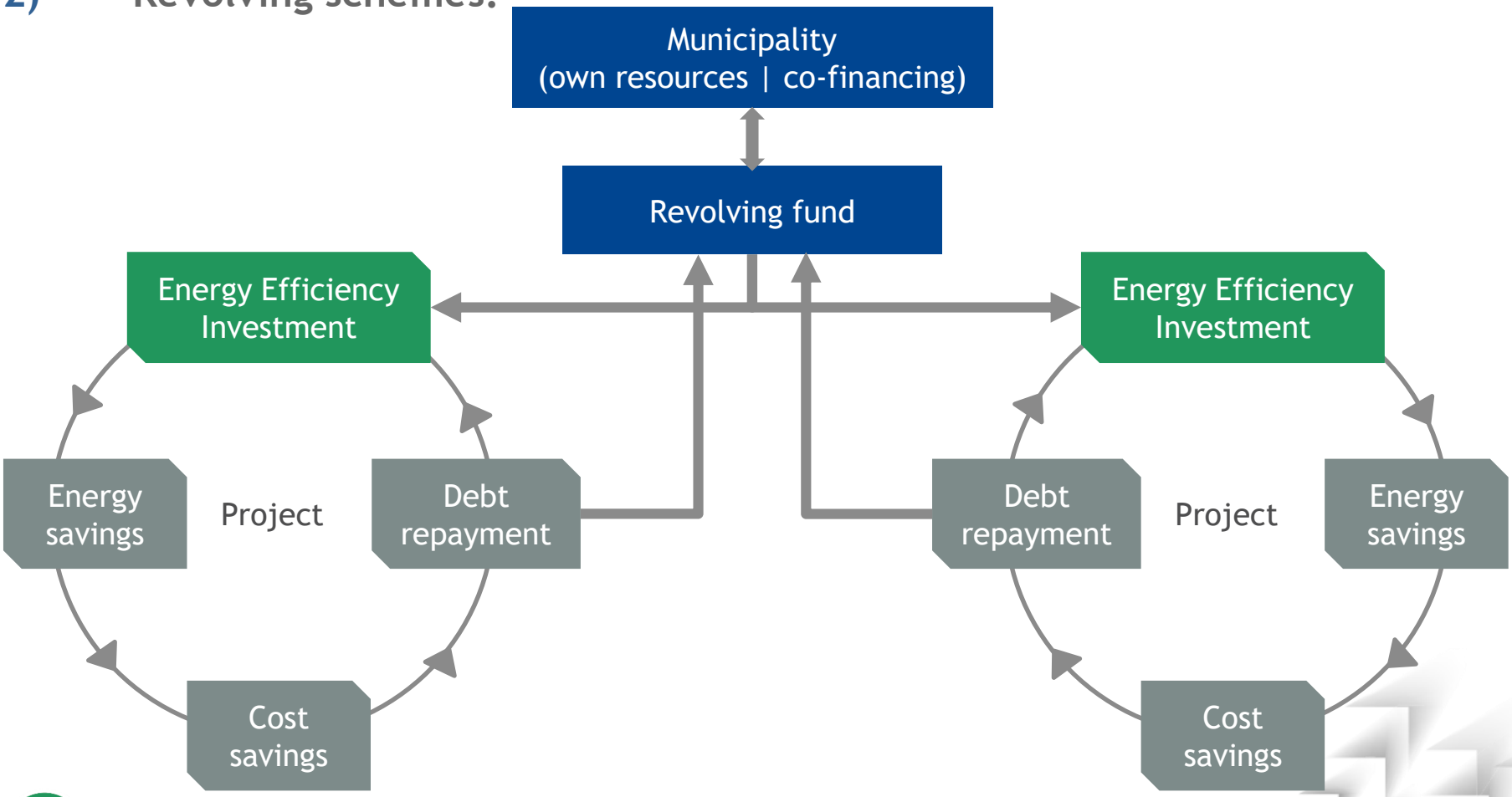
Matching sources and models



Self-financing

Self-financing

1) Municipal budget
2) Revolving schemes:



Source: ESMAP (2014) in Novikova et al. (2018)

Debt-financing

Debt financing

1) Loans (concessional or commercial)
2) Bonds

Debt | Bonds case study: Gothenburg's Green Bonds (2013-ongoing)

Context:

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

Eligible projects:

- Mitigation, adaptation and climate resilient growth, and sustainable environment
- The projects have to be in line with the city's **Environmental and Climate Programmes**.

Financing structure:

- Gothenburg has been issuing bonds for last four years. They can be purchased on the capital market by any mainstream investor
- The total capital raised via financial markets was **EUR 0.46 billion** (SEK 4.36 billion)

Outcomes:

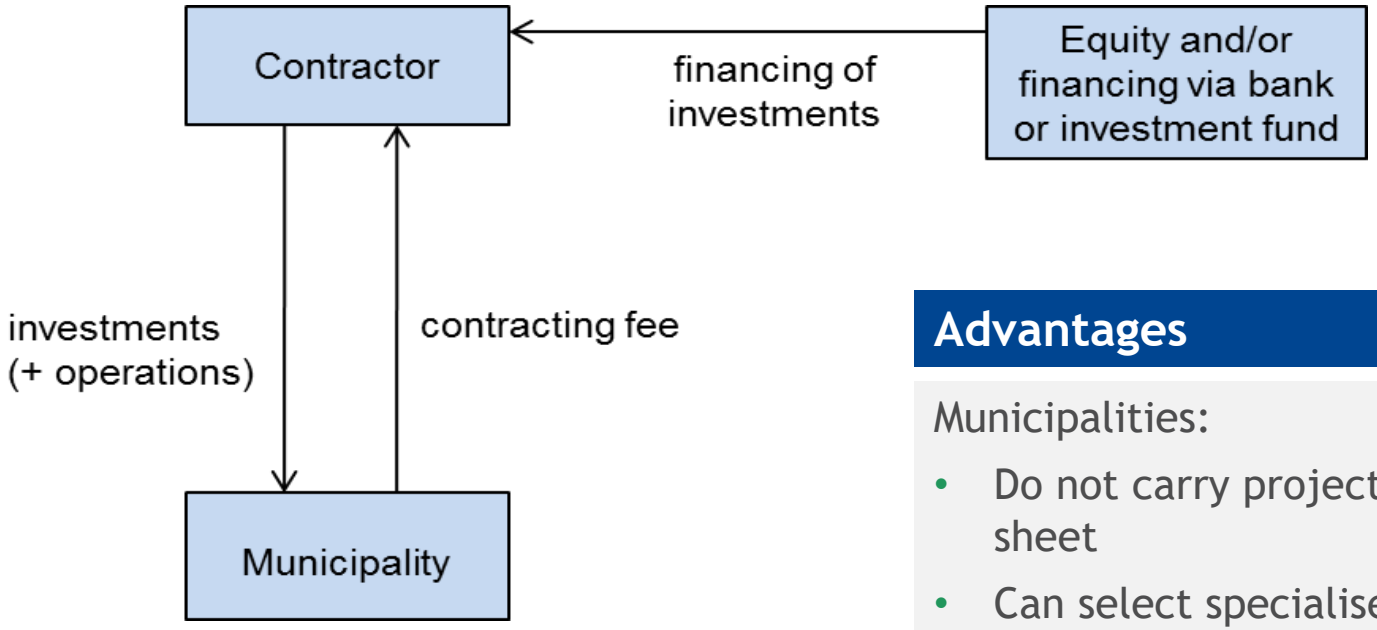
- Gothenburg was the first Scandinavian city and **the first city in the world to issue green bonds.**
- Since 2013, 11 projects have been financed with Gothenburg's green bonds, incl. energy efficiency measures in traffic lights, electric cars, bicycle infrastructure, sustainable housing, and district heating and other (as of 2016).

Financing by ESCOs and private contractors

Financing by ESCOs and private contractors

- Contracting
- Energy performance contracting
- Leasing
- Concession

Contracting | Simple contracting model



Advantages

Municipalities:

- Do not carry project cost on their balance sheet
- Can select specialised companies via a tendering process

Projects financed with this model

- There is no fixed size threshold, but a project volume of €0.5–1m is a reasonable minimum
- Widely applied for street lighting projects

Disadvantages

Municipalities:

- May face higher financing cost compared to concessional loans
- May face restrictions on use to public support

Energy performance contracting

Energy performance contracting (EPC):

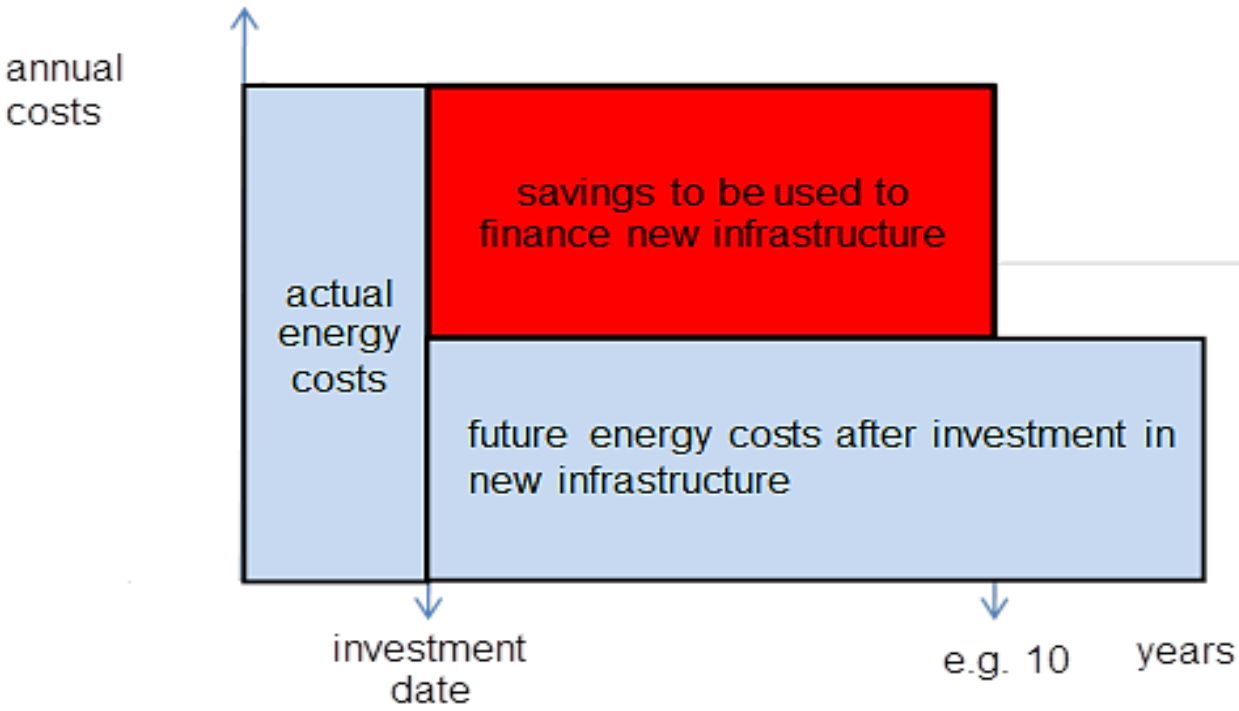
By the savings achieved:

- Guaranteed savings
- Shared savings

By the timing of modernisation:

- Modernization with immediate savings of energy cost
- Staggered savings

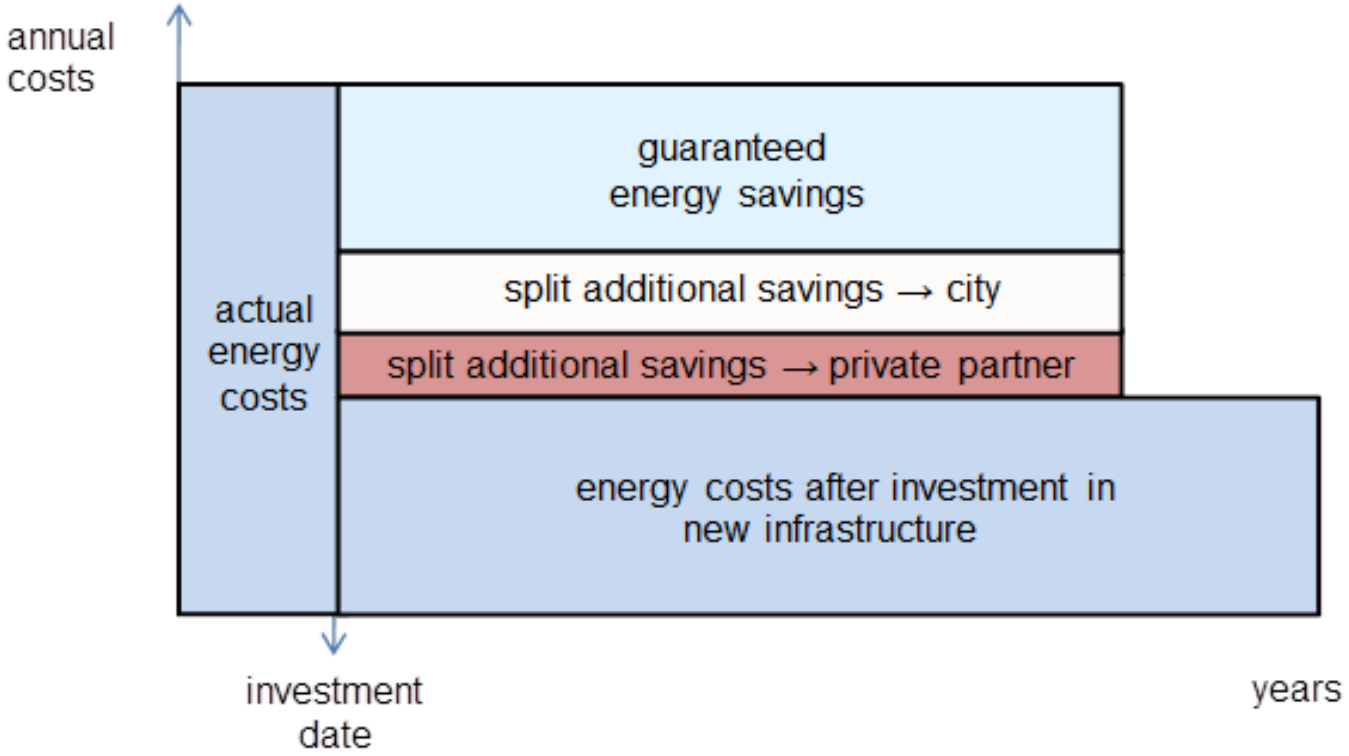
EPC| Guaranteed Savings



- Projects with a high energy cost savings potential
- Municipalities should have sufficient financial resources to pay the fees as set in the contract

Advantages	Disadvantages
• Can implement projects at a fixed rate, without spending peaks • Own the installed equipment after the contract expires • Transfer the risk to the contracting partner	• Need to bear high energy prices / cost, otherwise the payback time is too long for private contractors • Can hardly raise incentive for the contractor to go beyond the guaranteed savings

EPC | Shared savings



- Projects with a high energy cost savings potential
- Municipalities should have sufficient financial resources to pay the fees as set in the contract

Advantages

- Same as in EPC with guaranteed savings
- Achieve higher savings by setting an incentive for the contracting partner

Disadvantages

- Need to bear high energy prices / cost, otherwise the payback time is too long for private contractors

EPC | Modernization with immediate savings of energy cost

Concept:

- Implementing improvements as short as possible so that energy savings can be achieved as quickly as possible
- Can be with guaranteed or shared savings

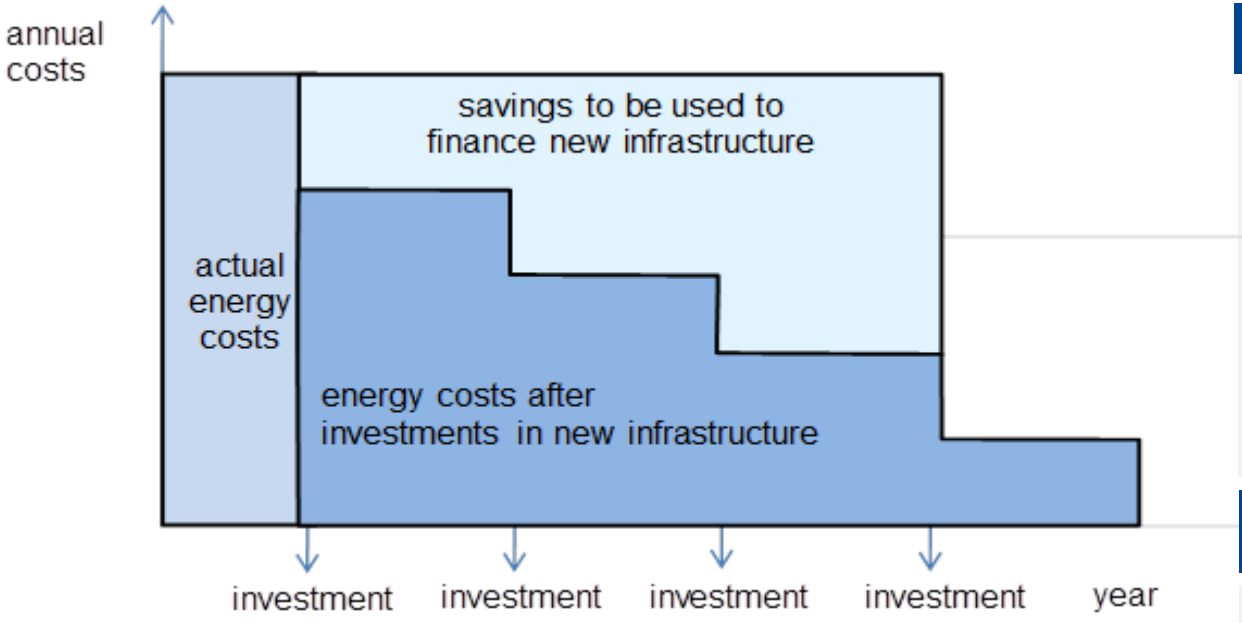
Advantages:

- Allows for maximum energy savings
- Because new technologies, e.g. LED lamps, require less maintenance, the associated costs will be lower too

Disadvantages:

- All luminaires will be modernised at the same time, regardless of age
- Prevents the city from modernising at a constant rate, e.g. 3% of existing infrastructure per year with the advanced technology
- Modernisation completed at the beginning of the contract will not incorporate any new technology at a later contract period
- By the time the work is complete, the street lighting is once again outdated

EPC | Staggered savings



Advantages

- Reasonable investment regime and modern infrastructure
- Suitable for projects with existing luminaries of different age and technology

Disadvantages

Whole amount of energy and maintenance cost savings at later stages of the contract

Case study: the city of Hilden

Scope:

- Modernisation of (almost all) 5,000 luminaires and 2400 poles
- Operations management, incl. energy supply

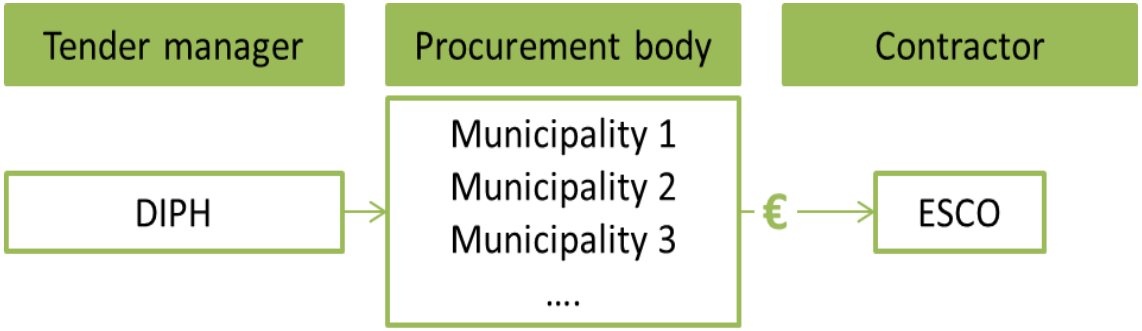
Contracting:

- Modernisation of the luminaires (the oldest first) at fixed intervals (after 5, 10, 15 and 20 years).
- Payments made by the city, but it recoups indirect costs in the form of energy savings.

EPC| Project bundling: Huelva (2015-2027)

Challenge: Individual projects are often too small to attract ESCOs

Solution: Developing a grouped tender process: bundling projects of several municipalities and tendering them as a group



Project scope:

- Improving public lighting infrastructure and services in nine municipalities
- Mixture of energy service contract and energy performance contract with guaranteed energy savings
- Volume of EUR 7.1 million and average energy savings of 72.9 %.

Source: Diputacion de Huelva 2016.

Leasing and concession models

Concession:

- Outsourcing operation and maintenance of lighting infrastructure to a private sector company for a fixed fee by drawing up a concession agreement

Leasing:

1) Selling street lighting infrastructure to a private contractor conditional on upgrade, operation, and management
2) Leasing it back from a private contractor for a fixed fee over a set period of time
3) Transferring ownership rights are back to the municipality at the end of the leasing contract

Leasing case study: Cesena (2015-2027)

Context:

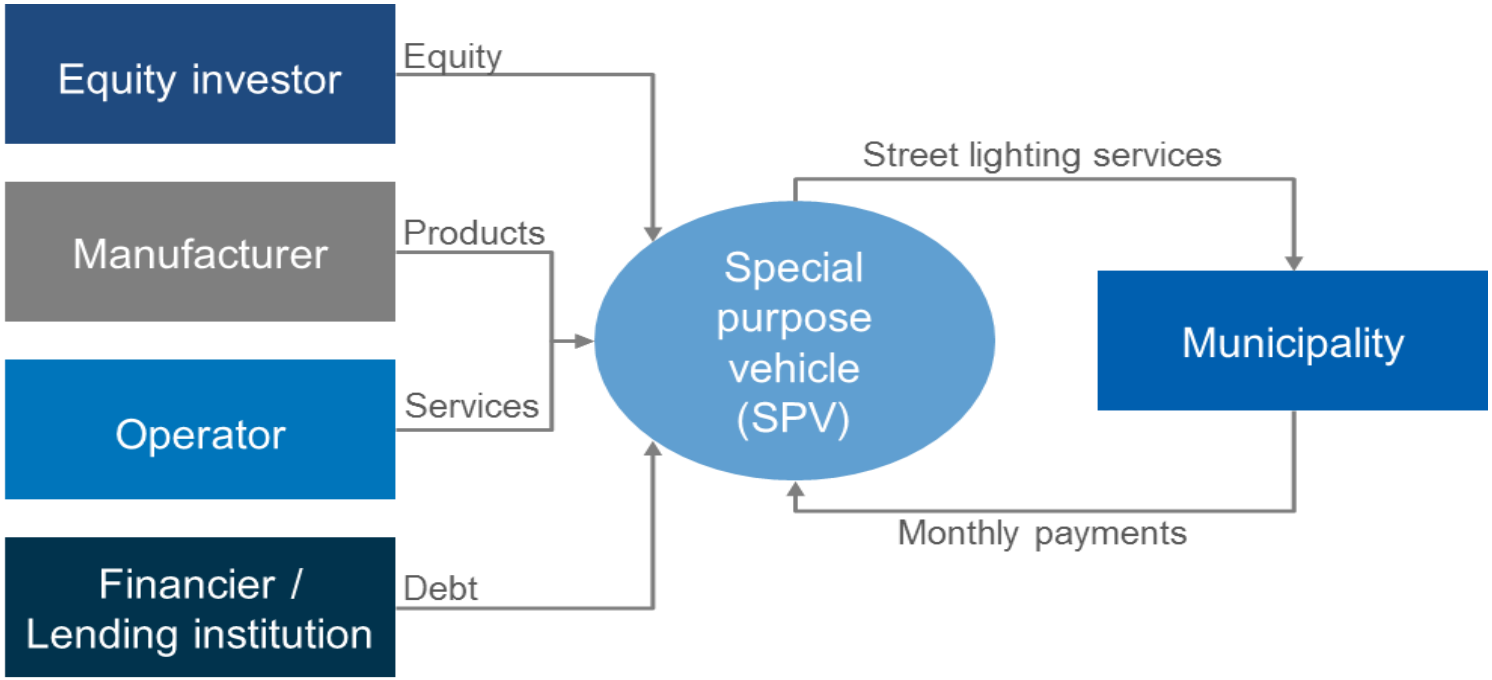
- Municipality objective is to decrease energy consumption by 30-40% and increase the quality of lighting in public spaces

Project scope:

- Transfer of the ownership and management of the majority of light points and traffic lights to Hera Luce Ltd:
  - 15,830 light points owned by Hera Luce Ltd
  - 5,236 remain in municipal property
  - After 2027, Cesena will regain ownership of these light points
- First project: €2.3m to replace the most outdated lights with LED luminaires (4,880 light points)
- Second project: investment plan and update 15,830 light points

Project finance

Project finance| Special Purpose Vehicles (SPV) in Public Private Partnerships (PPP)



Advantages

- Off-balance sheet finance
- Isolating project risks within SPV
- May foresee penalties if private partners fail to deliver the services

Disadvantages

- High transaction costs related to the preparation and implementation of the special purpose vehicle
- For large projects only (> EUR 20 million) or consortium of several municipalities

Financing by utilities

Financing by utilities

1) Energy Efficiency Obligation Schemes / white certificates
2) On-bill financing

White certificates case study: Italy (2004-ongoing)

Objective: Meeting EED requirements & boost ESCO market

Scope:

- Requires electricity and gas distributors with more than 50,000 customers to meet the primary energy saving targets via energy efficiency measure
- Efficiency measures cover all end-use sectors, except energy generation
- For each verified ton of energy saved entities receive a white certificate
- Entities can either implement measures themselves, outsource implementation, or buy the certificates

Implementation:

- 96% of the certificates are generated and traded by non-obligated parties
- As of 2015, 48mn certificates had been traded, 65% via bilateral agreements
- The scheme boosted the ESCO market. ESCOs account for 78% of the entities participating in the scheme, issuing 72% of total white certificates.
- In 2015, 64% of the certificates were issued for EE in the industrial sector, 4% of EE improvements related to lighting, 32% were in the civil sector

Financing by citizens

Crowdfunding:
Bettervest crowdfunding platform

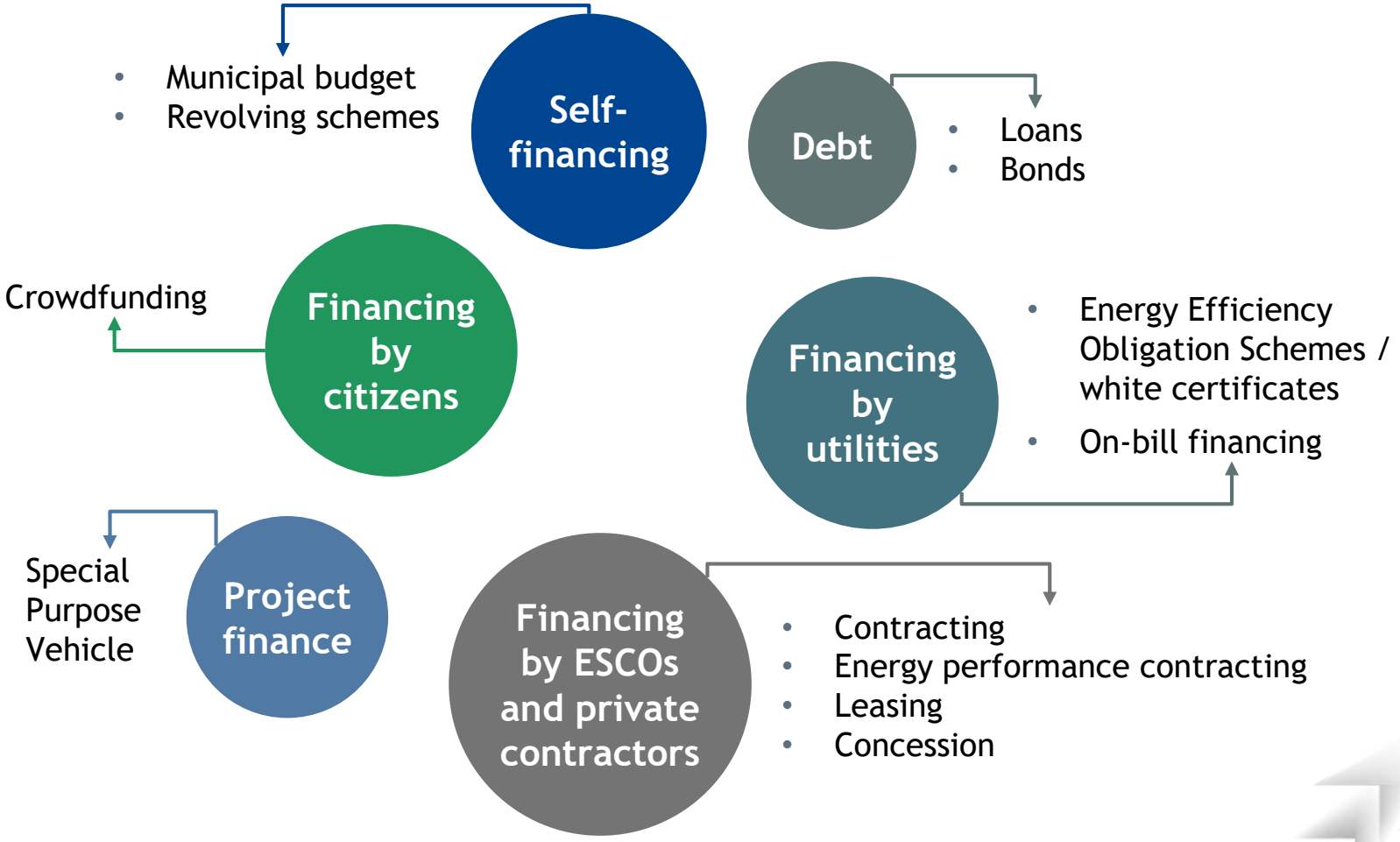
- Germany-based crowdfunding platform for climate-change mitigation projects

- **50 energy-efficiency projects** from **€4,000-€600,000** in Germany and other countries, as of 2017

- **Example: lighting upgrades in a public school in Szeged, Hungary:**
  - The school raised €46,400 from 92 investors through Bettervest
  - Expected energy savings of more than 70% and significantly reduced energy and maintenance costs
  - After securing funds, the school signed a 10-year lease-purchase contract with LED-LIGHT-Germany.
  - The contract transfers the obligations towards crowd-investors from the school to LED-LIGHT-Germany – the contractor will have 7 years to pay back 100% of the funds borrowed from the crowd-investors plus 7% rate of return.
  - The school pays LED-LIGHT-Germany €6,542 per year for upgrades and installation work.

Conclusion

Re-cap


Municipal budget
Revolving schemes
Self-financing
Debt
Loans
Bonds
Crowdfunding
Financing by citizens
Financing by utilities
Energy Efficiency Obligation Schemes / white certificates
On-bill financing
Special Purpose Vehicle
Project finance
Financing by ESCOs and private contractors
Contracting
Energy performance contracting
Leasing
Concession

Conclusion

- **There is no one-size-fits-all** – different complexity, degree of autonomy of the municipality, risk sharing between municipality and private partner, number and kind of involved partners, costs, running time, etc.
- **Key considerations**:

  a) **Availability of public policies and funding**: budget allocations, grants, concessional loans, revolving schemes, white certificate schemes

  b) **Project size and bankability**:

  - The larger the project, the greater the need for private sector engagement
  - Should meet private investors risk-return requirements

  b) **Maturity of the market for ESCO and energy service providers**: in mature markets, advantageous terms for EPCs, leasing, and concession models, incl. bundling several small-scale projects

  c) **Municipality's borrowing capacity & finance from commercial financial institutions**:

  - Loans, bonds, project finance, equity, and other financial instruments
  - Projects must be financially sustainable
  - Cost of capital higher than through public support programmes

More information:

https://www.interreg-central.eu/Content.Node/Dynamic-Light/Guidelines-financial-models.html

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