

Economic and Social Commission for Western Asia

Energy efficient financing mechanisms : Roof insulation of existing residential buildings in Jordan

ESCWA UNDA Closing Webinar:
Presentation of the outcomes of the UN Development Account Project on
“Up-scaling Energy Efficiency in the residential and services sectors in the Arab Region”

Online, via Zoom, 20 & 21 December 2021



MINISTRY OF ENERGY AND MINERAL RESOURCES
THE HASHEMITE KINGDOM OF JORDAN



11th INTERNATIONAL FORUM ON ENERGY
FOR SUSTAINABLE DEVELOPMENT
VIRTUAL | SEPTEMBER - NOVEMBER 2021



AGENCE NATIONALE POUR
LA MAÎTRISE DE L'ÉNERGIE
ANME

Un engagement durable et renouvelable



UNITED NATIONS

الاسواق
ESCWA

Shared Prosperity **Dignified Life**



Rafik Missaoui

Senior Sustainable Energy Expert
Alcor

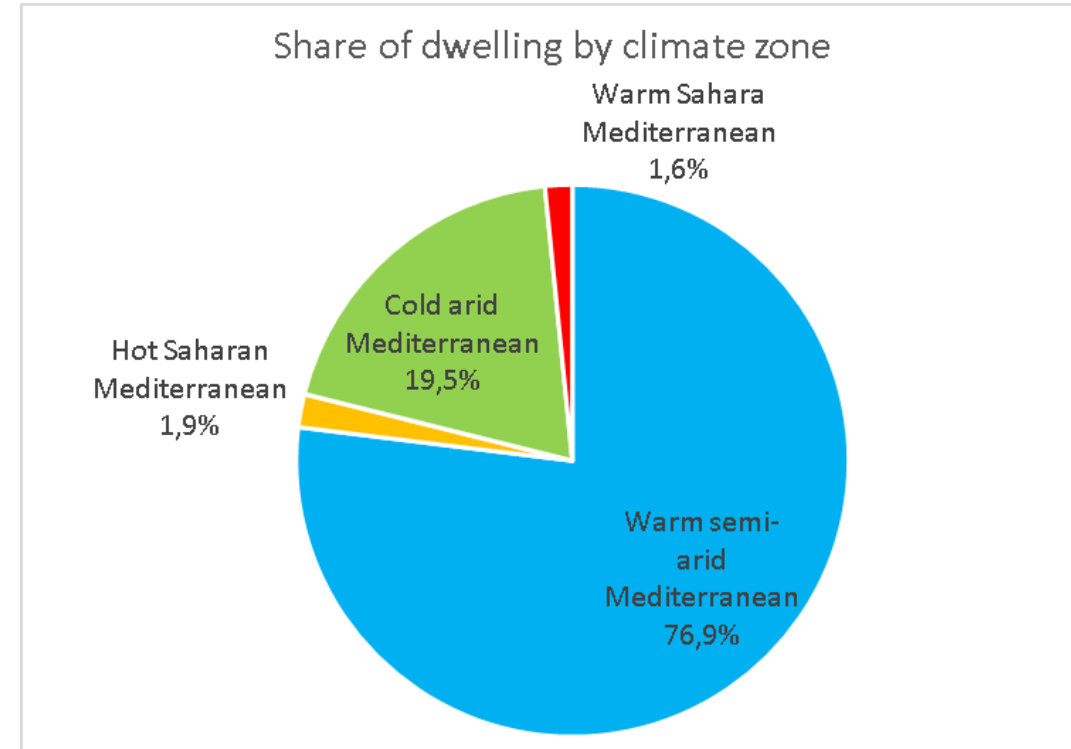
Content

- **Market analysis**
- **Economic assessment of roof insulation of existing residential buildings**
- **Recommendations for financing mechanism**

Market analysis

Dwelling stock by climate zone

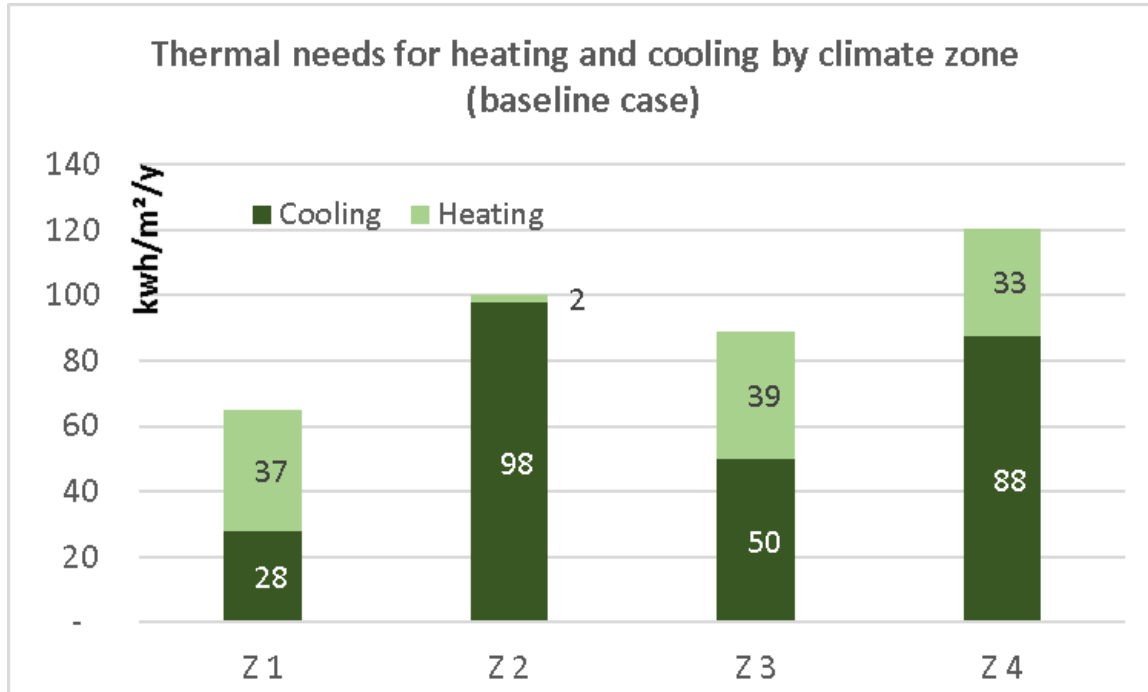
Climate Zones	Governorates	Number of dwellings
Warm semi-arid Mediterranean	Jarash – Ajluon- Irbed – Madaba- Alkarak- Amman-Albalqa-Tafieleh	1 724 995
Hot Saharan Mediterranean	Aqaba	43 604
Cold arid Mediterranean	Zarqa and Almafraq	437 530
Warm Sahara Mediterranean	Maan	35 789
Total		2 241 918



- Average space per unit estimated through the housing statistics of the general census of 2015: Around 140 m²/unit.
- Total space : around 314 million m².
- With an assumption of 8 dwellings by residential building: total area of roofs around 40 million m².

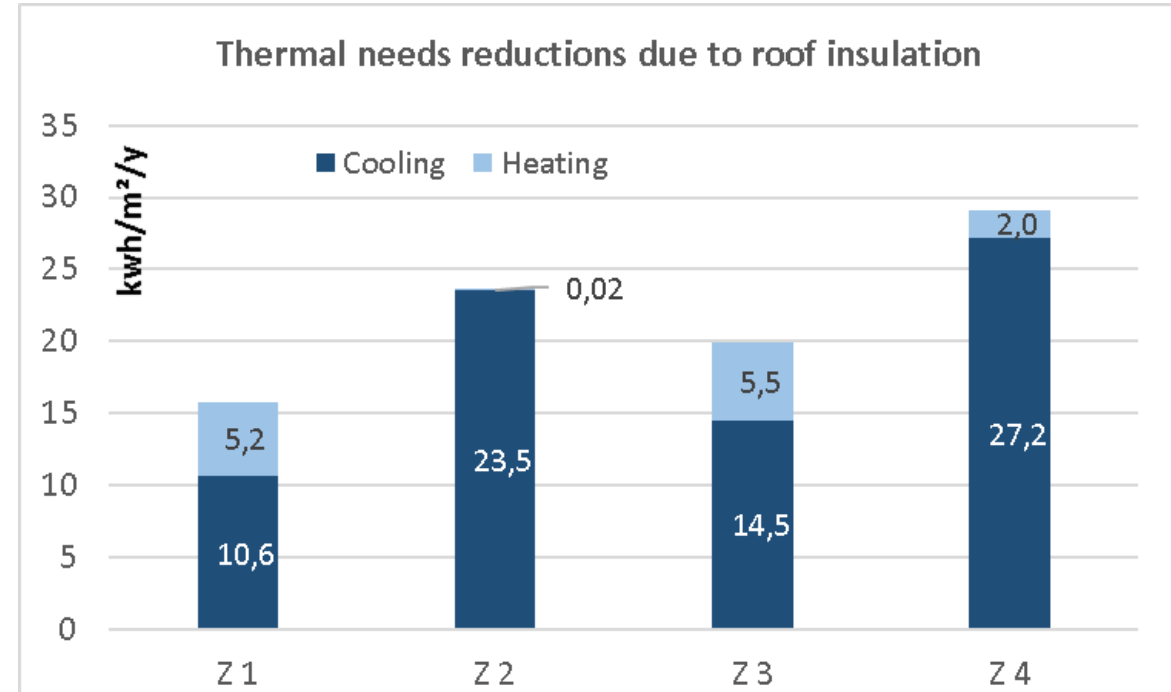
Market analysis

Thermal needs



Share of needs in %

	Cooling	Heating
Z1	43%	57%
Z2	98%	2%
Z3	56%	44%
Z4	73%	27%



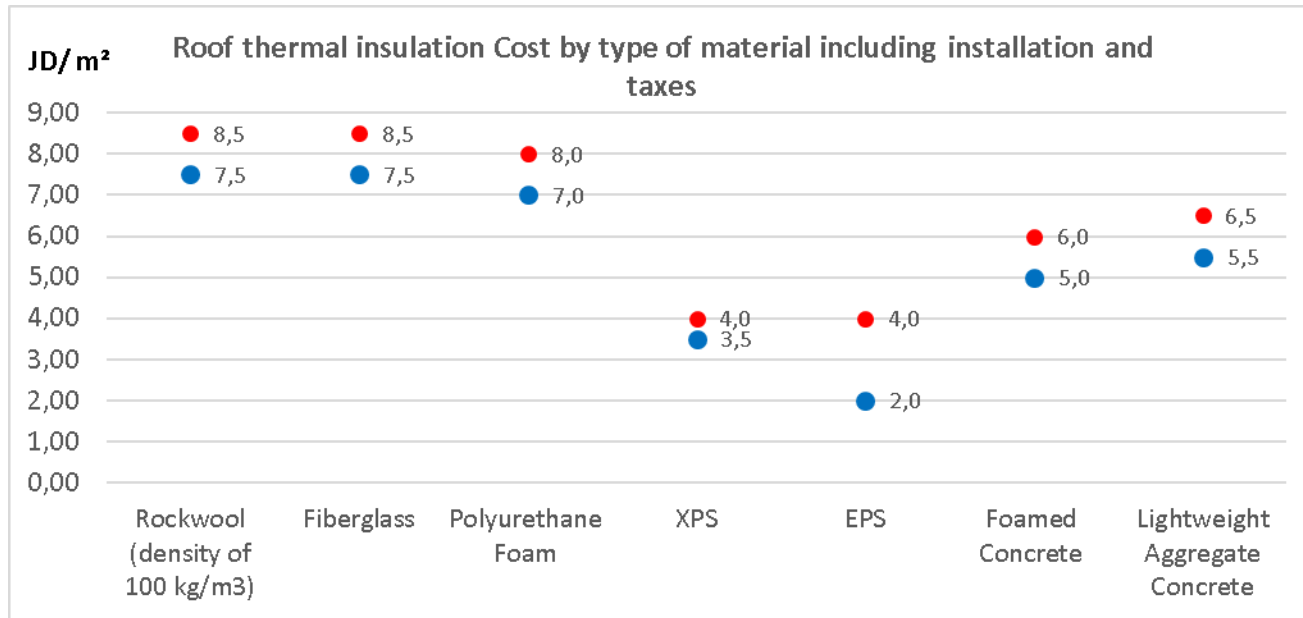
Needs reduction in %

	Cooling	Heating
Z1	38%	14%
Z2	24%	1%
Z3	29%	14%
Z4	31%	6%

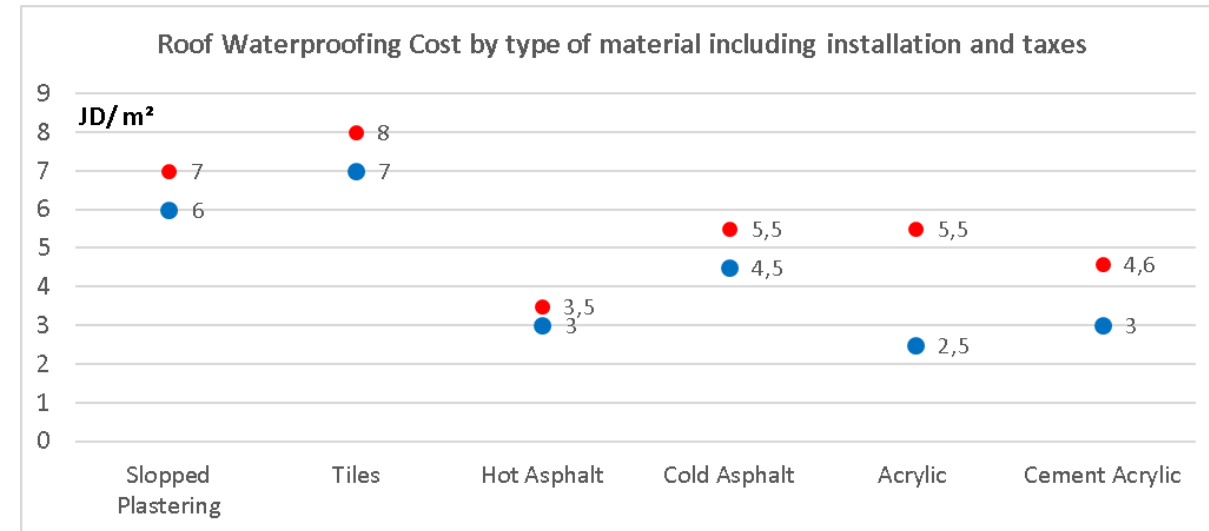
Market analysis

Technology local supply

Cost of thermal insulation



Cost of Waterproofing

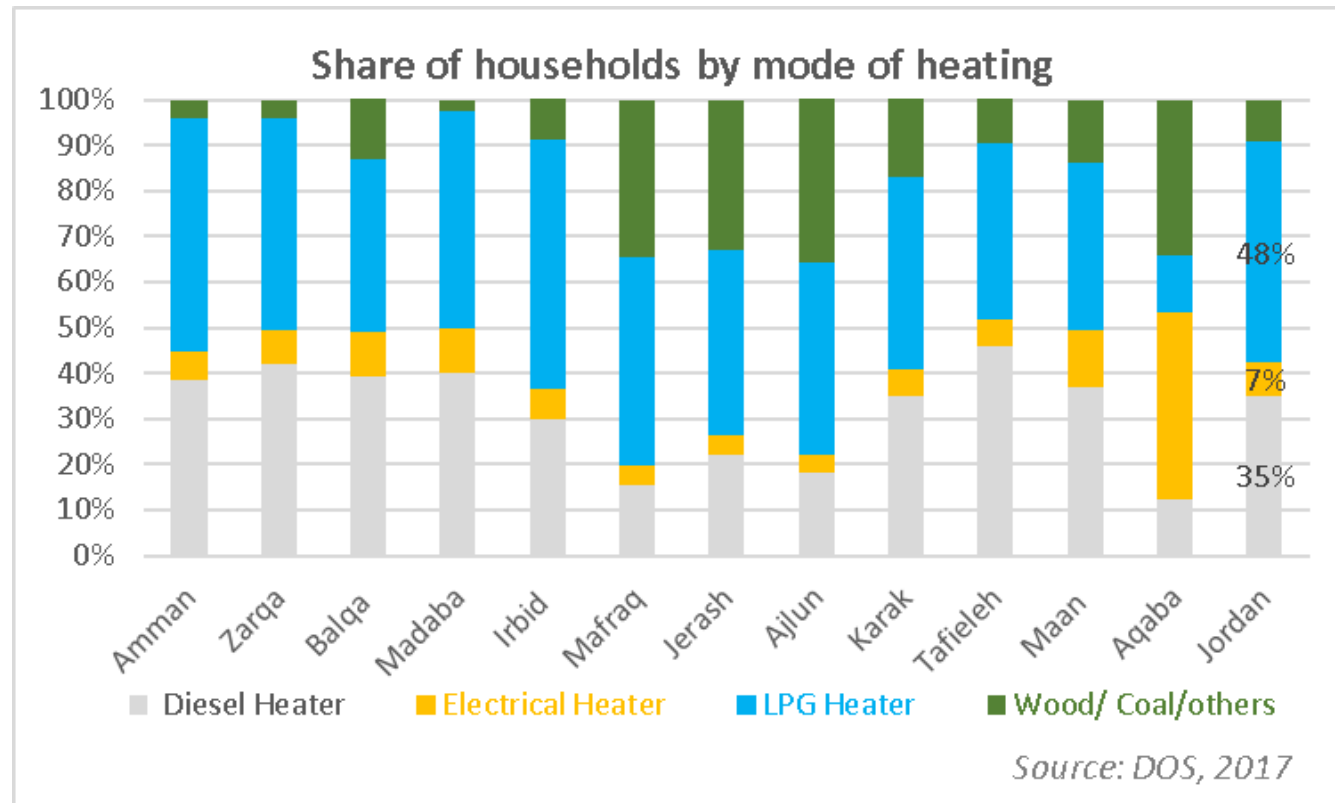


Source: Energy efficiency implementation/financing mechanisms – ESCWA, Shada El-Sharif, september 2021

Profitability assessment of roof insulation for existing residential buildings

Methodology

- Possible cases of energy use for heating and cooling in Jordan:
 - Electricity heating & Electricity Cooling
 - Diesel heating & Electricity Cooling
 - LPG heating & Electricity Cooling



Profitability assessment of roof insulation for existing residential buildings

Methodology

- Assessment is made for the different following categories, because of the electricity tariffing approach

	Electricity heating & Electricity Cooling	Diesel heating & Electricity Cooling	LPG heating & Electricity Cooling
< 160 kWh/month			
161-300			
301-500			
501-600			
601-750			
751-1000			
>1000 kWh/month			

	JD/kWh
Electricity	
< 160 kWh/month	0,041
161-300	0,057
301-500	0,089
501-600	0,099
6001-750	0,121
751-1000	0,152
>1000 kWh/month	0,217
LPG	0,045
Diesel	0,061

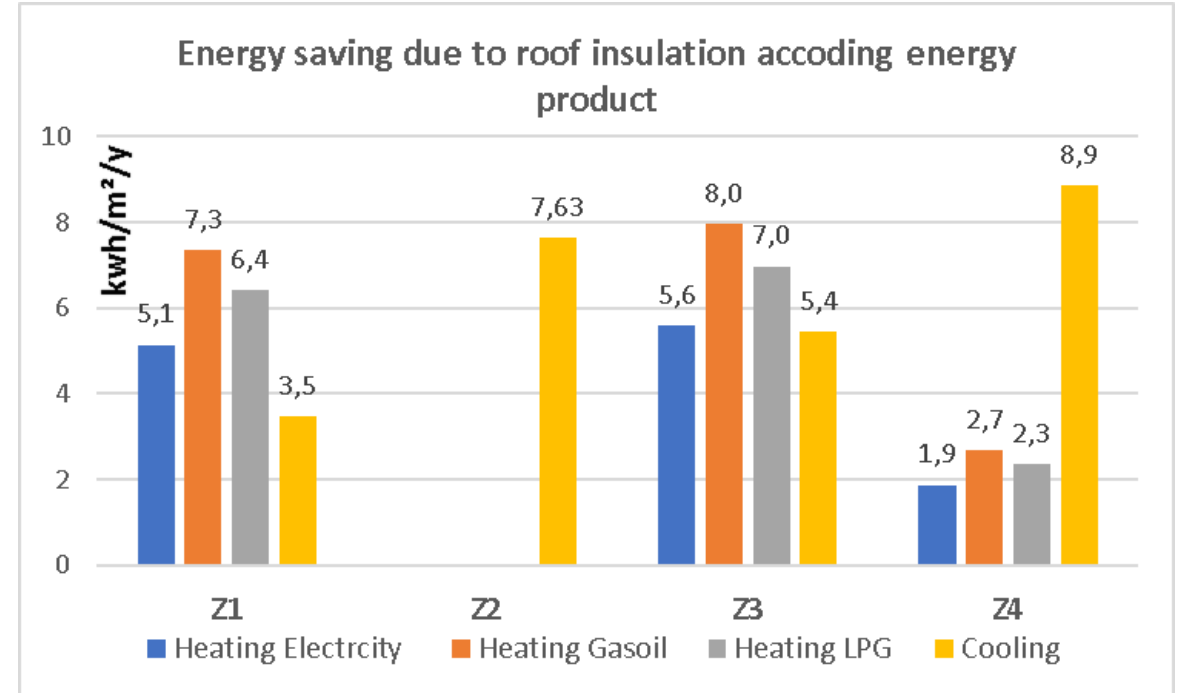
- The profitably assessment is based on the payback period as main indicator of profitability evaluation.
- All the calculation are related to 1 m² of roof insulation

Profitability assessment of roof insulation of existing residential buildings

Main assumptions

Energy performance assumptions

EER cooling	3,1
Electrical heating yield	100%
LPG heating yield	80%
Diesel heating yield	70%

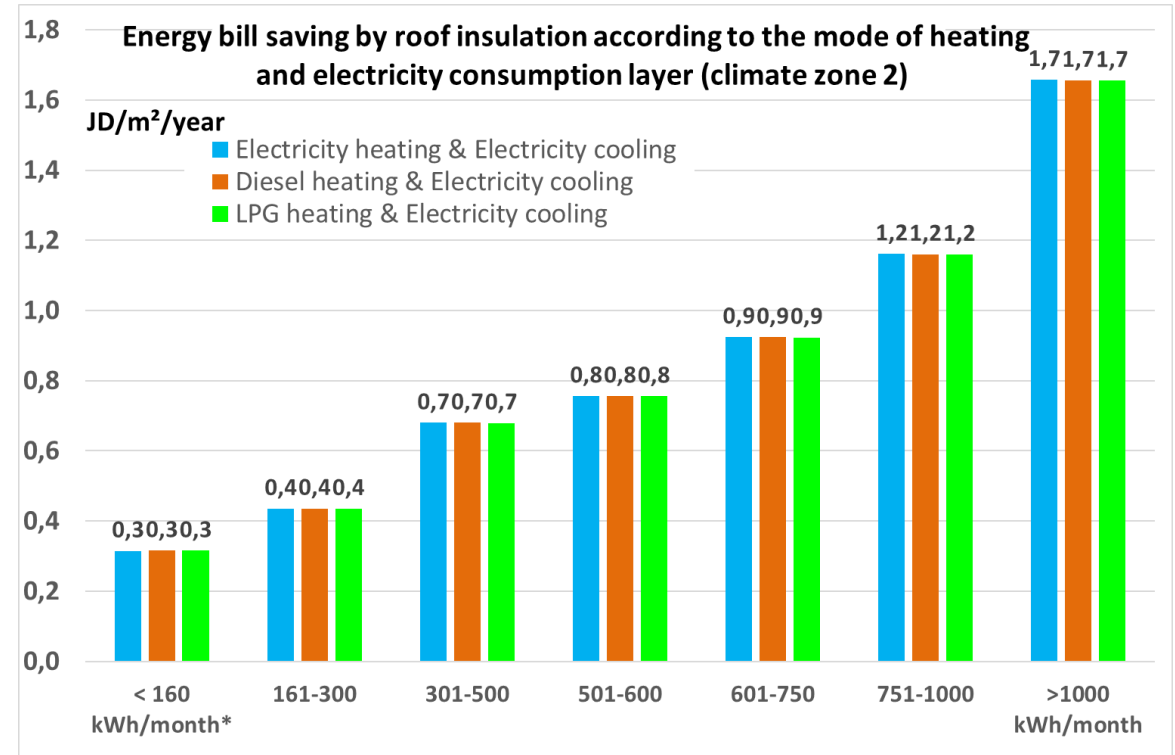
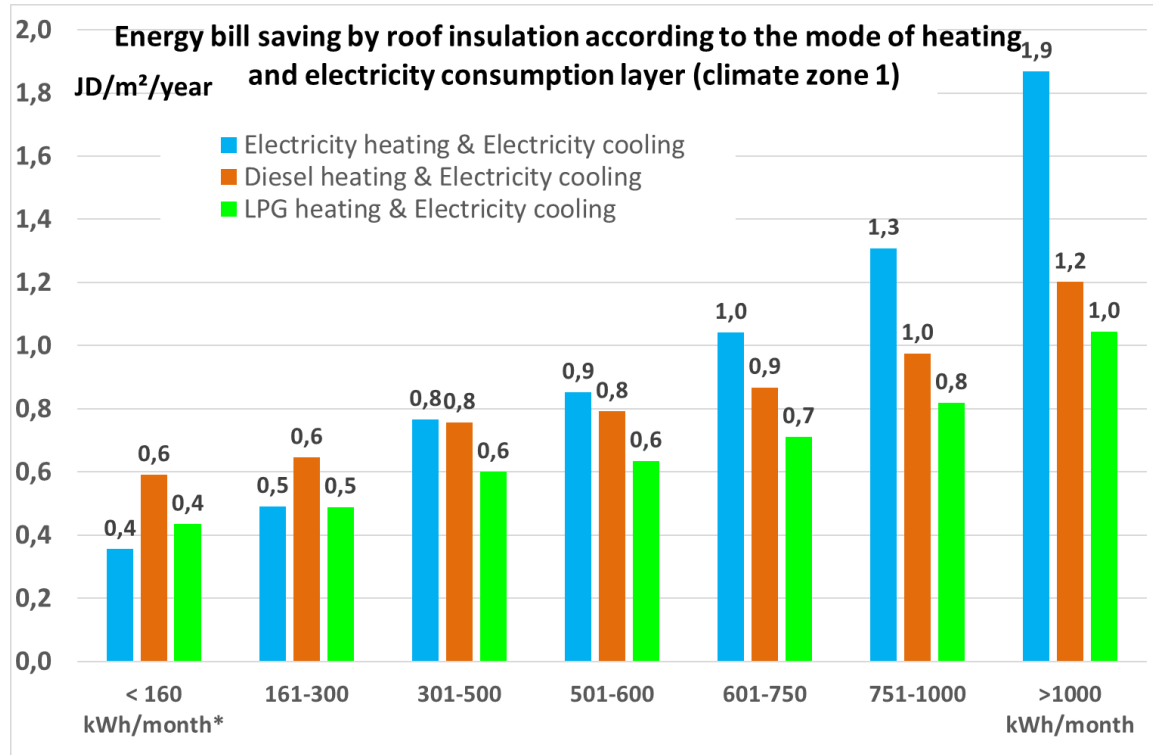


Cost and financing assumptions

Cost of insulation (JD/m ²)	8
Loan interest rate	6%
Loan duration (years)	7

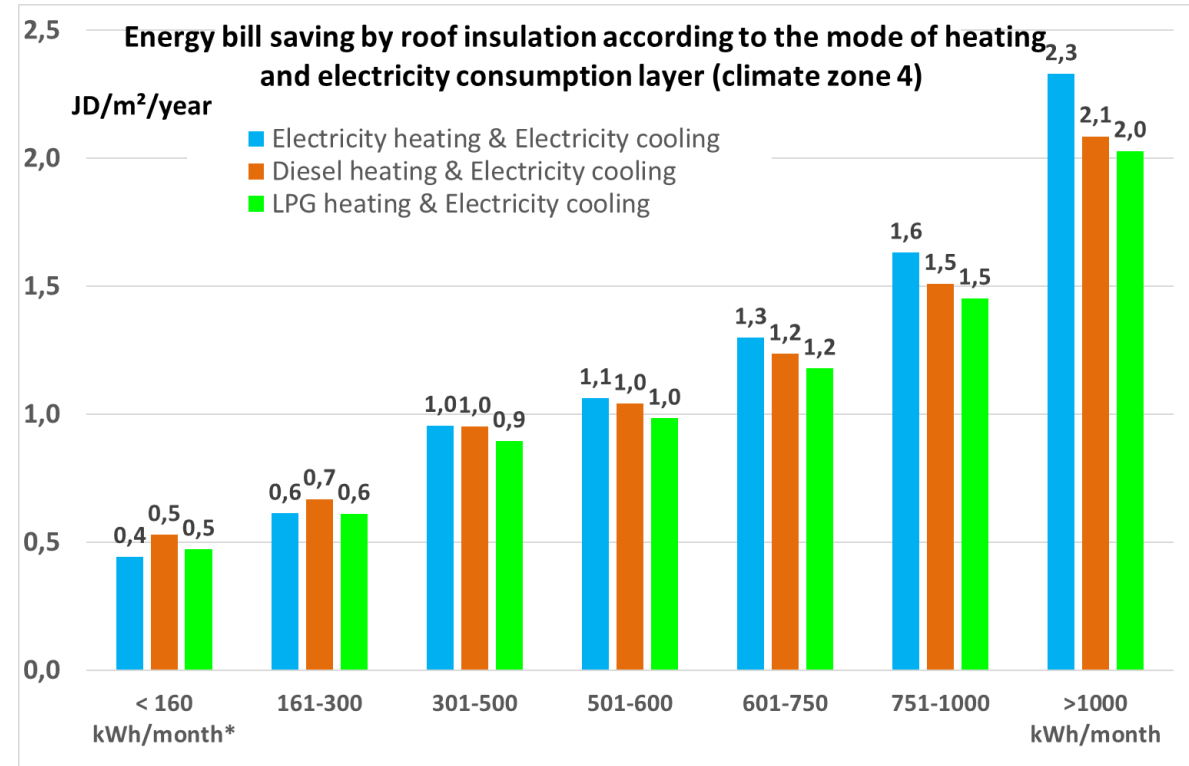
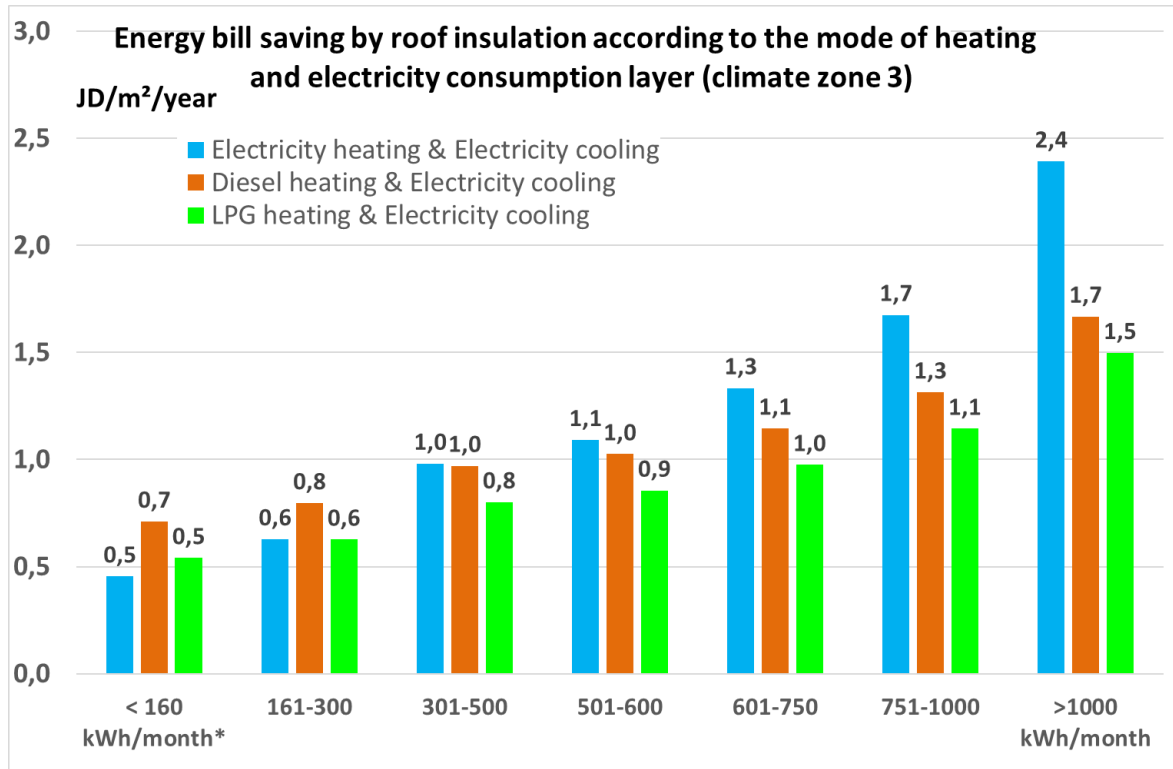
Profitability assessment of roof insulation of existing residential buildings

Energy bill saving



Profitability assessment of roof insulation of existing residential buildings

Energy bill saving

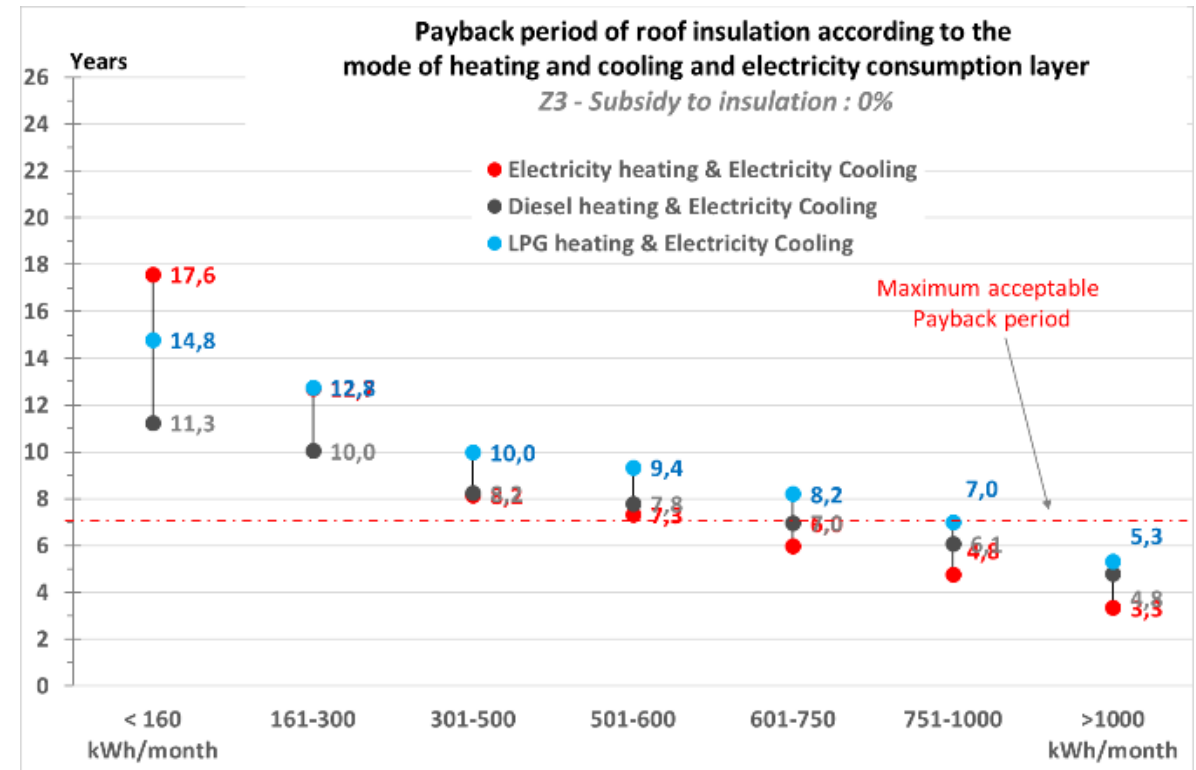
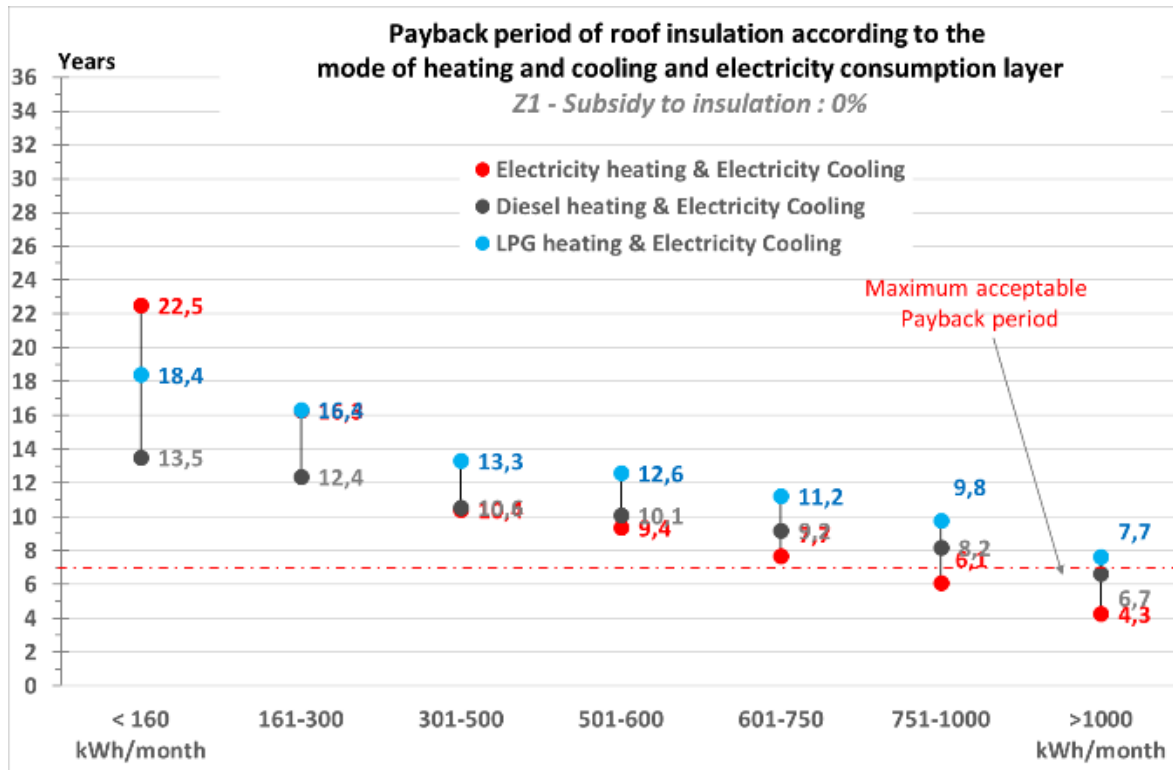


Profitability assessment of roof insulation of existing residential buildings

Payback period

Assumption : Maximum acceptable payback period for households: 7 years

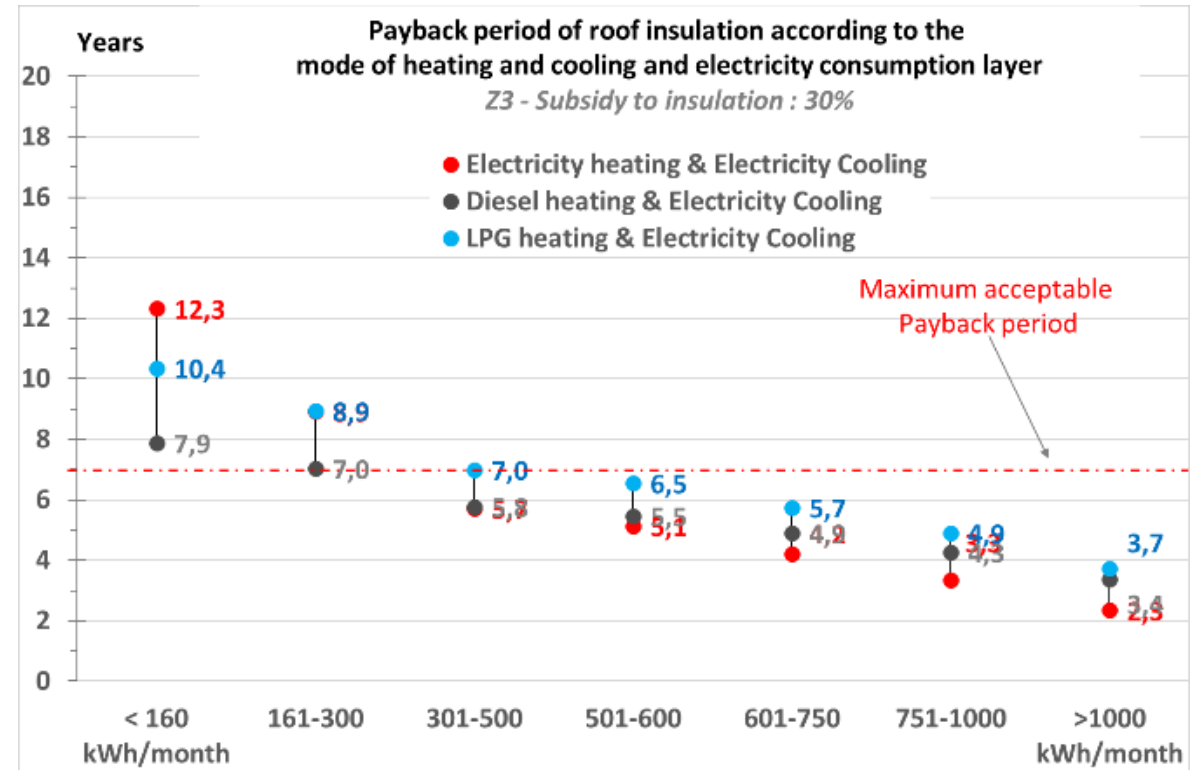
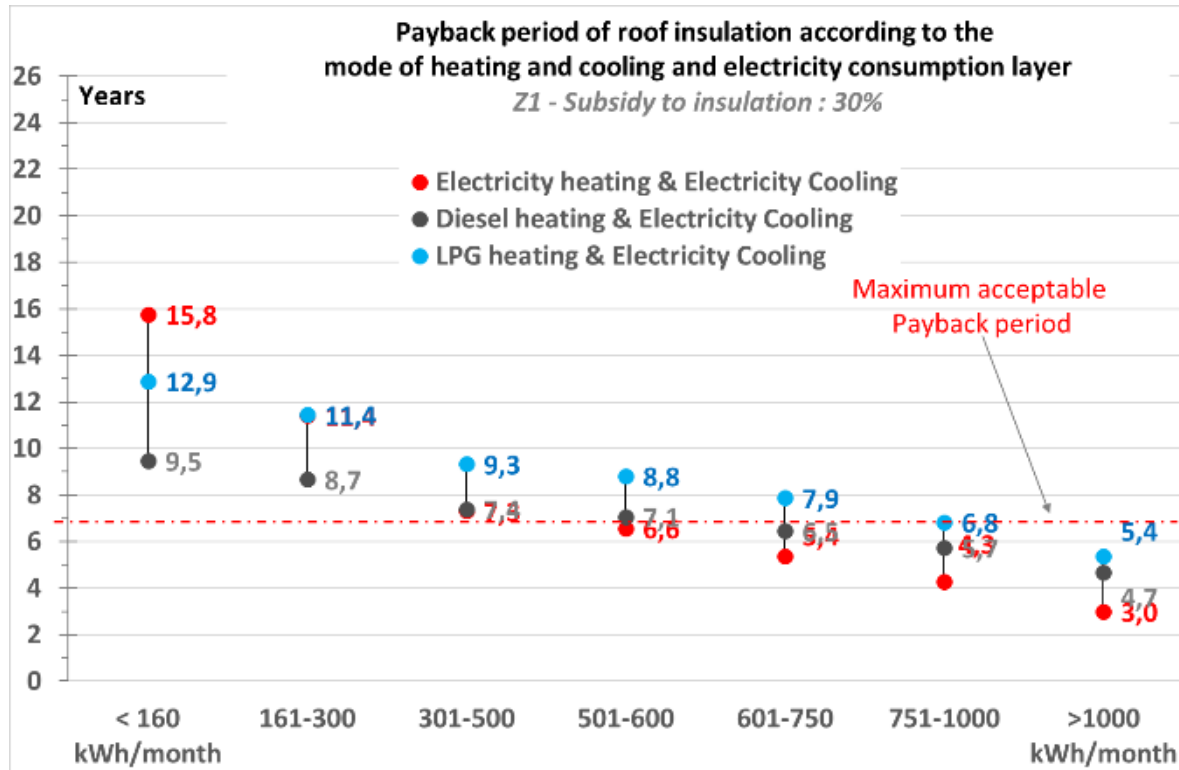
Without subsidy of insulation cost



Profitability assessment of roof insulation of existing residential buildings

Payback period

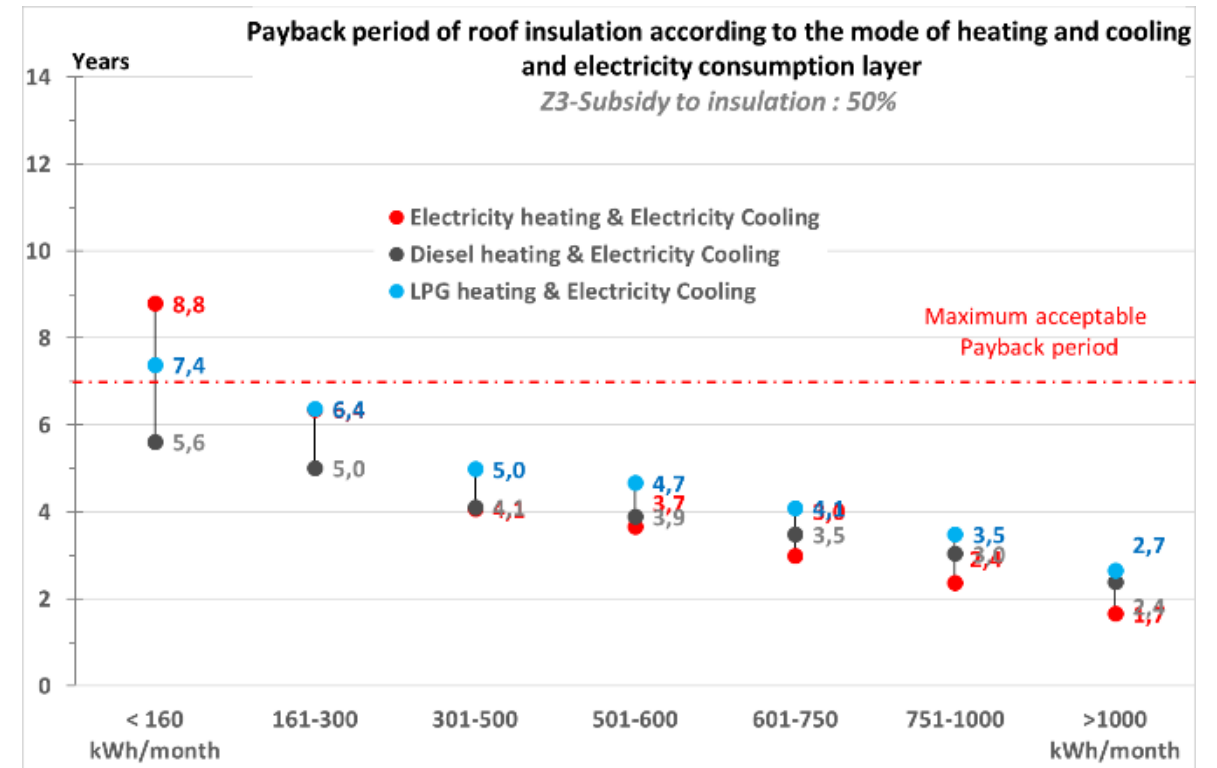
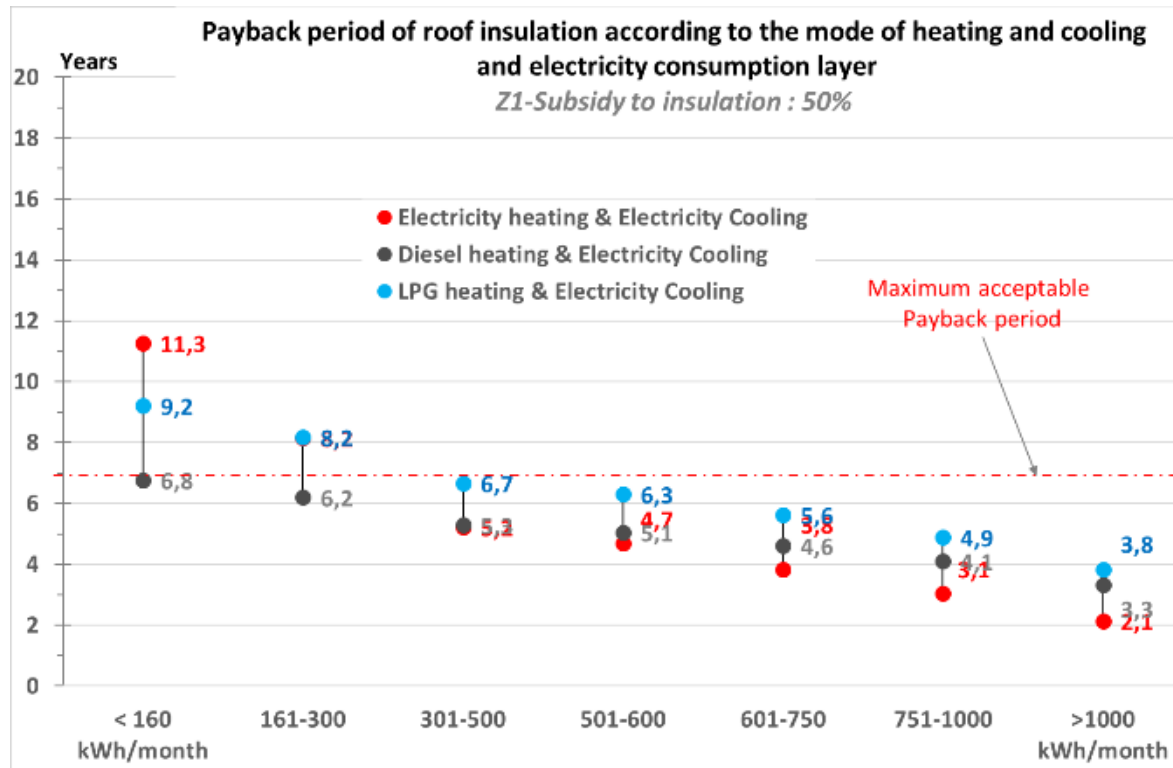
30% subsidy of insulation cost



Profitability assessment of roof insulation of existing residential buildings

Payback period:

50% subsidy of insulation cost



Profitability assessment of roof insulation of existing residential buildings

30% subsidy of insulation cost

	Climate zone 1				Climate zone 3		
	Electricity heating & Electricity Cooling	Diesel heating & Electricity Cooling	LPG heating & Electricity Cooling		Electricity heating & Electricity Cooling	Diesel heating & Electricity Cooling	LPG heating & Electricity Cooling
< 160 kWh/month	Nonprofitable	Nonprofitable	Nonprofitable		Nonprofitable	Nonprofitable	Nonprofitable
161-300	Nonprofitable	Nonprofitable	Nonprofitable		Profitable	Profitable	Nonprofitable
301-500	Nonprofitable	Nonprofitable	Nonprofitable		Profitable	Profitable	Profitable
501-600	Profitable	Profitable	Nonprofitable		Profitable	Profitable	Profitable
601-750	Profitable	Profitable	Nonprofitable		Profitable	Profitable	Profitable
751-1000	Profitable	Profitable	Profitable		Profitable	Profitable	Profitable
>1000 kWh/month	Profitable	Profitable	Profitable		Profitable	Profitable	Profitable

50% subsidy of insulation cost

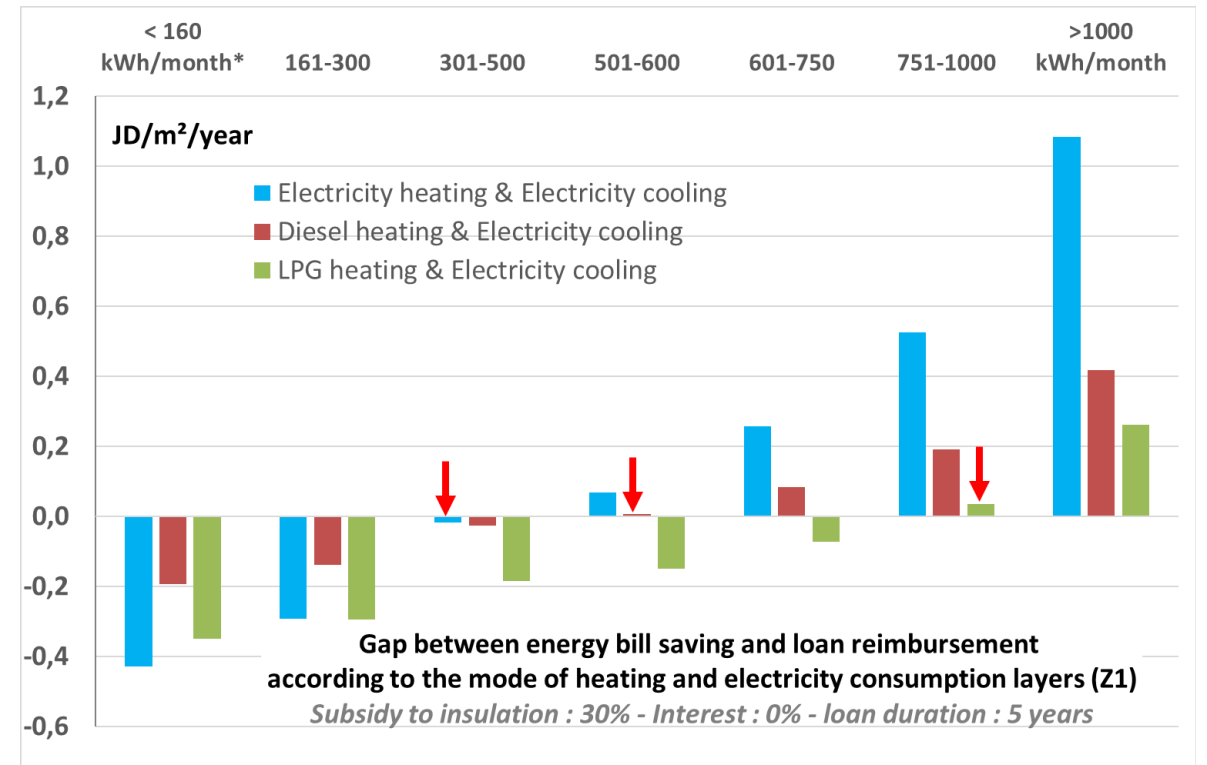
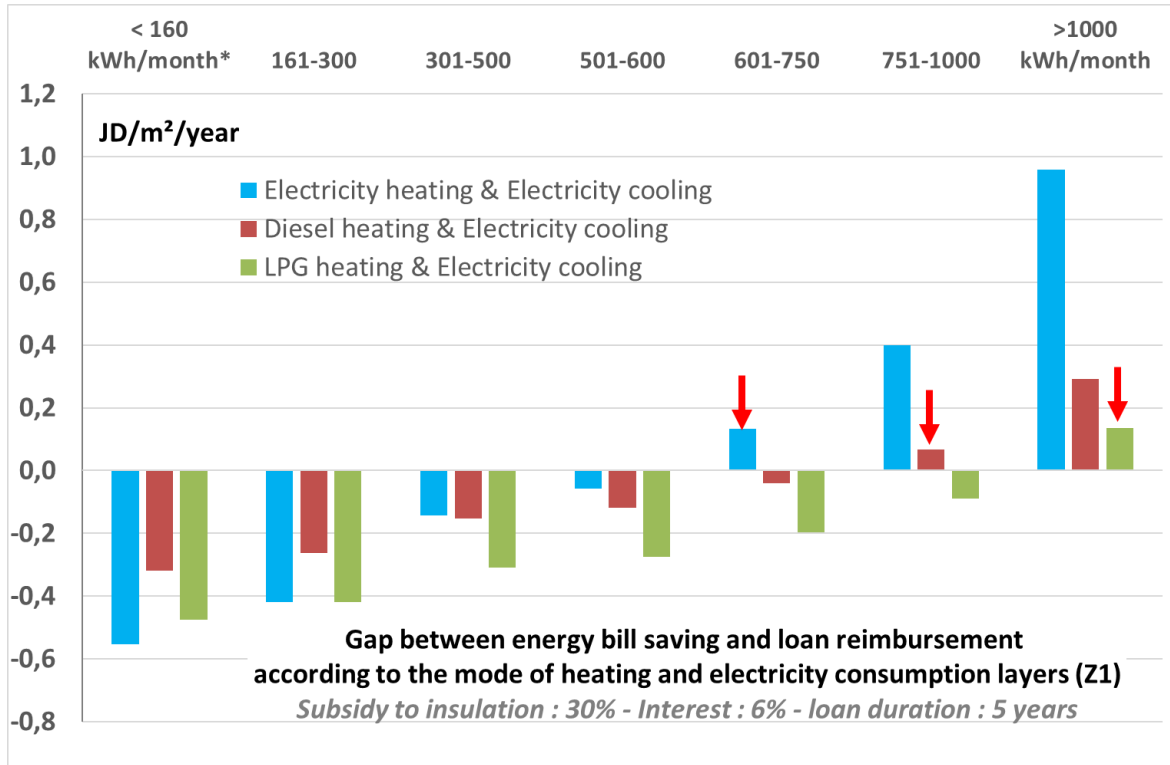
Nonprofitable	
Profitable	

	Climate zone 1				Climate zone 3		
	Electricity heating & Electricity Cooling	Diesel heating & Electricity Cooling	LPG heating & Electricity Cooling		Electricity heating & Electricity Cooling	Diesel heating & Electricity Cooling	LPG heating & Electricity Cooling
< 160 kWh/month	Nonprofitable	Profitable	Nonprofitable		Nonprofitable	Profitable	Nonprofitable
161-300	Profitable	Profitable	Nonprofitable		Profitable	Profitable	Profitable
301-500	Profitable	Profitable	Profitable		Profitable	Profitable	Profitable
501-600	Profitable	Profitable	Profitable		Profitable	Profitable	Profitable
601-750	Profitable	Profitable	Profitable		Profitable	Profitable	Profitable
751-1000	Profitable	Profitable	Profitable		Profitable	Profitable	Profitable
>1000 kWh/month	Profitable	Profitable	Profitable		Profitable	Profitable	Profitable

Profitability assessment of roof insulation of existing residential buildings

Affordability assessment

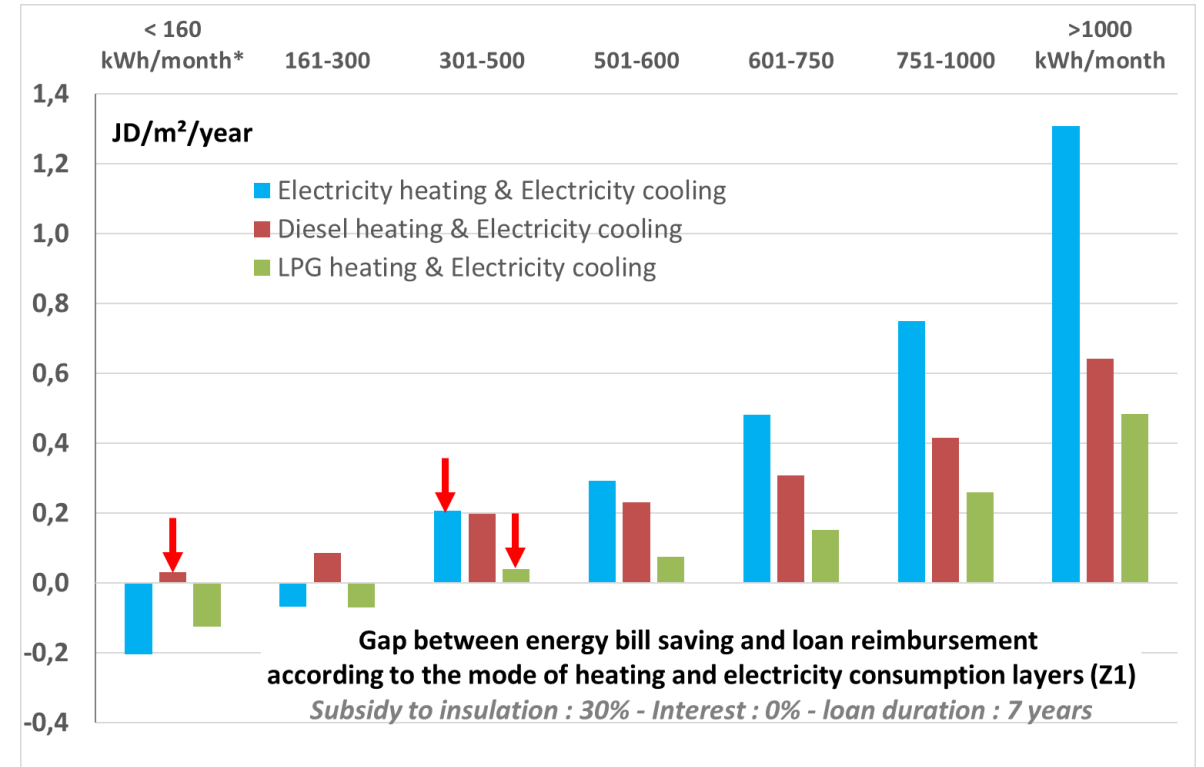
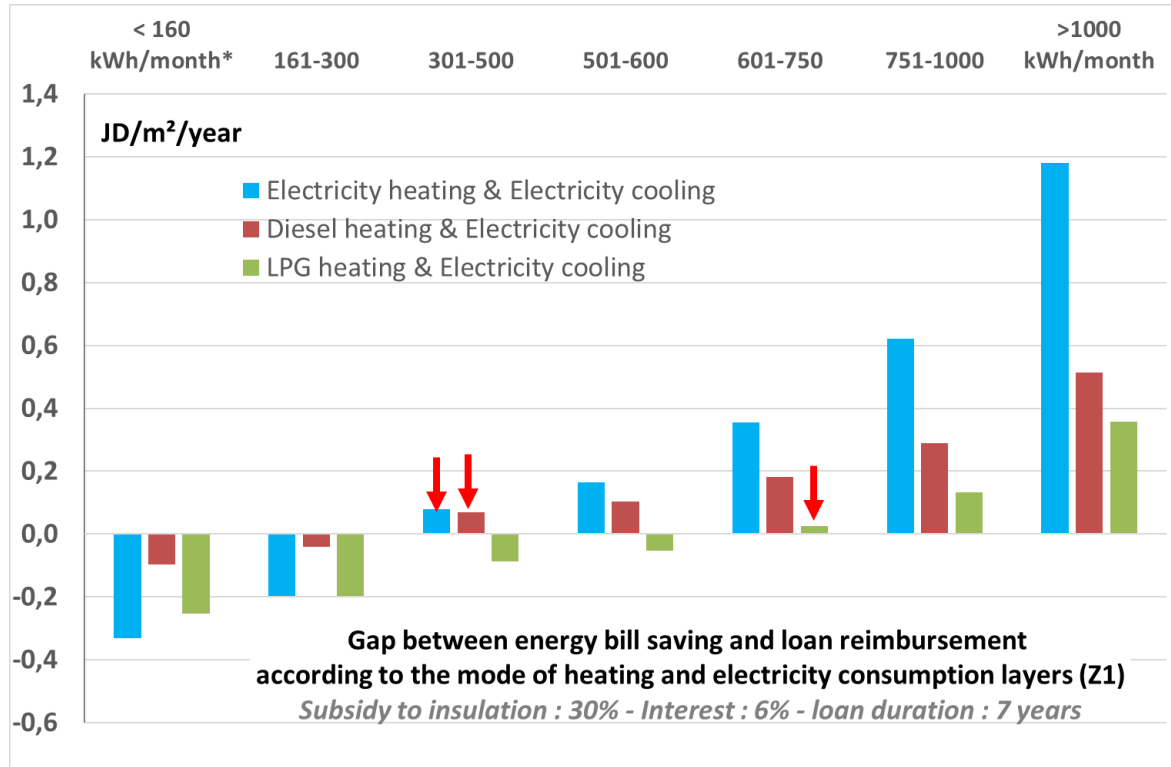
Gap between monthly loan reimbursement and bill saving (30% subsidy)



Profitability assessment of roof insulation of existing residential buildings

Affordability assessment

Gap between monthly loan reimbursement and bill saving (30% subsidy)



Profitability assessment of roof insulation of existing residential buildings

Affordability assessment

Case of 30% subsidy and 7 years loan at 6% interest rate

	Climate zone 1		
	Electricity heating & Electricity Cooling	Diesel heating & Electricity Cooling	LPG heating & Electricity Cooling
< 160 kWh/month			
161-300			
301-500	X	X	
501-600	X	X	
601-750	X	X	X
751-1000	X	X	X
>1000 kWh/month	X	X	X

Nonprofitable	
Profitable	
Affordable	X

Profitability assessment of roof insulation of existing residential buildings

Affordability assessment

Case of 50% subsidy and 7 years loan at 6% interest rate

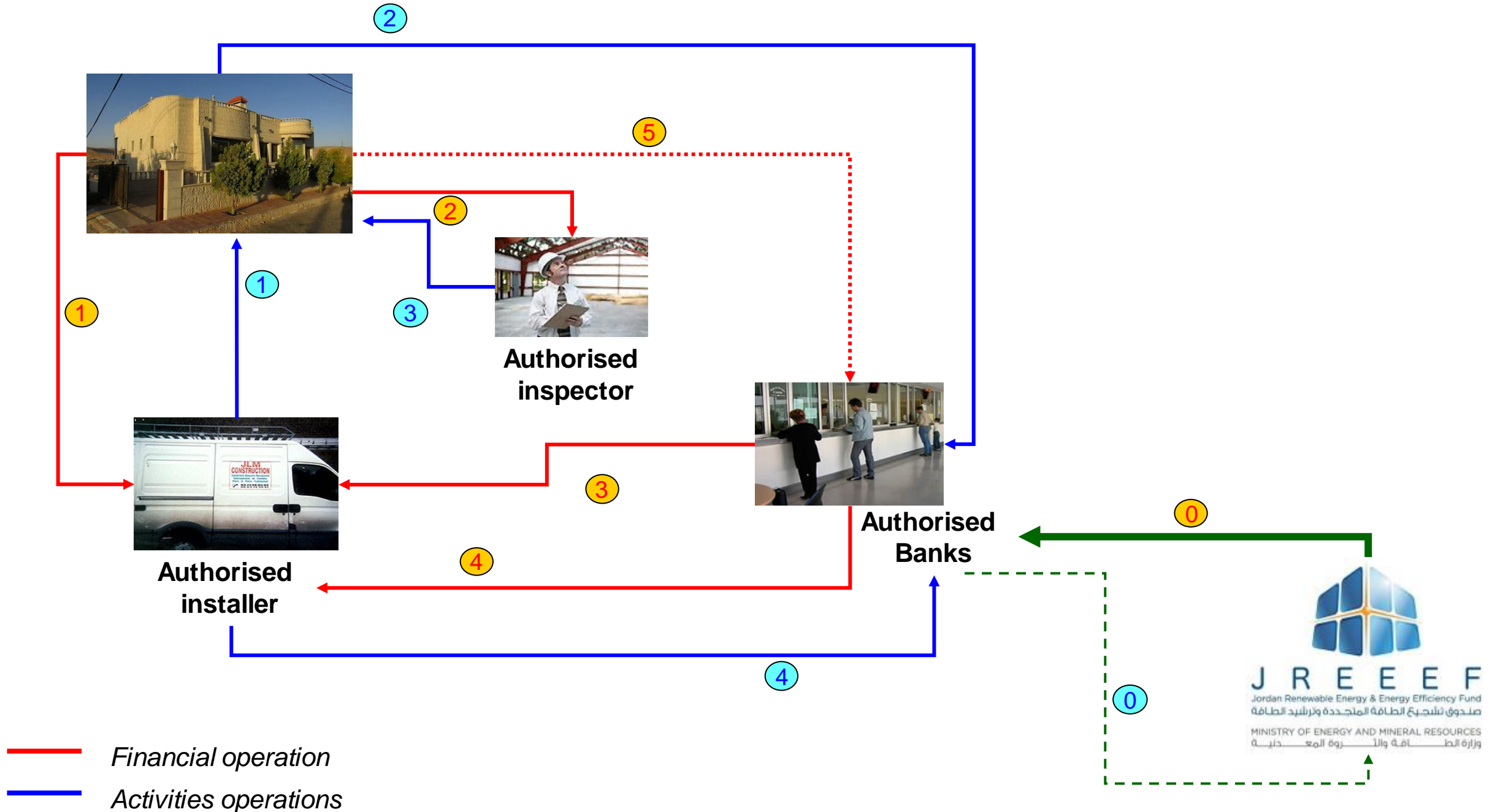
		Climate zone 3		
		Electricity heating & Electricity Cooling	Diesel heating & Electricity Cooling	LPG heating & Electricity Cooling
< 160 kWh/month				
161-300		X	X	X
301-500		X	X	X
501-600		X	X	X
601-750		X	X	X
751-1000		X	X	X
>1000 kWh/month		X	X	X

Nonprofitable	
Profitable	
Affordable	X

Financial mechanism proposal

- The financing mechanism should combine :
 1. An investment subsidy of 30%, with a ceiling of 4 JD/m² with a maximum 600 JD/beneficiary.
 2. A 7 year loan with market interest rate, but with a ceiling of 7%
- The subsidies are provided by JREEEF
- The loans are provided by banks in the framework of an agreement with JREEEF
- The proposed mechanism may make roof insulation profitable and affordable for the upper income households that can start the market as first movers
- These firsts movers will develop the market and allow to lower income consumers to take advantages from the insulation cost decrease.
- The first market niches will allow to create the supply actors and enhance their business, so they will dynamize the market by themselves.

Financial mechanism proposal



Financial mechanism proposal

Administrative procedures

- 0 Reporting on the subsidy use
- 1 Canvassing of customers by the authorized installer
Preparation of grant and credit documents
Implementation of the insulation by the authorized installer
- 2 Credit formalities with the authorized bank
- 3 Inspection and acceptance of the work by the approved inspector
- 4 Submission of grant application documents

Financial flows

- 0 Funding of the subsidy
- 1 Down paiement
- 2 Paiment of inspection fees
- 3 Credit transfer to the installer by the bank
- 4 Payment of the subsidy to the installer
- 5 Credit reimbursement on 84 monthly payments



Shared Prosperity Dignified Life



Thank you

Rafik Missaoui, Alcor
r.missaoui@alcor.com.tn