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ROMANIA

Consolidation of the Strategic Planning Capacity of the Ministry of Regional Development and Public Administration for Renovation of the National Building Stock for Energy Efficiency and Seismic Risk in Romania

New Long-term Renovation Strategy – Key Elements for Consultation

Stakeholder Consultation Event, Bucharest, September 11, 2019

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I. Introduction

- The World Bank is providing advisory services to MDRAP to support the consolidation of its strategic planning capacity to renovate the national stock of buildings for the purposes of energy efficiency and preparedness for seismic risks.
- The project addresses in an integrated manner the issues of energy efficiency and seismic risk through two separate but interlinked components.
- The scope of energy efficiency component includes: (i) the elaboration of a gap analysis of the current set-up for energy efficiency in Romania and road map to address gaps; (ii) the preparation of new National Long-term Building Renovation Strategy (LTRS) for energy efficiency.
- This presentation outlines the key elements of the LTRS required under the revised EU Energy Performance of Buildings Directive. The LTRS document will also be aligned with the EC Recommendation (EU) 2019/786 of 8 May 2019 (whose key elements are also summarized toward the end of this presentation).
- The draft LTRS document is under preparation and will be distributed over the next few weeks to a wide range of stakeholders. Feedback on the key elements presented today, including key assumptions and methodology, is key for the finalization of the LTRS document.

II. Gap Analysis: key conclusions and recommendations

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Gap analysis framework

Strategies and Policies

- The role of energy efficiency in buildings in relevant national strategies and policies.
- Existing National Building Renovation Strategy
- Transposition of EU engagements relative to the EPBD and building renovation strategy in national strategies and policies

Legislation and Regulation

- National EE laws
- Secondary legislation/rulebooks
- EE building codes – new and existing buildings
- Building certificates/passport
- Equipment standards
- Appliance labeling
- HOA legislation
- Public Procurement
- Energy pricing, net metering/prosumers
- EE obligations
- Enforcement, monitoring and evaluation

Institutions and Market

- Coordination between and within key institutions and agencies
- Research institution, academia, etc
- Energy users (HOAs, single-family homes, public buildings, administrators, private building owners)
- Energy auditors/manager, professional and business associations
- Awareness and information programs
- Local authorities and energy information centers
- Databases for building stock and energy performance certification

Financing and Implementation

- Financial incentive programs for public and residential building
- Total EE financing for buildings
- ESCOs/EE service provider financing
- Credit lines for public, commercial and residential buildings
- Local Financial Institution lending for EE
- Creditworthiness of municipality and HOAs
- Monitoring and Reporting Mechanism
- Energy Audit Subsidies

Summary of key identified gaps

Strategies and Policies

- Current LTRS lacked agreed scenario.
- Many national strategies/plans lack analysis of implementation costs, plans, progress reporting and evaluations.
- Strategies are not always well-coordinated showing consistent contributions of building EE to other priorities (e.g., energy security, sustainable urban development, climate change, seismic/fire safety, air pollution).
- Strategies and plans lack clear actions to promote deep renovations and the long-term development of the market—financing, supply chains, service providers, ESCOs, etc.

Legislation and Regulation

- Lack of enforcement and evaluation mechanism
- Cost-optimal methodology not submitted to EU, adopted and required for all energy audits/building renovations
- Most legislation and regulations lack proper progress reporting, information on enforcement and period evaluations
- Weak legislation around ESCOs, energy poverty and prosumers (especially for HOAs)
- No tools/support to improve EE in public procurement
- Complex and slow public procurement process
- No 'bonus-malus' mechanisms in place, quantification of non-EE benefits
- Weak targeting for energy and heating subsidies

Institutions and Market

- MDRAP lacks resources to be lead champion of LTRS
- Lack of governance mechanism for the LTRS implementation within central and between central/ local levels
- No national database for building stock, typology and EPCs
- Lack of platform among stakeholders to discuss/coordinate key market barriers and strategies to systematically address them
- Lack of ex-post inspections to ensure quality of service providers
- No requirements for recertification of contractors
- Lack of communication awareness campaigns

Financing and Implementation

- Overlapping programs with different requirements, terms and financial instruments.
- Overdependence on EU grants and IFI financing with minimal co-financing
- Lack of detailed program implementation plans, financing mechanisms, funding sources, supporting measures, progress monitoring and reporting and periodic evaluations
- Most HOAs and some municipalities are not creditworthy or have borrowing limitations, preventing increased co-financing
- Poor coordination on central public building renovation programs
- No programs in place for commercial buildings, single-family homes

Action plan - summary of key recommendations

Short-term priorities

Beyond adhering to the EPBD requirements, the new LTRS should have a clear renovation scenario to be adopted and implemented, and detailed program plans with financing mechanisms, funding sources, progress reporting and evaluation mechanisms.

Romania should update relevant laws and regulation to transpose the revised EPBD. The cost optimality framework should be completed to resolve EU infringement notices and disseminated and incorporated into future building renovation schemes.

MDRAP should be adequately resourced to fulfill its institutional role as the lead agency and champion to successfully implement the next LTRS.

The government must make a clear policy statement that continued reliance on grants cannot continue and, going forward, the EU funds will be used to provide decreasing percentages of grants over time.

Medium-term priorities

Revisions of any of the related energy, climate and urban/sustainable development strategies need to ensure that energy efficiency programs in building renovations show their contributions and are given consistent high priority as determined by the LTRS.

Monitoring, reporting and evaluation of legislative initiatives and regulations should be made systematic

There is a need to implement and strengthen legislative enforcing mechanisms

There is a need to put in place a formal governance mechanism for the LTRS, including a coordination mechanism for policy development and implementation a national level.

There is a need to provide a consolidated national program with a single window for applications.

Long-term priorities

MDRAP should be tasked and resourced to host and maintain a building database integrating results from the various renovation programs during the LTRS implementation.

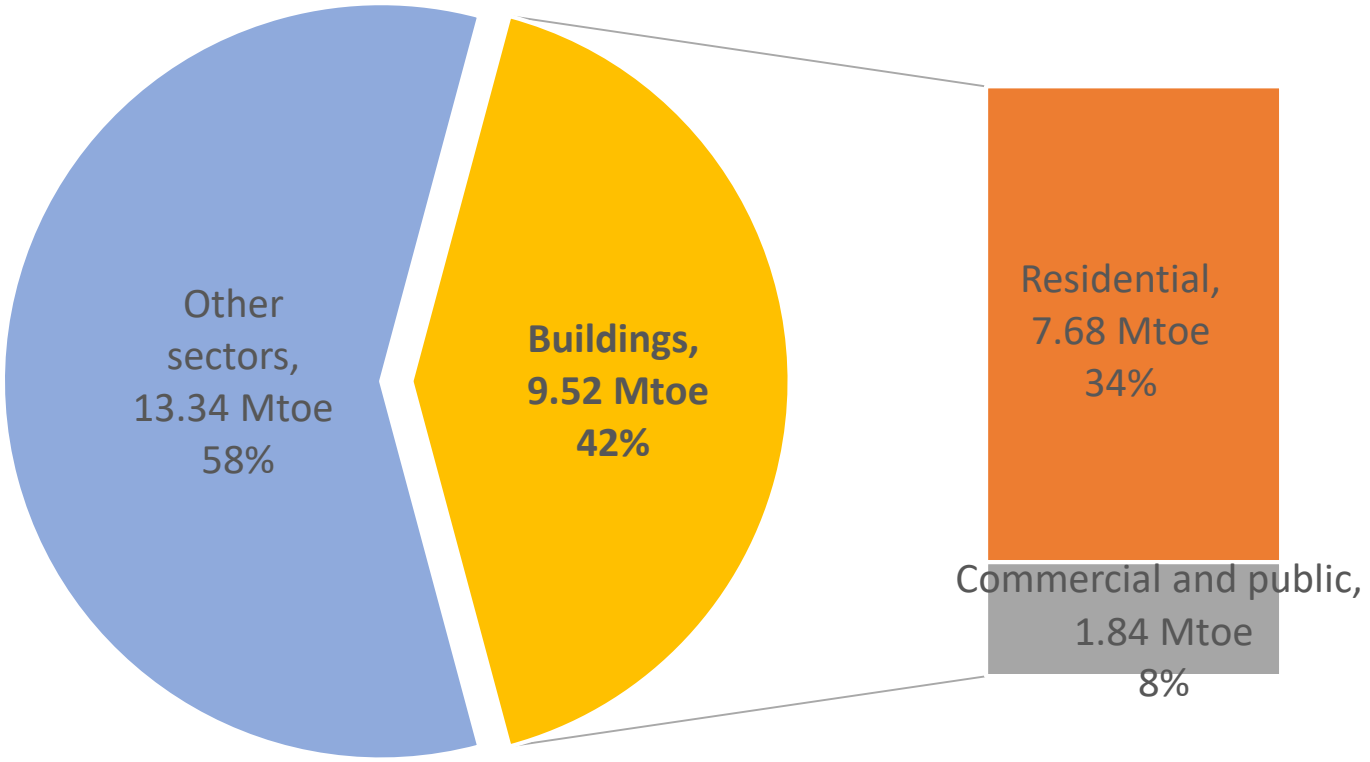
An effective monitoring and evaluation system should be developed in order to better monitor progress and to provide feedback for future policy and program improvements.

III. Overview of the national building stock

Overview of the national building stock

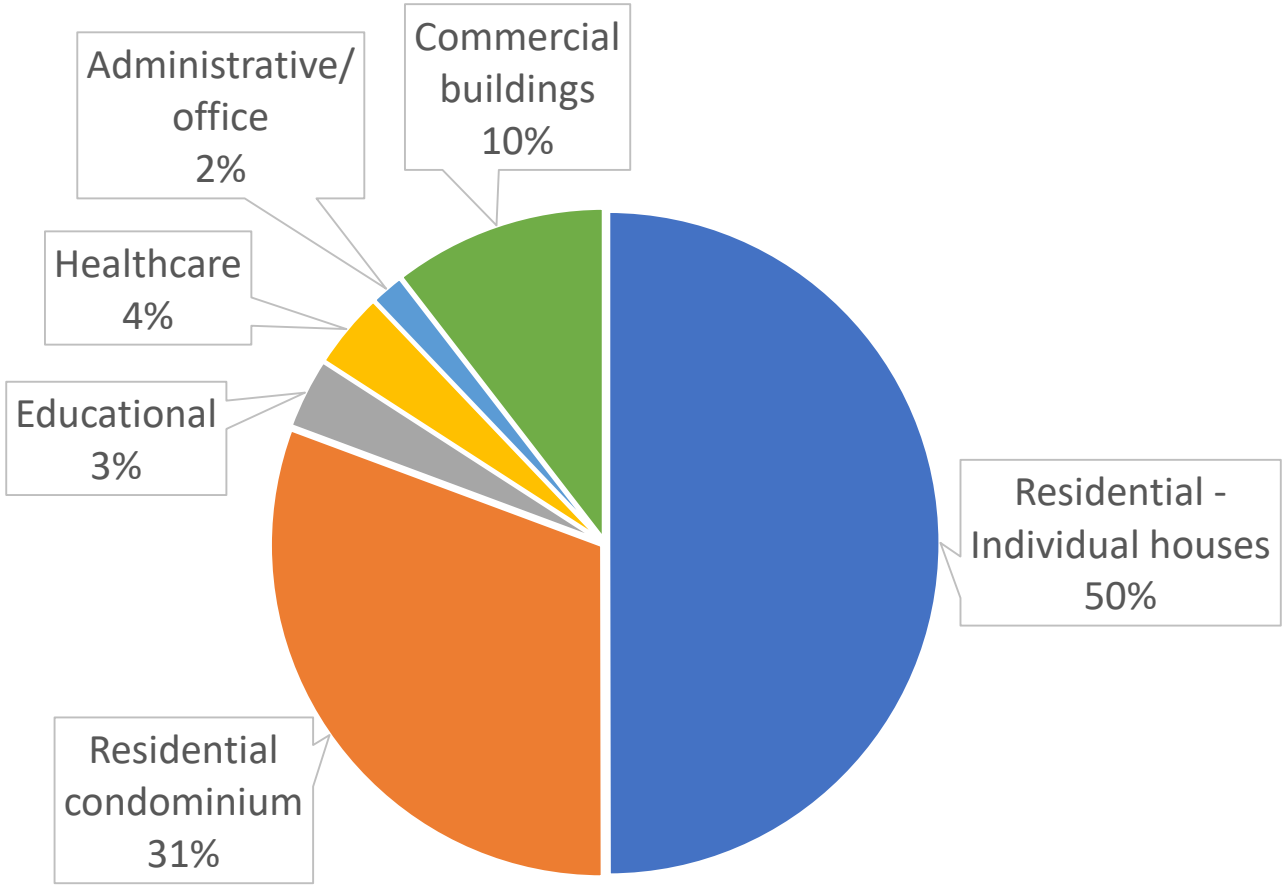
Building types	Possible main categories	Representative picture	Buildings number [-]	Total heated area [M m2]	Built <2000 floor area [Mm2]	Renovated by 2020 [%]	Not renovated area [Mm2]
Residential - Individual houses	Rural		3810737	247.80	217.840	3%	211.30
	Urban		1354263	124.46	102.012	8%	93.85
Residential condominium	<=P+4 floors		92332	94.51	77.50	7%	72.07
	>P+4 floors		61554	115.51	94.72	7%	88.09
Educational	Schools		18000	17.50	16.63	15%	14.13
Healthcare	Hospitals		547	5.47	5.42	1%	5.36
	Other		50766	3.80	3.61	1%	3.58
Administrative/ office	Admistrative buildings		6000	5.26	4.73	5%	4.50
	Glass & steel buildings		1500	3.10	0.05	5%	0.05
Commercial buildings	Hotels		7642	4.23	0.85	5%	0.80
	Restaurants/ Coffee shops		36000	1.82	1.28	5%	1.21
	Shopping		122000	20.83	14.58	10%	13.12
Sub total residential		*90%*	**5,318,886**	**582.27**	**492.06**	**5%**	**465.31**
Sub total commericial and public		*10%*	**242,455**	**62.01**	**47.14**	**9%**	**42.75**
Total		*100.0%*	**5,561,341**	**644.29**	**539.20**	**6%**	**508.07**

Final energy consumption by sectors in Romania
Total final energy consumption = 22.86 Mtoe



Source: EUROSTAT 2017

Final energy consumption by type of buildings [M toe]
Total in buildings = 9.52Mtoe



Source: estimation based on EUROSTAT 2017 data

Key messages from the building stock data

- The housing stock is very old ~85% of buildings are built before 2000, and ~60% build before 1977.
- The building sector (residential, commercial and public) consume 42% of the total final energy.
- Access to sufficient, quality building stock data remains a critical issue. As with the last LTRS, many assumptions had to be made on the data so this should be viewed as indicative only.
- It is estimated that ~6% of buildings will be renovated by 2020, and ~79% of buildings will require renovation or reconstruction by 2050.
- The largest share ~91% of building requiring renovation are in the residential sector which have highest energy consumption ~81%
- ~65% of the buildings to be renovated are single family buildings (SFBs)* based on m^2
- For the 2021-2030 period, the priority to reduce energy consumption and CO_2 reduction would be **to target larger MABs first, followed by public buildings and SFBs.**

* However, ~32% of consumed residential, public and commercial energy share in EUROSTAT recorder under "Renewables and biofuels" belonging to the Single-family buildings burning firewood, woodchips etc. Therefore non-renewables consumption is only ~18% from the Single-family buildings. At the same time CO_2 emissions conversion factor in Romania for wood is set very low 0.019 kg CO_2/kWh (i.e. 10 times less than gas or DH using CHP), which makes low impact to the CO_2 reduction from the Single-family buildings renovation using wood.

IV. Cost Optimal Framework

Methodology (1): renovation packages calculation

1) Selected technical solutions of measures for buildings renovation packages: (i) minimum scope (to meet national regulations, i.e., Class C); (ii) medium scope (full renovation excluding rooftop PV, to avoid "lock-in" effect to allow for future, staged renovation to meet NZEB); and (iii) maximum scope of renovation (deep or nZEB renovation standard) including RES-measures in existing buildings: (i) residential single-family, (ii) multi-apartment, (iii) education, and (iv) office buildings using different source of heating fuel: gas, wood or heat from district heating (DH).

2) The packages are based on cost-optimal levels of minimum energy performance requirements for building and building elements methodology. Estimated investment costs are based on the actual renovation costs reported in Romania, calculated global cost and effects on energy performance and CO_2 emissions. (Global costs are calculated as the net present value of all costs incurred during a defined period – 30 years, taking into account the replacement costs and residual values of equipment with longer lifetimes.)

3) The methodology and cost comparisons correspond to those defined in Delegated Regulation 244/2012 and the Guidelines accompanying Commission Delegated Regulation (EU) No 244/2012 of 16 January 2012. The calculation follows the recommendations presented in EN 15459- part 1 and part 2 regarding economic evaluation procedure for energy systems in buildings.

4) The selection for the type and categories of the cost's items are linked to their influence on the energy performance of the building.

5) The calculations were performed for 3 climatic zones of Romania.

Methodology (2) : renovation packages selection parameters

1) Packages were selected based on a multi-parameter analysis to ensure that specific energy consumption corresponds to an EPC A level for all buildings with the exception of SFBs for which EPC class B was also considered acceptable.
2) Global costs for reduction of final energy consumption and global cost for CO_2 reduction were used as main selection parameters, along with other parameters (e.g., investment costs, payback period).

Parameters for packages selection based on comparison between all buildings and within building type: greener – better, red – worse.

Building type & Climatic Zone	Package code	Initial cost investment, [lei/m2]	Global Cost, [lei/m2]	Specific final energy consumption, [kWh/m2 year]	Reduction of final energy [kWh/m2 year]	Global cost for final energy reduction, [lei/m2]	Investment cost for final energy reduction, [Lei for kWh/m2]	CO2 reduction, [kg oe CO2 m2]	Global cost for CO2 reduction, [Lei for 1kg oe C02]	Ivestment cost for CO2 reduction, Lei for 1kg C02/kWh	Simple payback from saved energy	Selected packages for macro analysis
MAB_10_DH_II	P1*	428	1873	128.35	143.80	13.03	2.97	31.64	59.21	13.52	12	
MAB_10_DH_II	P2*	597	1965	114.06	158.09	12.43	3.78	39.71	49.48	15.04	13	←P2
MAB_10_DH_II	P3*	762	1978	114.06	158.09	12.51	4.82	46.97	42.12	16.22	16	
MAB_4_DH_II	P1*	481	1767	143.19	69.66	25.36	6.90	15.33	115.28	31.38	42	
MAB_4_DH_II	P2*	694	1809	115.04	97.81	18.50	7.09	26.45	68.40	26.23	33	←P2
MAB_4_DH_II	P3*	1063	1755	115.04	97.81	17.94	10.87	33.70	52.07	31.55	45	
SFB_Gas_II	P1*	951	2829	207.71	278.58	10.15	3.41	57.11	49.53	16.65	21	←P1
SFB_Gas_II	P2*	2287	5879	135.43	350.86	16.76	6.52	89.04	66.03	25.69	105	
SFB_Gas_II	P3*	3164	4784	135.43	350.86	13.64	9.02	99.69	47.99	31.74	44	
SFB_Wood_II	P1*	932	3064	180.61	342.86	8.94	2.72	1.63	1885.38	573.56	10	←P1
SFB_Wood_II	P2*	2100	5527	84.48	438.99	12.59	4.78	9.95	555.72	211.19	29	
SFB_Wood_II	P3*	2977	4269	84.48	438.99	9.72	6.78	9.95	429.18	299.35	24	
Education_DH_II	P1*	427	3253	174.41	90.86	35.81	4.70	19.99	162.75	21.37	57	
Education_DH_II	P2*	967	3683	112.67	152.60	24.13	6.34	43.26	85.14	22.36	45	
Education_DH_II	P3*	1664	2655	112.67	152.60	17.40	10.91	58.36	45.50	28.52	25	←P3
Education_Gas_II	P1*	427	3022	186.45	91.09	33.18	4.69	18.67	161.86	22.88	100	
Education_Gas_II	P2*	967	4382	97.03	180.51	24.27	5.36	43.88	99.85	22.04	120	
Education_Gas_II	P3*	1664	3156	97.03	180.51	17.48	9.22	56.90	55.46	29.25	73	←P3
Office_DH_II	P1*	420	4320	153.43	159.32	27.11	2.64	35.05	123.25	11.98	9	
Office_DH_II	P2*	1361	5044	121.37	191.38	26.36	7.11	47.75	105.65	28.51	19	
Office_DH_II	P3*	1807	3945	121.37	191.38	20.61	9.44	68.81	57.34	26.27	15	←P3
Office_Gas_II	P1*	420	4619	160.22	175.60	26.30	2.39	36.00	128.30	11.66	9	
Office_Gas_II	P2*	1361	6092	121.83	213.99	28.47	6.36	49.19	123.85	27.67	26	
Office_Gas_II	P3*	1807	4853	121.83	213.99	22.68	8.45	68.84	70.49	26.25	17	←P3

Climatic zone II selected as representative sample for all climatic zones (zone II has largest share of buildings and main parameters represent close to average values for all three climatic zones)

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Methodology (3): Renovation packages selection (allocation packages to the building types)

Set scope of not renovated buildings area which have to undergo renovation by 2050.

For selected renovation packages, **a 70% ratio to the energy and CO2 emissions savings** will be applied in order to minimize over optimistic savings estimations.

Building types	Possible main categories	Representative picture	Total Number [-]	Total heated area [Mm2]	Built <2000 floor area [Mm2]	Renovated by 2020 [%]	Not renovated area [Mm2]	Gas h...								
								Renovation package	Investment Cost [Lei/m2]	Reduction of final energy [kWh/m2 year]	CO2 reduction [kg CO2/kWh m2]	Renovation package	Investment Cost [Lei/m2]	Reduction of final energy [kWh/m2 year]	CO2 reduction [kg CO2/kWh m2]	Type of fuel
Residential - Individual houses	Rural		3810737	247.80	217.840	3%	211.305	P1*	951	195	40	P1*	932	240	1	
	Urban		1354263	124.46	102.012	8%	93.8507	P1*	951	195	40	P1*	932	240	1	wood
Residential condominium	<=P+4 floors		92332	94.51	77.50	7%	72.07	P2*	694	68	19	P2*	694	68	19	DH
	>P+4 floors		61554	115.51	94.72	7%	88.09	P2*	597	111	28	P2*	597	111	28	DH
Educational	Schools		18000	17.50	16.63	15%	14.13	P3*	1,664	126	40	P3*	1,664	107	41	DH
Healthcare	Hospitals		547	5.47	5.42	1%	5.36	P3*	1,664	126	40	P3*	1,664	107	41	DH
	Other		50766	3.80	3.61	1%	3.58	P3*	1,664	126	40	-	-	-	-	DH
Administrative/office	Admistrative buildings		6000	5.26	4.73	5%	4.50	P3*	1,807	150	48	P3*	1,807	134	48	DH
	Glass & steel buildings		1500	3.10	0.05	5%	0.05	P3*	1,807	150	48	-	-	-	-	DH
Commercial buildings	Hotels		7642	4.23	0.85	5%	0.80	P3*	1,807	150	48	-	-	-	-	DH
	Restaurants / Coffee shops		36000	1.82	1.28	5%	1.21	P3*	1,807	150	48	-	-	-	-	DH
	Shopping		122000	20.83	14.58	10%	13.12	P3*	1,807	150	48	P3*	1,807	134	48	DH
Sub total residential			**5,318,886**	**582.27**	**492.064**	**5%**	**465.31**									
Sub total commericial and public			**242,455**	**62.01**	**47.141**	**9%**	**42.75**									
Total			**5,561,341**	**644.29**	**539.204**	**6%**	**508.07**									

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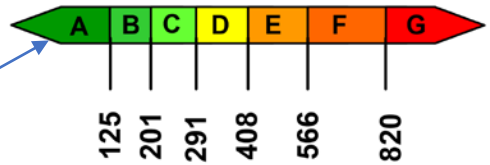
Cost effective approaches to renovation (1)

A. Existing residential multi-apartments buildings

Built in 1967

Built in 1982

Heating, DHW, Lighting



Stage 1
- Thermal insulation
- BVs, TRVs
- Ventilation solution*

Stage 2
- Solar DHW
- Photovoltaic panels

A trigger points:

- A panning list of MAB renovation created by local authority with proposal to apartment owners for renovation with public financial support.
- A disaster/incident (e.g. fire, earthquake, flood) after which building must be restored with improved energy performance characteristics as defined in stage 1.
- Planned major capital repair of building for which building manager/apartment owners need from the local authority to obtain construction permit.

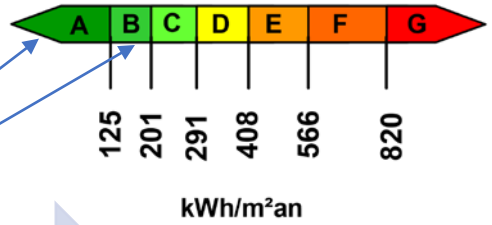
*modifications made for the natural ventilation channels inside the building and apartments must be properly assessed and relevant ventilation strategy solution shall be proposed.

Cost effective approaches to renovation (2)

B. Existing Single- family (individual) buildings:

Built in 1958

Heating, DHW, Lighting



Stage 1

- Thermal insulation
- Firewood stoves improvement (issue of incomplete combustion, without particle filters)*

Stage 2

- Solar DHW
- Photovoltaic panels
- Heat pump air-water/ground

A trigger points:

- A transaction- sale or rent of building for which owner is required to renovate building corresponding to the cost-effective approach specified in the stage 1 above.
- disaster/incident (e.g. fire, earthquake, flood) building must be restored with improved energy performance characteristics as defined in stage 1.
- Planned major capital repair of building for which building owners need from the local authority to obtain construction permit.

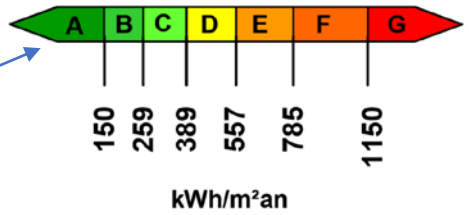
* Specific program is needed on: Efficient use of *firewood,* biomass, modern heat generation systems, in particular for rural heating (NECP)

Cost effective approaches to renovation (3)

C. Education institutions buildings

Built in 1948/ partially renovated in 2010

Heating, DHW, Lighting,
Mechanical ventilation
Air-conditioning,



Stage 1
- Thermal insulation
- Heat recovery
- Air-conditioning
- DH or Heat pump air-water/ground

Stage 2
- Solar DHW
- Photovoltaic panels

Recommended to implement in one stage

A trigger points:

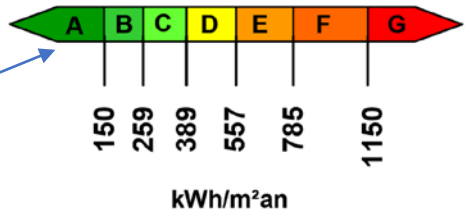
- Education facilities network optimization program run by state or local authority in which is planned extend/reduce educational facilities based on education service demand/supply analysis in specific location.
- disaster/incident (e.g. fire, earthquake, flood) building must be restored with improved energy performance characteristics as defined in Stage 1 and Stage 2 above.
- Planned major capital repair of education building for which education building owners/managers need from the local authority to obtain construction permit.

Cost effective approaches to renovation (4)

D. Offices Buildings

Built in 1972

Heating, DHW, Lighting,
Mechanical ventilation
Air-conditioning,



Stage 1

- Thermal insulation
- Radiators for variable refrigerant volume
- AHU with heat recovery
- DH or heat pump air-water/ground

Stage 2

Photovoltaic panels

A trigger points:

- A transaction- sale or rent of building for which owner is required to renovate building corresponding to the cost-effective approach specified above.
- Disaster/incident (e.g. fire, earthquake, flood) building must be restored with improved energy performance characteristics as defined in stage 1 above
- Planned major capital repair of building for which building owners need from the local authority to obtain construction permit.
- Administrative facilities network optimization program run by state or local authority in which is planned extend/reduce public institutions facilities based on the public service demand/supply analysis.

V. Renovation scenarios, energy savings and wider benefits

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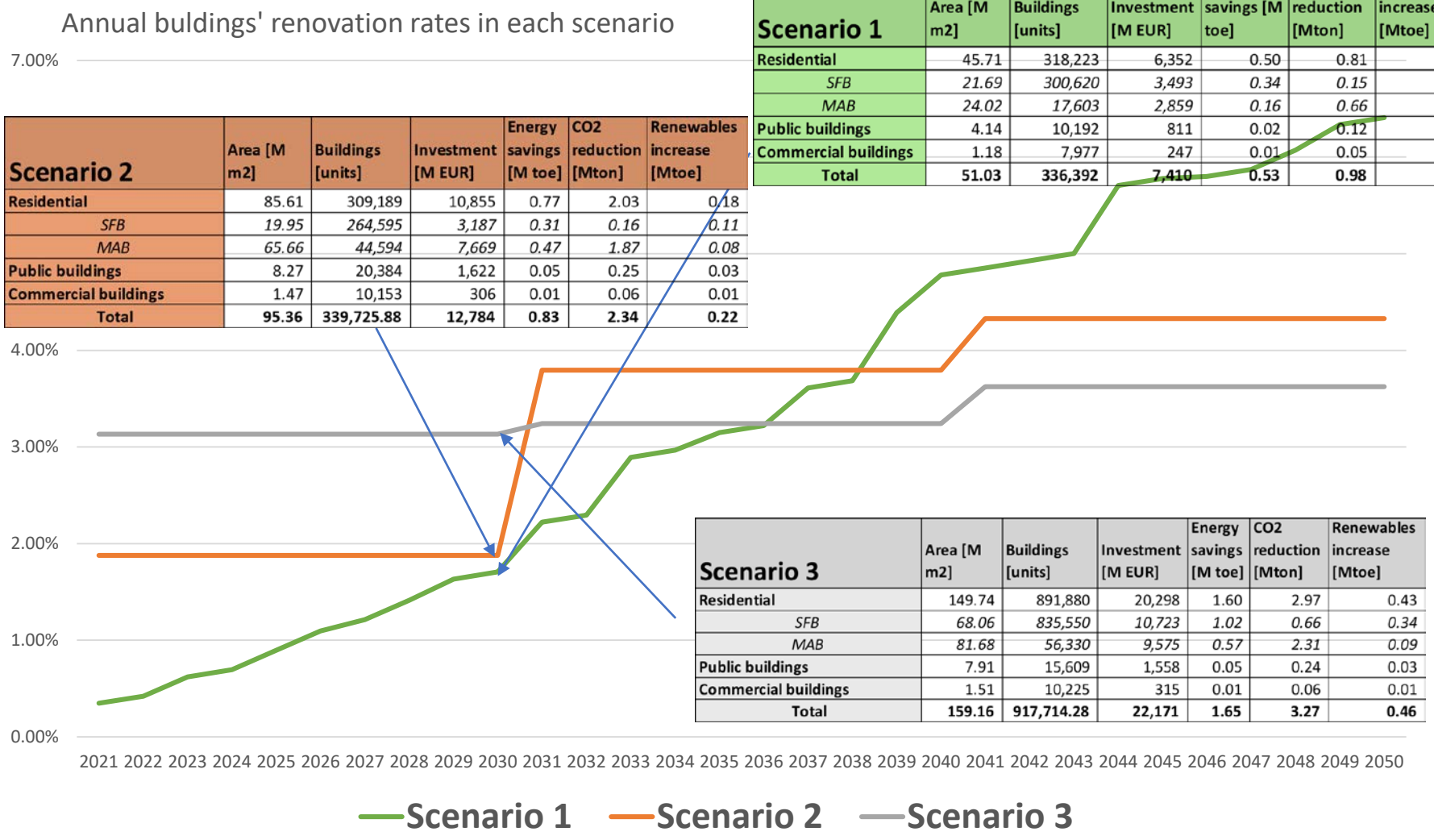
Methodology and key assumptions for scenario selection

- Three scenarios were developed based on different paces of renovations for each decade, and based on the different targeting of buildings types:
  - ✓ Scenario 1 was defined as incremental renovations which scope increases by 0.1-0.15% each year. This scenario maybe attractive in the first decade due to the need to build market capacities; however this will require a major increase in pace from 2030-50 in order to meet the 2050 target which will be a big challenge.
  - ✓ Scenario 2 was defined with a more gradual increase in pace for each decade. The first decade has a greater focus on MABs (~40%) as they offer the highest energy savings and CO_2 reduction potential.
  - ✓ Scenario 3 was defined as relatively equally distributed annual renovation rates in each decade. Such scenario maybe difficult to implement 2021-30 when the market may not be fully capable for such a pace of renovations and financing would be much more difficult to mobilize.

	2021-2030 annual renovation rates	2031-2040 annual renovation rates	2041-2050 annual renovation rates
Scenario 1	Incremental from 0.35% to 1.71%	Incremental from 2.22% to 4.78%	Incremental from 4.85% to 6.41%
Scenario 2	1.88%	3.79%	4.33%
Scenario 3	3.13%	3.24%	3.62%

Buildings renovation scenarios (values in tables cumulative by 2030)



Scenario 1	Area [M m2]	Buildings [units]	Investment [M EUR]	Energy savings [M toe]	CO2 reduction [Mton]	Renewables increase [Mtoe]
Residential	45.71	318,223	6,352	0.50	0.81	0.15
SFB	*21.69*	*300,620*	*3,493*	*0.34*	*0.15*	*0.12*
MAB	*24.02*	*17,603*	*2,859*	*0.16*	*0.66*	*0.03*
Public buildings	4.14	10,192	811	0.02	0.12	0.01
Commercial buildings	1.18	7,977	247	0.01	0.05	0.00
Total	**51.03**	**336,392**	**7,410**	**0.53**	**0.98**	**0.17**

Scenario 2	Area [M m2]	Buildings [units]	Investment [M EUR]	Energy savings [M toe]	CO2 reduction [Mton]	Renewables increase [Mtoe]
Residential	85.61	309,189	10,855	0.77	2.03	0.18
SFB	*19.95*	*264,595*	*3,187*	*0.31*	*0.16*	*0.11*
MAB	*65.66*	*44,594*	*7,669*	*0.47*	*1.87*	*0.08*
Public buildings	8.27	20,384	1,622	0.05	0.25	0.03
Commercial buildings	1.47	10,153	306	0.01	0.06	0.01
Total	**95.36**	**339,725.88**	**12,784**	**0.83**	**2.34**	**0.22**

Scenario 3	Area [M m2]	Buildings [units]	Investment [M EUR]	Energy savings [M toe]	CO2 reduction [Mton]	Renewables increase [Mtoe]
Residential	149.74	891,880	20,298	1.60	2.97	0.43
SFB	*68.06*	*835,550*	*10,723*	*1.02*	*0.66*	*0.34*
MAB	*81.68*	*56,330*	*9,575*	*0.57*	*2.31*	*0.09*
Public buildings	7.91	15,609	1,558	0.05	0.24	0.03
Commercial buildings	1.51	10,225	315	0.01	0.06	0.01
Total	**159.16**	**917,714.28**	**22,171**	**1.65**	**3.27**	**0.46**

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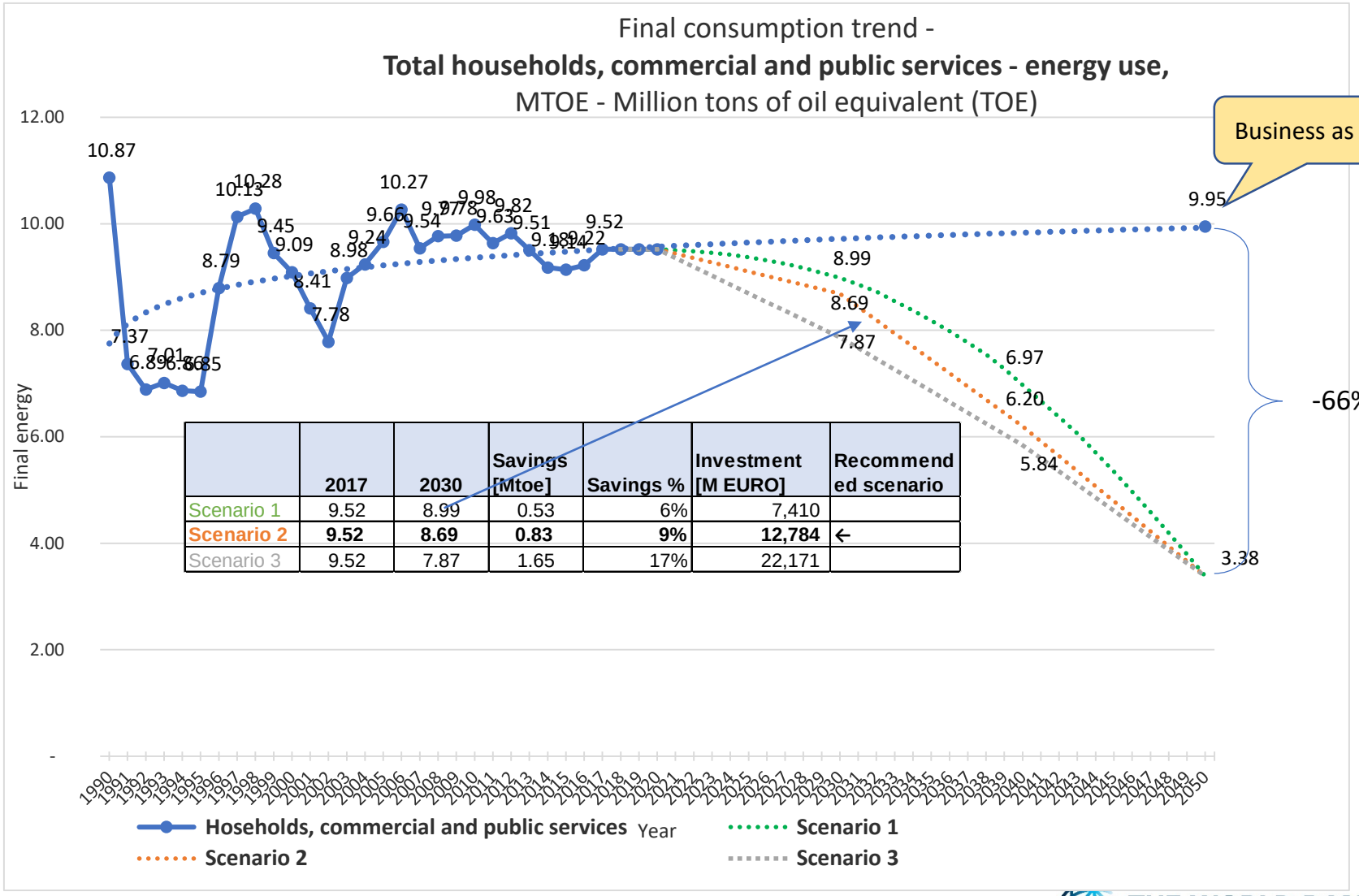
Buildings renovation benefits: Energy consumption reduction (values in the table cumulative by 2030)



	2017	2030	Savings [Mtoe]	Savings %	Investment [M EURO]	Recommended scenario
Scenario 1	9.52	8.99	0.53	6%	7,410	
Scenario 2	**9.52**	**8.69**	**0.83**	**9%**	**12,784**	←
Scenario 3	9.52	7.87	1.65	17%	22,171	

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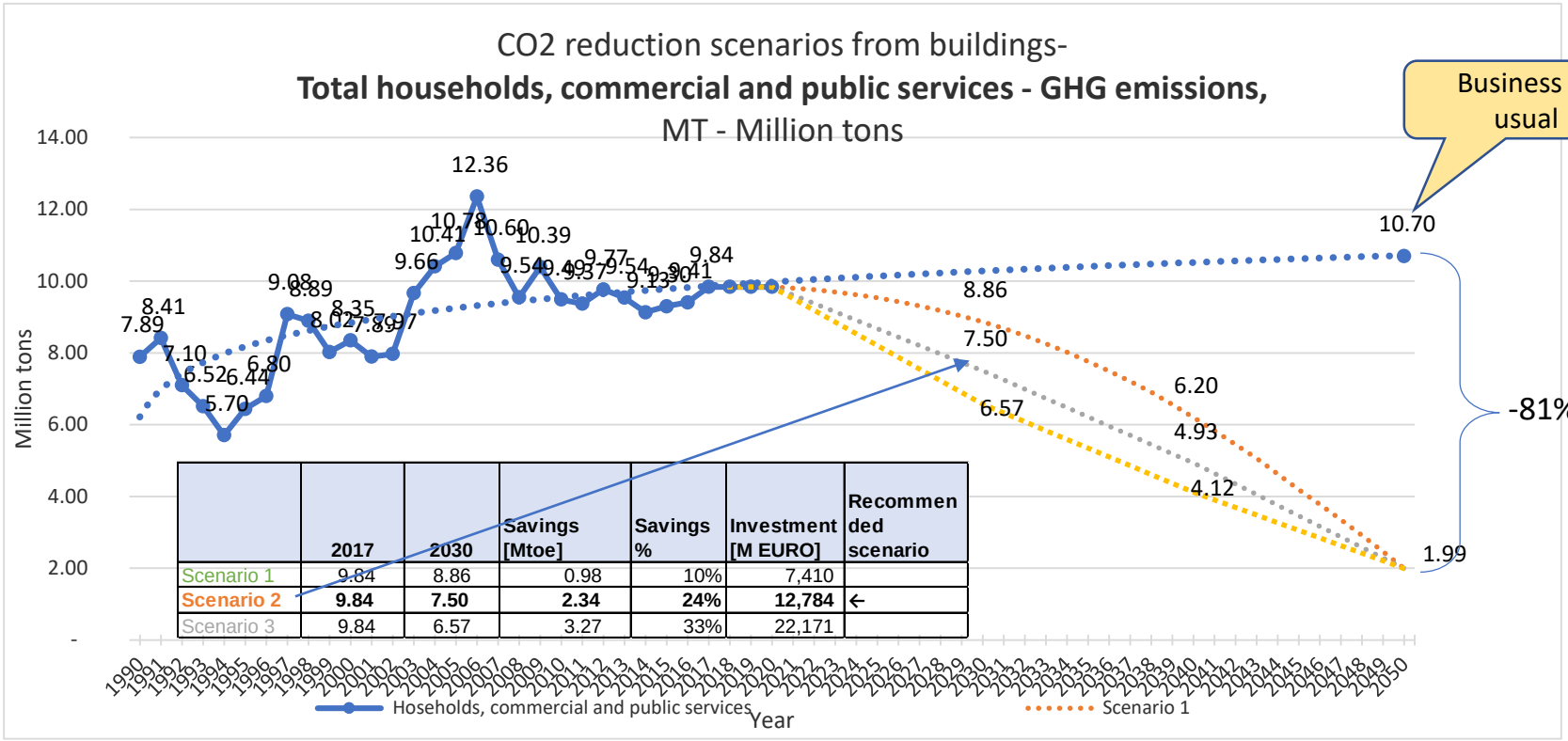
Buildings renovation benefits: CO2 reduction (values in the table cumulative by 2030)



	2017	2030	Savings [Mtoe]	Savings %	Investment [M EURO]	Recommended scenario
Scenario 1	9.84	8.86	0.98	10%	7,410	
Scenario 2	**9.84**	**7.50**	**2.34**	**24%**	**12,784**	←
Scenario 3	9.84	6.57	3.27	33%	22,171	

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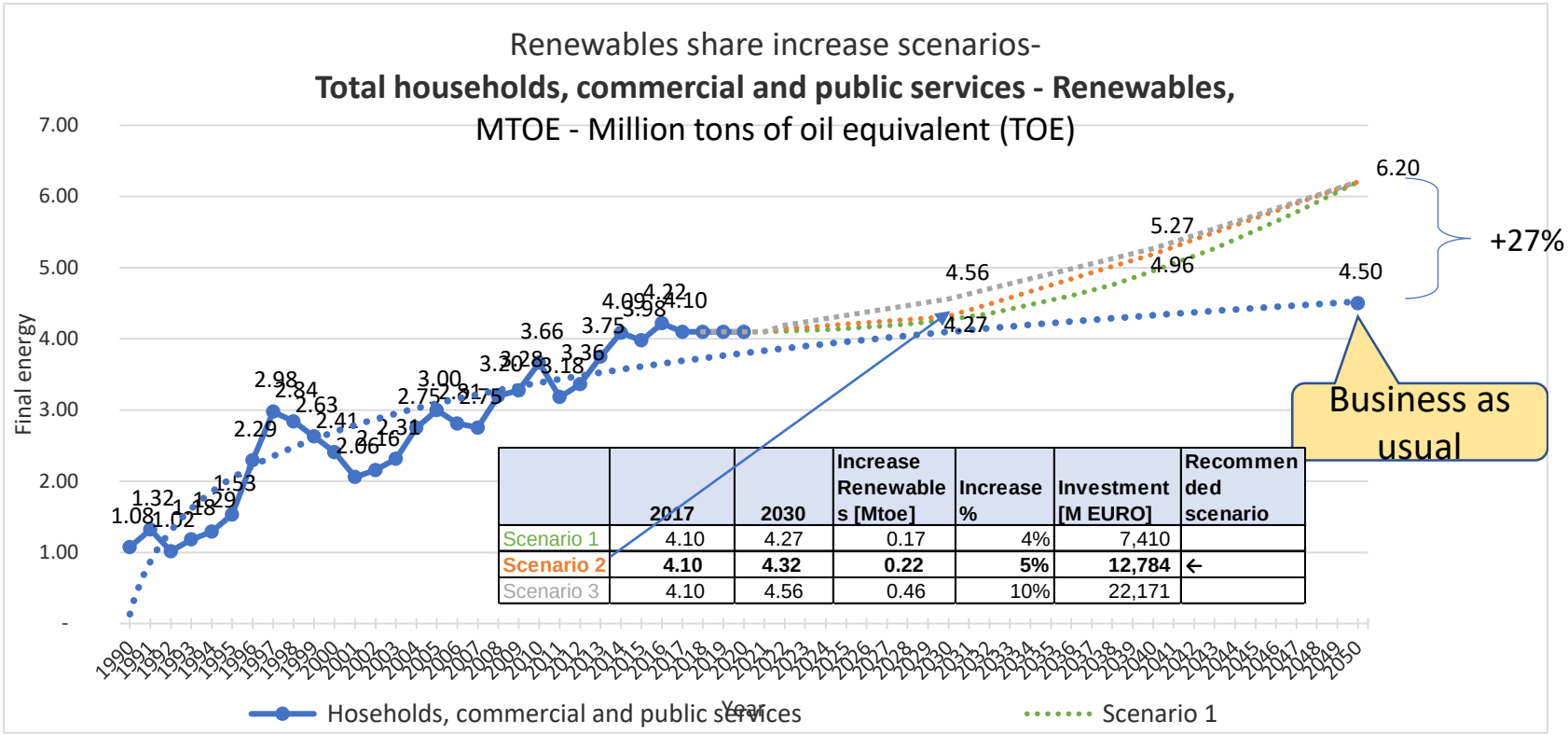
Buildings renovation benefits: renewables share increase (values in the table cumulative by 2030)



	2017	2030	Increase Renewables [Mtoe]	Increase %	Investment [M EURO]	Recommended scenario
Scenario 1	4.10	4.27	0.17	4%	7,410	
Scenario 2	**4.10**	**4.32**	**0.22**	**5%**	**12,784**	←
Scenario 3	4.10	4.56	0.46	10%	22,171	

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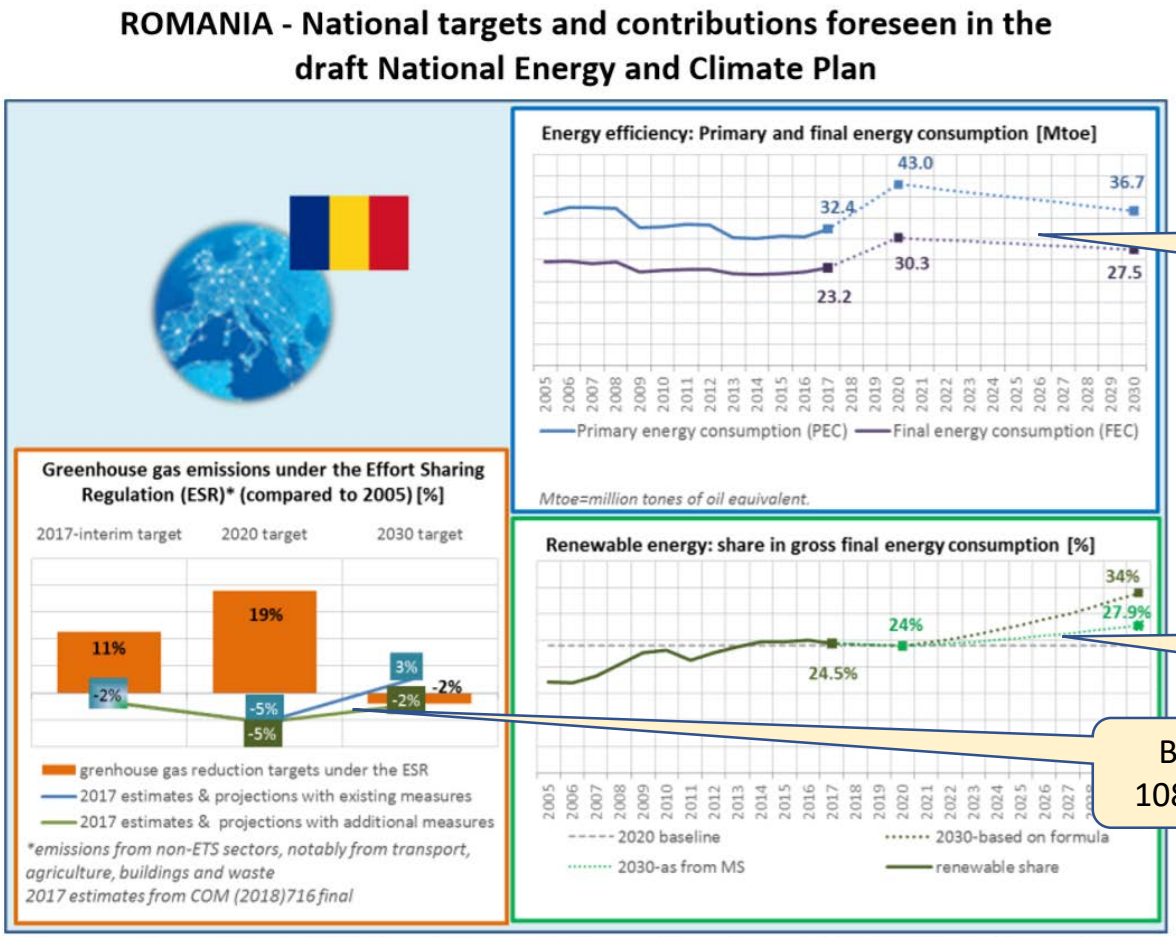
Buildings renovation scenario 2 impact to the National targets of the Integrated Energy and Climate Plan of Romania



Buildings can contribute by 30% (-0.83Mtoe reduction)

Buildings can contribute by 87% (+0.22Mtoe increase)

Buildings can contribute by 108% (-3.28 M tons reduction)

Sources: Romania's draft National Energy & Climate Plan, Eurostat (PEC2020-2030, FEC2020-2030 indicators and renewable SHARES), COM (2018) 716 final (2017 GHG estimates)

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Summary of recommended buildings renovation scenario (2)

Building types	Possible main categories	Area [M m2]	Buildings [units]	Investment [M EUR]	Energy savings [M toe]	CO2 reduction [Mton]	Renewables increase [Mtoe]
Residential - Individual houses	Rural	10.57	162,475	1,736.87	0.17	0.04	0.07
	Urban	9.39	102,120	1,449.88	0.14	0.11	0.04
Residential condominium	<=P+4 floors	21.62	21,124	2,791.47	0.11	0.47	0.02
	>P+4 floors	44.04	23,471	4,877.24	0.36	1.41	0.05
Educational	Schools	4.24	4,361	874.84	0.03	0.14	0.01
Healthcare	Hospitals	1.61	161	318.33	0.01	0.06	0.01
	Other	1.07	14,324	192.52	0.01	0.02	0.00
Administrative/office	Admistrative buildings	1.35	1,539	236.55	0.01	0.03	0.00
	Glass & steel buildings	-	-	-	-	-	-
Commercial buildings	Hotels	0.04	73	9.38	0.00	0.00	0.00
	Restaurants/ Coffee shops	0.12	2,394	27.05	0.00	0.00	0.00
	Shopping	1.31	7,686	269.40	0.01	0.06	0.01
Total		**95.36**	**339,726**	**12,783.53**	**0.83**	**2.34**	**0.22**

Required investments amount ~12.78 billion euro by 2030

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Wider benefits

- Thermal comfort of apartments (will be estimated as value of indoor temperature increase to the normative value 21C)
- Health benefit (will be estimated as value of lost wok day due to the sickness related with respiratory diseases due to the poor housing conditions)

Other qualitative benefits which will not be quantified in the strategy:

- Improved social cohesion (from stronger HOAs and communities)
- Reduced energy poverty (increased access to modern energy services: electricity, heating and clean cooking facilities (fuels and stoves that do not cause air pollution)
- Urban renewal (from visual impacts of renovated buildings)
- Address huge contingent liability from dilapidated and undermaintained buildings, including those that are not seismically sound. Also increase post-disaster resilience and more rapid recovery. From a cost-efficiency perspective, significant savings and efficiencies can be achieved when renovation of buildings is planned and undertaken in an integrated way considering EE, seismic safety and other interventions.
- Economic growth and employment generation Support financial viability of district heating systems (through the promotion of reconnections)
- Help to meet various EU obligations

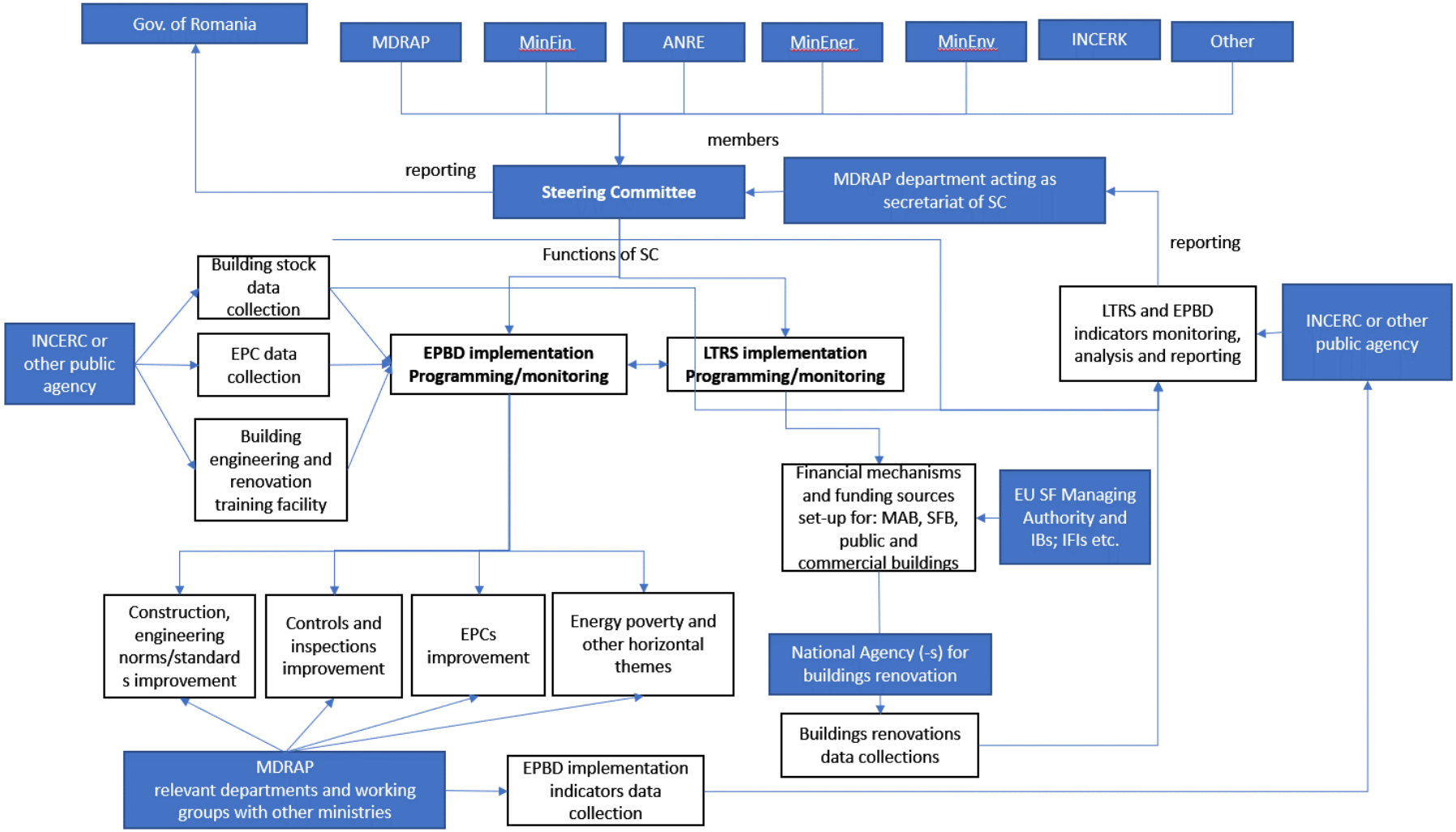
Note: Co-benefits are generally additional benefits from renovated buildings which are not part of the core objectives. These can also be tracked under the M&E framework if desired, as it can help justify future government funding and support.

VI. Key policies and actions for implementation

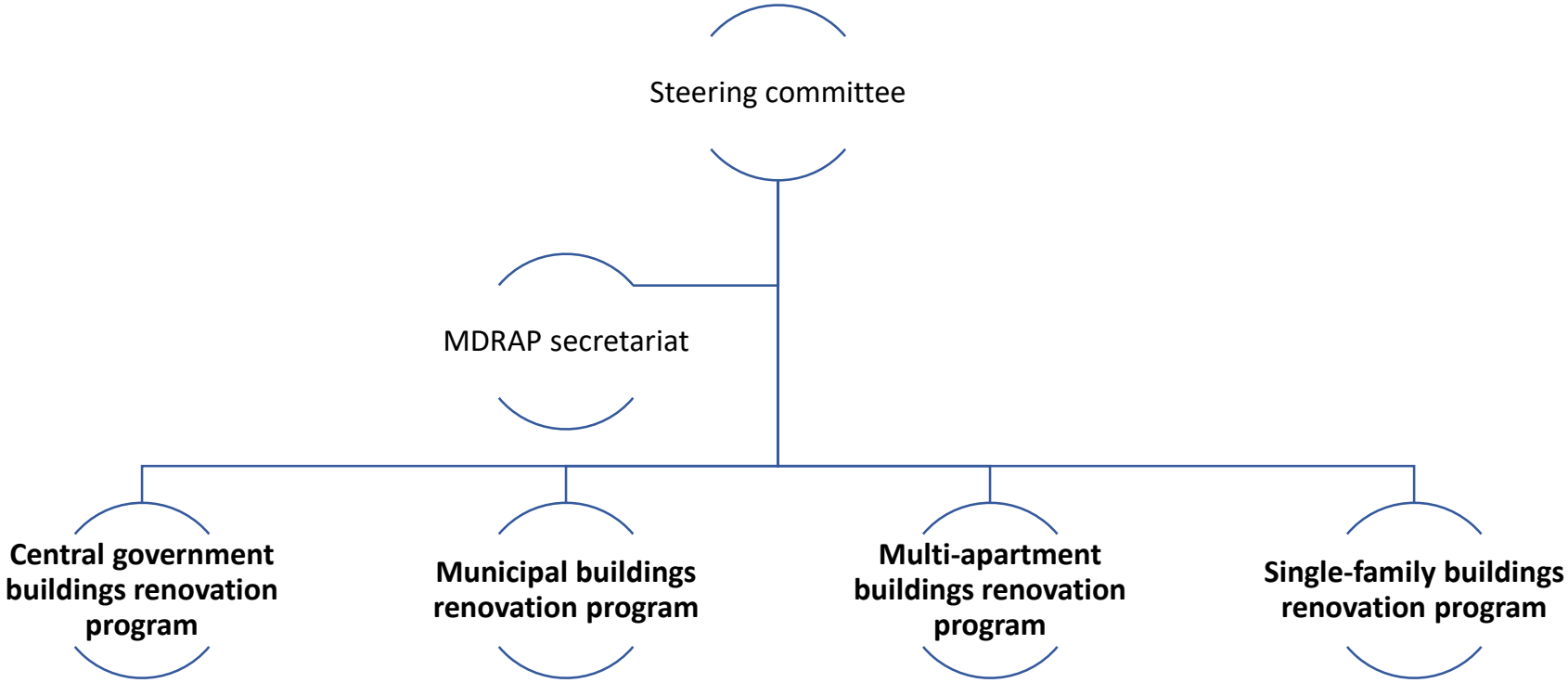
A. Governance and Institutional Set-up

- MDRAP should be adequately resourced to fulfill its institutional role as the lead agency and champion to successfully implement the next LTRS
- There is a need to design formal governance mechanisms for the LTRS, including a coordination mechanism (such as an inter-ministerial steering committee to oversee the EPBD and LTRS implementation, perhaps chaired by the DPM or PM) for policy development and implementation at the national level.
- MDRAP or other designated central government agency should be tasked and resourced to host and maintain a building database integrating results from the various renovation programs during the LTRS implementation.

A. Governance and Institutional Set-up
Example for the LTRS Governance Framework



A. Governance and Institutional Set-up
Example for renovation programs



B. Financing: mobilization of investments into the renovation needed to achieve the goals

- Public EE financing mechanisms:
  - A key objective is to reduce the share of annual investment requirement from nation and EU budgets, as these funds are limited and not scalable or sustainable
  - Integrated management of public financing from EU and national budgets into buildings renovation in the form of partial grants, repayable grants, investments into other financing instruments (e.g., revolving funds, guarantees, etc.).
- Commercial bank lending (credit lines, guarantees), particularly for private buildings. Need for special considerations for renovation of buildings in high risk seismic category.
- Need to improve share of creditworthy borrowers (i.e., HOAs, maintenance firms, municipalities, ESCOs, utilities, etc.)
- Need to promote and foster innovations in financing to see what works (e.g., residential home/appliance credit, commercial building renovation credits, on-bill utility financing, property assessed clean energy or PACE)

B. Financing: Financing, repayment options (illustrative)

	INVESTMENT PERIOD 2 years		REPAYMENT PERIOD 10 years									
			Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Option 1	**Gov. grant 100 %**											
	Building/apartment owner repays **40%** in case own part comes from loan financing											
Option 2	**Gov. grant 60%**	**Owner own 40%**	Owner 4%+int.	Owner 4%+int.	Owner 4%+int.	Owner 4%+int.	Owner 4%+int.	Owner 4%+int.	Owner 4%+int.	Owner 4%+int.	Owner 4%+int.	Owner 4%+int.
	Building/apartment owner repays 4**0%** repayable grant over 10 years											
Option 3	**Gov. grant 60%, repayable grant 40%**		Owner 4%	Owner 4%	Owner 4%	Owner 4%	Owner 4%	Owner 4%	Owner 4%	Owner 4%	Owner 4%	Owner 4%
	Reduce loan to be repaid		In case of the loan: Owner repays the remaining loan **70%** plus interest									
Option 4	**Owners own financing or loan 100%**	**Gov. grant 30 %**	Owner 7%+interest	Owner 7%+interest	Owner7 7%+interest	Owner 7%+interest	Owner 7%+interest	Owner 7%+interest	Owner 7%+interest	Owner 7%+interest	Owner 7%+interest	Owner 7%+interest

Note: Variations of the above options are also possible. Values in the options provided are for illustration purposes only.

B. Financing: €12.8B investment [€5.0B public and €7.8B private]

Central government buildings CGBs (~€300M from public budget/EU funds)

- ✓ Option 1 (100% budget support) can be most suitable for CGBs as it is based on 100% grant option.
- ✓ If there are savings, government can reduce budget appropriations for the energy and maintenance costs for renovated buildings.

Municipal public buildings (~€1.3B of which ~€700M public budget/EU funds and ~€600M from private sector)

- ✓ Option with a revolving preferential loan and/or a partial grant/repayable grant.

Multi apartment buildings (~€7.6B of which ~€3.5B public budget/EU funds, ~€4.2B from private sector)

- ✓ Option with a revolving loan and a partial grant for example an initial maximum level of 80%, decreasing to 60% after 5 years, 40% after 10 years, etc. To be determined.
- ✓ Repaid amounts could be collected and used to repay IFIs, or could revolve under Program for future phases

Single family buildings (~€3.2B of which ~€500M public budget/EU funds, €2.7B private sector)

- ✓ Mortgage loans and partial grants for thermal insulation and RES installations

Commercial buildings (~€300M from private sector)

- ✓ Own financing of commercial buildings owners
- ✓ Loans from commercial banks

C. Targeting: Policies, actions for all public buildings

Public sector can take a leadership role by improving its energy efficiency by renovation of 8.25 million m^2 (26%) of public buildings by 2030, an achievement which would reduce energy consumption by 0.05 million toe and avoided CO_2 emissions of 0.25m ton for the period 2021 - 2030.

- Creating a project pipeline and ensuring development assistance for key projects which will ensure renovation at least 26% by 2030, 52% by 2040 and 100% by 2050.
- Enhanced support for schools and other public buildings on technical design solutions
- Aggregation of public buildings renovation projects in large packages to achieve better pricing
- Centralized procurement and procurement frameworks for services and energy efficiency works to state owned buildings and municipal buildings
- Retention part of financial savings made from energy efficiency improvements to support the implementation of structured energy management in public buildings
- Assessment where appropriate to use PPP and/or EPC contracts as alternative delivery modes for public buildings renovation
- Financial scheme for the central government buildings funded by budgetary grants and repayable grant scheme or financial instrument developed for municipal buildings at central government level
- Interim evaluation of the implementation of this Strategy and analytical expertise to support effective governance

C. Targeting: Policies and actions on deep renovation (1)

'deep renovation' can be considered as renovation that leads to significant (typically more than 60 %) efficiency improvements.

- Deep renovation approach:
  - ✓ the first step is to insulate the building so that it has heat losses as little possible (more than 60%) with relevant ventilation strategy.
  - ✓ the next step is to install a renewable heating sources e.g. a heat pump, solar panel, PV or other- biomass system.
- Romania shall encompass policy that buildings which undergo renovation shall improve energy performance by more than 60% the same rule shall apply in order to receive public financial support for building renovation.
- To reach deep renovation level for public buildings it is recommended for Romania to renovate buildings to the energy performance levels corresponding to the current requirements for class A, except for the single-family buildings class B would be enough.
- Introduction of building renovation passport system--> starting point: to analyze and test in practice from the iBRoad developments.

C. Targeting: Policies and actions on deep renovation (2)

Complementary measures for deep and major renovation:

- Installation of required safety measures (seismic, fire protection, etc. – see slide on safety issues)
- Replacement of old electrical system
- Replacement of cold water, wastewater pipes (including rainwater drainage)
- Improvement/replacement of elevators
- Provision of intelligent shading systems for the hot season, such as the actionable walk-throughs with direct sun radiation sensor, adjustable exterior blinds (harder to implement), or high incidence reflective glazing windows (mirror exterior mirror "made by thin metallic metal coating);
- Install of artificial lighting with economic scenario, possibly with a human presence sensor, and the provision of low energy consumption LEDs;
- Aeraulic balancing of the introduced air distribution network, if the airflows from the inlets do not correspond to those of the technical design of the air conditioning installation (by sampling, on a sample of 10% of the total number of holes);
- the implementation of BMS/EMS system at the building level (including the air-conditioning installation), which allows efficient energy management for end-users - air conditioning equipment.
- For non-residential buildings with >10 parking spaces, the installation of at least 1 recharging point for electric vehicles or ducting infrastructure for at 5 parking points
- For residential buildings undergoing major renovation, with >10 parking spaces, installation of ducting infrastructure, namely conduits for electric cables, for every parking space to enable the installation, at a later stage of recharging points for electric vehicles
- installation of ramps and handrails on staircases for disabled access to the building
- Renovation of balconies and loggias

C. Targeting: Policies, actions on worst performing buildings

To determine the worst-performing segments of the Romania national building stock, following criteria can be applied:

- building is built before year 2000;
- specific final energy consumption is above 300 kWh/m^2
- specific final heating energy consumption is above 200kWh/m^2
- in case of residential multi-apartment building, more than 30% apartment owners living in building are socially vulnerable people receiving state support.
- In case of residential single-family building, owner is socially vulnerable person receiving state support.
- building is well connected to the transport and communication systems including access to internet and to the main public services like health, education, social protection.

A trigger points:

- Restrictions on sale or rental of buildings belonging to the lowest energy performance categories (NECP)

To address worst performing buildings may require around €3B allocation from the public budget in the in the period of 2021-2030 to co-finance investments in worst-performing buildings.

D. Other Issues
The alleviation of energy poverty

Energy poverty is a result of a combination of low income, high energy expenditure and dwellings' poor energy performance — effective action to alleviate energy poverty should therefore include energy efficiency measures alongside social policy measures.

It is recommended to implement energy poverty alleviation actions in the light of national conditions and legislation defining social policy taking into account above criteria for worst-performing buildings by providing additional support for the implementation of renovation and safety measures to the socially vulnerable people in worst-performing buildings and by compensating fully or partially investment costs to the vulnerable owners of apartments and single family buildings.

Such intervention for the government require allocated budget around 200-300 million euro annually in the next 10 years post 2020 period. It is expected that such intervention can reduce amount of vulnerable people and relevant energy subsidies by more than 30%.

D. Other Issues
Safety issues (1)

- Trigger points and criteria defined for cost-effective and deep renovation shall encompass also bellow listed safety issues.
  - ✓ Fire protection:
    - Regular inspections (in particular before a renovation) to check fire safety of the buildings that lead to mandatory requirements for upgrade of obsolete electrical, gas, firewood systems or other fire unsafe installations.
    - Upgrades during renovation to bring obsolete electrical installations up to safety standards along with fire save renovation measures implementation.
    - Mandatory requirement in residential premises installation of smoke detectors which will serve as fire mitigating measures.
    - Training on correct installation of appropriate ventilation and sprinkler systems, and the safe and correct installation of equipment that could have a fire-safety impact, such as photovoltaic (PV) panels and recharging points for electric vehicles.
    - Transform and apply in the national legislation the common methods developed under EU legislation to assess and classify construction products' reaction to fire performance, resistance to fire and performance when used in rooves, keeping in mind fire-spread and safe escape.

D. Other Issues
Safety issues (2)

- ✓ Seismic safety:
  - Technical inspection of seismically unsafe buildings with determination of relevant measures to improve seismic stability of the building.
  - Perform cost-benefit analysis for seismic unsafe buildings by comparing at least two mandatory alternatives:
    - 1) to renovate building to NZEB level along with seismic improvements,
    - 2) to demolish and construct new building corresponding NZEB requirements.
  - Mandatory requirement to improve seismic safety based on the above CBA results. Additional support for seismic improvement measures to the vulnerable consumers.

D. Other Issues
Incentives to use smart technologies and skills

- Active consumer (prosumer) development along with smart metering and smart grids (NECP).
- Use renewable energy sources in public buildings renovations and were cost-effective in residential.
- Support the local operators‟ development - service, materials and equipment providers - for buildings‟ rehabilitation (NECP)
- Support research and development projects and demonstration projects, promoting new technologies and new extensive renovation techniques (NECP)
- To enrich the existing design guidelines and technical regulations and to develop guidelines for nZEBs (design and execution of works). This can be done together with relevant associations, e.g. Cluster Pro-nZEB.
- Standard procurement documents, guidance and centralized procurement, use of electronic tools e-platforms
- Specialization and training programs for key professions and disciplines for building rehabilitation (NECP)
  - ✓ Continuous professional development - credit type system for energy auditors and Energy Certification Assessors (ECA) to a certain period and subject to renewal (e.g. every 5 years)
  - ✓ Training programs for training/qualification supervision of construction works,
  - ✓ Training programs, for training/qualification of builders / on-site workers and construction management specialists.

D. Other Issues
Building stock and energy use databases

Limited information on building stock and lack of understanding of energy use and potential savings is one of the key barriers in Romania. To overcome this issue is recommended:

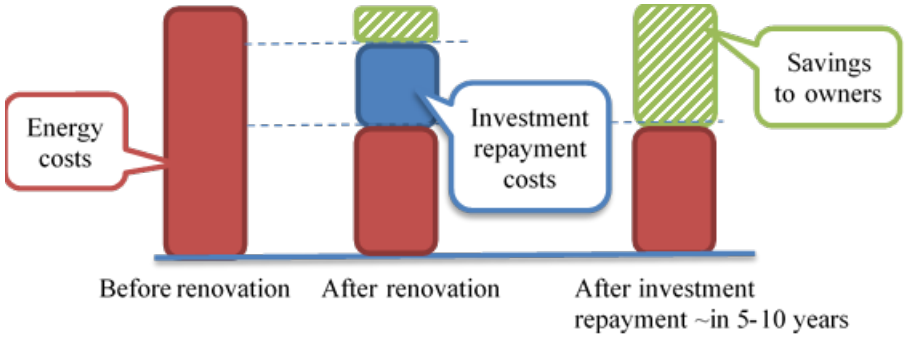
- Create a unique data base for energy efficiency certificates and audits
  - ✓ The existing data base (from INCERC, INSEE and others) could be reunited in one unitary template. The template must contain not only information about energy efficiency, renovation, but also data of characteristics of the building etc.
  - ✓ Should take into account the availability of relevant building stock data at local level from existing databases at central or local level - e.g. available in ENERFUND tool.
- Introduce mandatory reporting requirements on performed renovation works, for the energy savings data and other useful energy data.
- Online submission of EPCs to the database should be supported - with the possibility to implement compliance checks at submission time.
- Transition to national on line EPC calculation and submission system shall be implemented.

D. Other Issues
Split-incentive dilemmas

'Split or misaligned incentive' refers to transactions where the benefits do not accrue to the person who pays for the transaction. In the context of building-related energy, it refers to the situation where the building owner pays for energy retrofits efficiency upgrades but cannot recover savings from reduced energy use that accrue to the tenant.

- In Romania around 90% residential apartments, building owners are living in their owned property, thus the scale of split-incentive dilemmas is not very large, and should not be addressed as urgent measures in the period 2021-2030 of strategy implementation.
- However proposed financing mechanism which distributes energy costs after renovation in the way that owner/tenant would be able to use previously consumed energy saving to pay for investment and to have small saving 5%-10% could be suitable model to overcome split-incentive dilemma. Such financing mechanism will require state financing interventions to provide investment grant in order remaining repayable amount to the owner together with energy costs after renovation would be approximately 5-10% lower.

Example of an Incentive Mechanism for Residential Consumers



D. Other Issues
Other policies for buildings linked with NECP

- Integrated approach on the district heating sector, with coordination of investment projects throughout the supply chain - production, transport and the efficient heat usage. Opportunity analysis for efficient, non-polluting district heating systems
- Step-by-step implementation of smart city concept, integrating developed infrastructure; implementation of IoT at residential level
  - ✓ Develop regional programs based on ITI (integrated territory investments) mechanism, which include selected districts in cities for deep renovation of buildings in combination with other urban renewal, such as children playgrounds, car parking, recreational zones, public service buildings (schools, kindergartens and so on)
- Standards:
  - ✓ Develop minimum renovation standards in accordance with the EPBD directive
  - ✓ Establish performance standards for buildings‟ renovation / insulation elements and HVAC systems
- Monitor / Re-enforce the construction codes observance

D. Other Issues
Public consultations

- Establishing a wide stakeholder group as a forum for consultation, policy formulation and feedback on practical issues and barriers to renovation
- Regular consultations in the form of annual conference with the key stakeholders on strategy implementation progress and discussions of correction actions and proposed improvements for strategy implementation which could serve as guiding instrument for steering committee to take corrective actions.
- There is a need for strengthened communication with the public to explain why energy efficiency is important, the potential for building renovations, public and private benefits, the government's vision and program plans, and how other stakeholders can collectively contribute to this vision.

D. Other Issues
Information campaigns

- Wide information campaigns on TV, radio, internet most popular in Romania social media like Facebook and so on, to reach target groups and promote renovation programs
- informing users about efficient use of energy and setting a suitable local comfort temperature, avoiding room overheating (summer temperatures below 24 degrees), which would cause illness;
- information campaigns for office building users, with the distribution of brochures, flyers and brief information sessions; they will also be informed of the negative impact of opening the windows when the air conditioning system is in operation;
- encouraging the collection information from the users / owners of the building, in which they periodically expose their dissatisfaction with the thermal comfort and indoor air quality (too cold or too hot, air status, dry air, currents air disturbing air in the work area, too high noise from fans or air treatment plants, etc.);
- promotion to use of low energy efficiency appliances, equipment and computers (laptop computers instead of desktop, etc.);
- Information on implement renovation projects, costd of measures implemented actual benefits achieved, indoor air climate solutions and use of renewables

D. Other Issues

Policy for maintenance companies involvement

- It is important to build a strong market for maintenance companies, to ensure that companies are capable to perform not only regular maintenance works, but also act as building renovation process manager on behalf of the apartment owners associations. In Romania, this work is currently performed by the local authorities with assistance of consultants.

VII. Roadmap

Roadmap (1). Indicators and milestones of buildings renovation contributing to EU targets

Indicator	Unit	Baseline value	Target values		
		2020	2030	2040	2050
Final energy savings	M Toe	0	0.83	3.32	6.14
	%	0%	9%	35%	65%
- Residential		0	0.77	3.19	5.88
▪ MAB		0	0.47	0.79	1.08
▪ SFB		0	0.31	2.40	4.80
- non-residential		0	0.06	0.13	0.26
▪ public		0	0.05	0.09	0.16
▪ commercial		0	0.01	0.04	0.10
CO2 emissions reduction	M Toe	0	2.34	4.91	7.85
	%	0%	24%	50%	80%
- Residential		0	2.03	4.20	6.41
▪ MAB		0	1.87	3.19	4.37
▪ SFB		0	0.16	1.02	2.03
- non-residential		0	0.31	0.71	1.45
• public		0	0.25	0.49	0.82
• commercial		0	0.06	0.22	0.63

Roadmap (2). **Indicators and milestones of buildings renovation contributing to EU targets** (values tbd in final report)

Indicator	Unit	Baseline value	Target values		
		2020	2030	2040	2050
Increase of NZEBs	m2				
	%				
- Residential					
▪ MAB					
▪ SFB					
- non-residential					
▪ public					
▪ commercial					
Reduction of people affected by energy poverty	%				
Reduction of buildings in the lowest energy classes	%				
Buildings equipped with BEMs or similar smart systems	%				
- non-residential					
▪ public					
▪ commercial					
No of one-stop shop initiatives	No				
Awareness raised that lead to concrete actions (% of owners taking renovation actions out of targeted owners)	%				

Roadmap (2). **Progress and outputs indicators of buildings**

Renovated buildings
- Residential
  - MAB
  - SFB
- non-residential
  - public
  - commercial
- By renovation type
  - NZEB
    - residential
    - public
    - commercial
  - Deep renovations (>60% savings)
  - EPC – A
  - EPC – B
  - EPC - C
  - EPC - <C

Annual energy consumption
- Residential
  - MAB
  - SFB
- non-residential
  - public
  - commercial

Annual C02 reduction
- Residential
  - MAB
  - SFB
- non-residential
  - public
  - commercial

Investments
- Residential
- public
- commercial

Public investments
- residential
- public
- commercial

Investment costs per annual savings
- Residential
- non-residential

Investment costs per CO2 reduced
- Residential
- non-residential

No of integrated/aggregated projects
- residential
- public

Public private partnership initiatives

Investments in public private partnership initiatives

Average no of buildings in integrated/aggregated projects
- residential
- public

No of one-stop shop initiatives in place

Awareness raising initiatives
- Owners reached
- Owners taking actions

Proportion of disposable household income spent on energy

Population living in inadequate dwelling conditions (e.g. leaking roof) or with inadequate heating and cooling

Reduction in energy costs per household (average)/decrease in energy poverty

Buildings in lowest energy classes EPC- E, F, G

Employment in the building sector (No of jobs created per EUR million invested in the sector)

GDP increase in the building sector

Removal/prevention of accessibility barriers for persons with disabilities

No of buildings equipped with BEMs or similar smart systems
- **non-residential**
  - public
  - commercial

Citizens participating in energy communities

No of graduated students
- **university courses with focus on energy efficiency and related smart technologies**
- **professional/technical training**
  - EPC certifiers
  - HVAC inspectors
  - Designers
  - Technical supervisors
  - Contractors

Budget of national research programmes in the field of building energy efficiency

Participation of national universities in international scientific research projects (e.g. H2020) on energy efficiency in buildings-related topics

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GUVERNUL ROMÂNIEI

POCA
Programul Operațional Capacitate Administrativă
Competența face diferența!

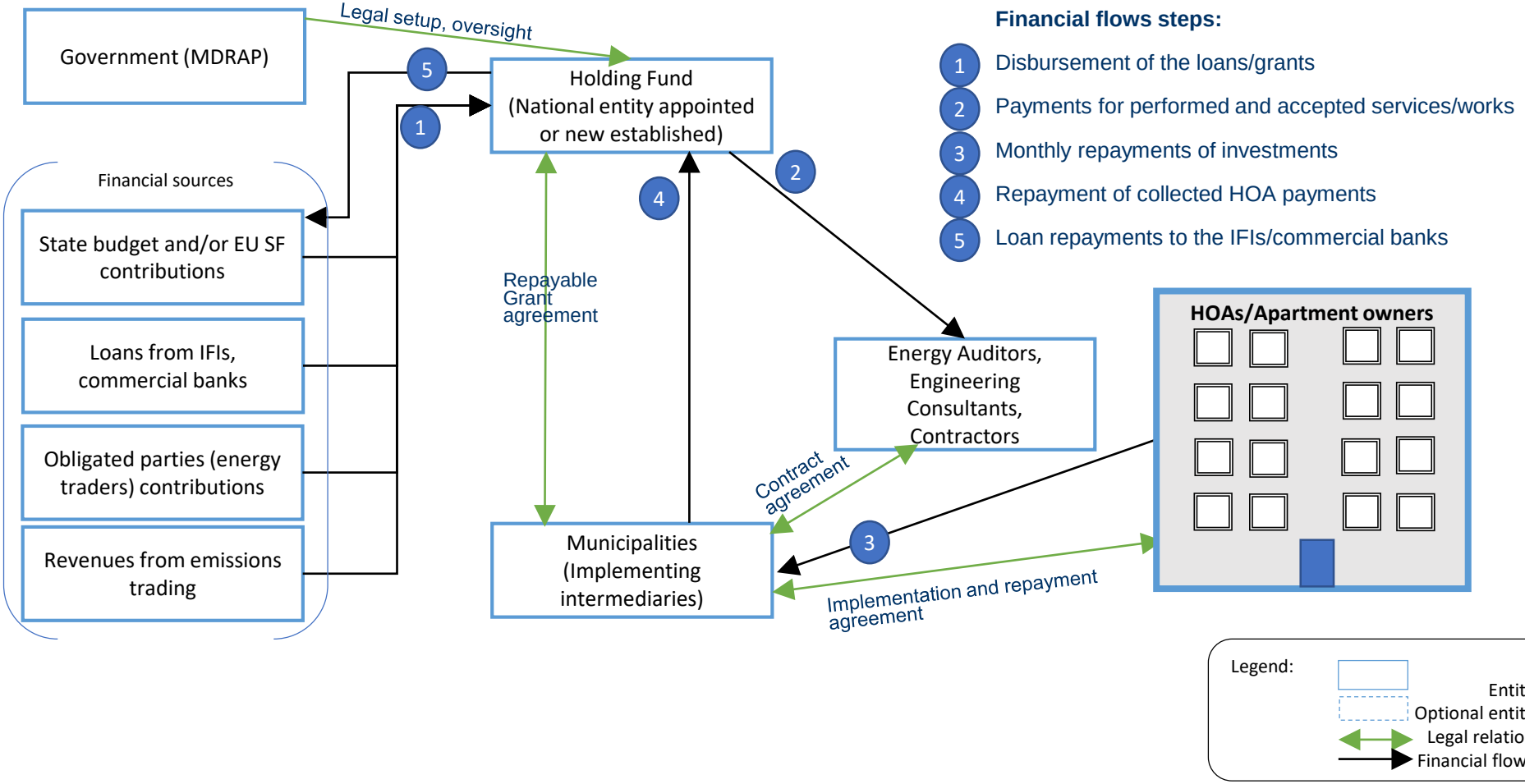
Instrumente Structurale 2014-2020

Annexes

WORLD BANK GROUP

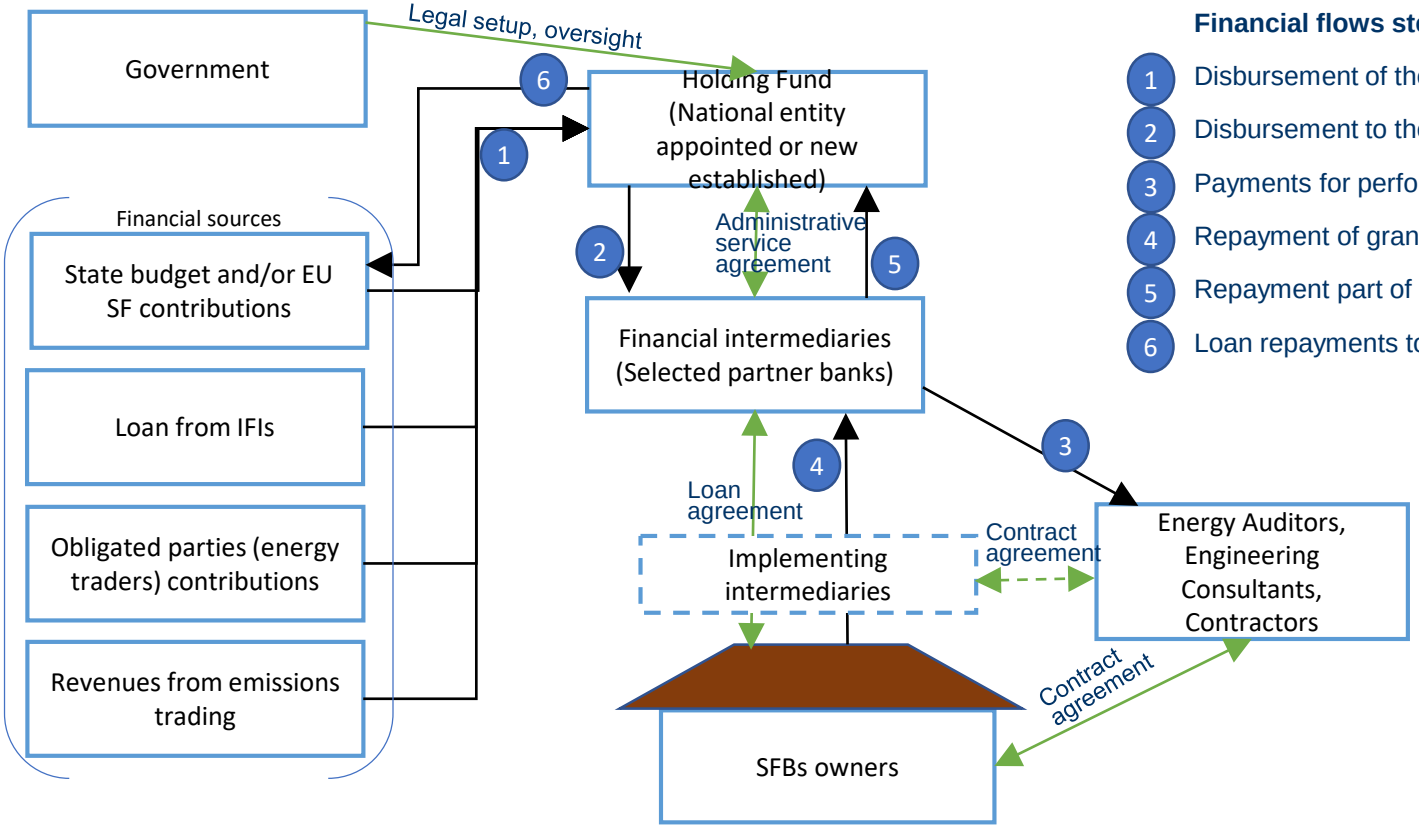
Preliminary financial flows example for MABs program

Possible delivery mechanism based on the institution setup *option 3 for MBAs*



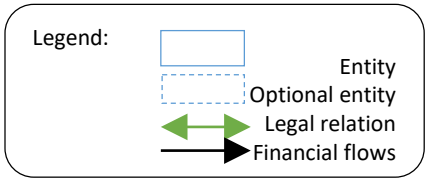
Preliminary financial flows example for SFBs program

Possible delivery mechanism based on the institutional setup *options 2 and 3*



Financial flows steps:

1. Disbursement of the loans/grants
2. Disbursement to the FI special account
3. Payments for performed and accepted services/works
4. Repayment of grant or loan
5. Repayment part of loan to HF
6. Loan repayments to the IFIs



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