CATCHING-UP REGIONS

FINANCING INSTRUMENTS TO SUPPORT ANTI-SMOG AND ENERGY EFFICIENCY IN SINGLE FAMILY BUILDINGS OF POLAND

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Switching from coal to gas is the most cost-effective approach to reduce both air pollution and carbon emissions

1. For the poor SFBs, boiler replacement and thermal retrofit must go hand in hand to reduce both air pollution and CO2 emissions, with fuel cost savings
2. For the non-poor SFBs, switching from coal to gas boilers coupled with thermal retrofit is the most cost effective way to reduce both air pollution and carbon emissions, with fuel cost savings
3. Boiler replacement alone increases fuel costs and CO2 emissions, and thermal retrofit alone has limited impacts on reducing air pollution.

Costs and Emission Reductions of Replacement of Old Coal Boiler and Thermal Retrofit of SFBs

	Replacement with ECO-design coal boiler	ECO-design coal boiler + full thermal retrofit of SFB****	Switching from old coal to gas boiler	Gas boiler + full thermal retrofit of SFB****	Switching from old coal boiler to heat pump	Heat pump + full thermal retrofit of SFB****	Partial thermal retrofit only***	Full thermal retrofit only****
Annual Fuel savings (GJ)	- 14.7	98	12.6	106.5	112.0	137.6	42.4	89.6
Annual fuel cost savings (PLN)*	- 1,857	1,825	-3,794	1,219	-2,500	1,624	995	2,101
Total investment** (PLN)	13,500	95,203	7,500	89,203	25,000	106,703	38,115	81,703
Annual reduction in particulate emissions (kg)	95	98	100	100	100	100	28	60
Annual reduction in CO2 emissions (tons)	- 4.1	5.3	2.4	7.3	1.1	6.9	2.7	5.7

+ The automatic-fed coal boiler consumes more coal and replaces the use of wood. It also consumes electricity for its operations
* The new coal boiler requires higher priced coal, and gas and electricity are higher priced fuels than coal
** A 5-10 kW automatic Ecodesign coal boiler costs about 9,000 PLN; a gas boiler costs about 4,000 PLN; and a heat pump costs about 20,000 PLN. This is in comparison to about 2,500 PLN for a “smoker” or manually fed boiler (total investment Includes cost of duct work and installation cost for new boiler)
*** Partial retrofit includes wall insulation and modernization of the central heating system components
**** full retrofit includes wall, roof and floor insulation, and modernization of the central heating system components

Implementing boiler replacement for anti-smog resolution and thermal retrofit in poor SFBs in Malopolskie and Slaskie requires investments of €1.1 – €1.7 billion

	Number of SFBs[1]	Unit Cost (PLN)	Total Investment
Replacement of old coal/solid fuel boilers with new ECO-design coal boilers	91,000	13,500	PLN 1,228.5 m (€289.06 m)
Full Thermal Retrofit[2]	72,800	50,000 to 81,703	PLN 3,640 m to PLN 5,947.76 m (€856.47 m to €1,399.47 m)
Total			PLN 4,868.50 m to PLN 7,176.26 m (€1,145.53m to €1,688.53m)

1. 10 percent of 910,000 SFBs in the two regions that require replacement of solid fuel boilers are assumed to be poor based on estimates by IBS
2. 80 percent of the poor SFBs are estimated to need thermal retrofitting under the program. The cost of thermal retrofitting varies significantly. While, the IEE has estimated cost of full thermal retrofitting for a typical SFB to be about PLN 81,703, anecdotal information from equipment installers indicates that the average cost of a full thermal retrofit of an SFB is PLN 50,000. This analysis assumes that the average cost of a full thermal retrofit of an SFB ranges from PLN 50,000 to PLN 81,700.

(i) The estimates in this table are based on average costs of boiler replacements and thermal retrofits in an average sized SFB.

(ii) Cost of the Program implementation/administration (energy assessment of SFBs, processing and evaluation of applications/proposals, disbursement of funds, M&V, etc.) is not included in the estimates shown in this table.

Implementing fuel switching to gas and heat pumps, boiler replacement and thermal retrofit in non-poor SFBs in Poland requires investments of €30.7 - €42.8 billion

	Number of SFBs	Unit Cost (PLN)	Total Investment
Replacement of coal/solid fuel to new coal boilers	2,672,847	13,500	PLN 36,083 m (€8,490 m)
Switching from coal/solid fuel to new gas boilers	1,217,236	7,500	PLN 9,129 m (€2,148 m)
Switching from coal/solid fuel to new heat pumps	167,370	25,000	PLN 4,184 m (€984 m)
Full Thermal Retrofit[2]	1,622,981	50,000 to 81,703	PLN 81,149 m to PLN 132,597 m (€19,093 m to €31,199 m)
Total			PLN 130,545 m to PLN 181,994 m (€30,716 m to €42,822 m)

1. 90 percent of 5,367,000 SFBs in Poland are assumed to be non-poor based on estimates by IBS. The number of SFBs switching from old solid fuel boilers to gas boilers is estimated based on availability of gas connection to SFBs in urban and rural areas (only 40 percent of SFB across Poland have access to gas connection). The number of SFBs estimated to switch to heat pumps is estimated based on SFBs that presently use old solid fuel boilers but do not have gas connection. And the number of SFBs switching to new coal boilers is estimated based on SFBs that presently use old solid fuel boilers but not have gas connection and do not switch to heat pumps.
2. 40 percent of the non-poor SFBs in Poland are estimated to need thermal retrofitting based on results from national surveys of SFBs by IEE. Only the SFBs participating in the program and switching from old solid-fuel boilers to new coal and gas boilers and heat pumps are considered for thermal retrofitting. The cost of thermal retrofitting varies significantly. While, the IEE has estimated cost of full thermal retrofitting for a typical SFB to be about PLN 81,703, anecdotal information from equipment installers indicates that the average cost of a full thermal retrofit of an SFB is PLN 50,000. This analysis assumes that the average cost of a full thermal retrofit of an SFB ranges from PLN 50,000 to PLN 81,700.

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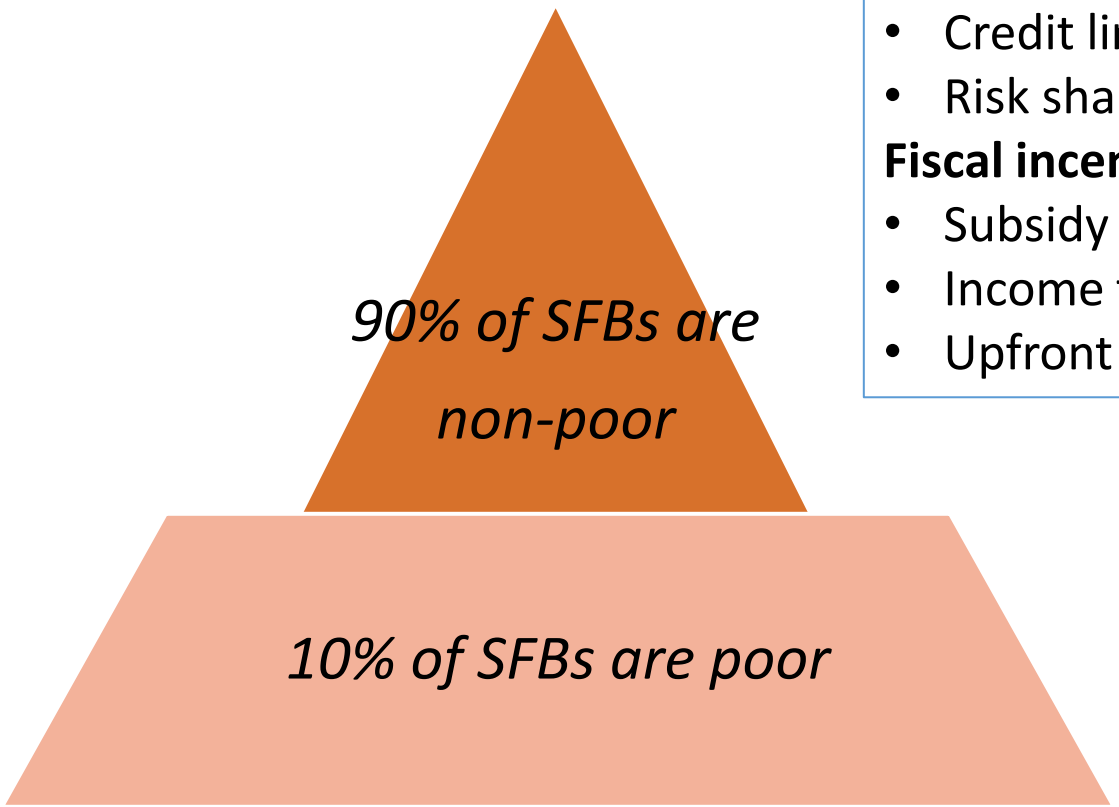
Poor and non-poor SFBs requires different financing instruments and support mechanisms



Commercial financing for the non-poor SFBs:

- Credit line through participating financial institutions
- Risk sharing/partial guarantee funds

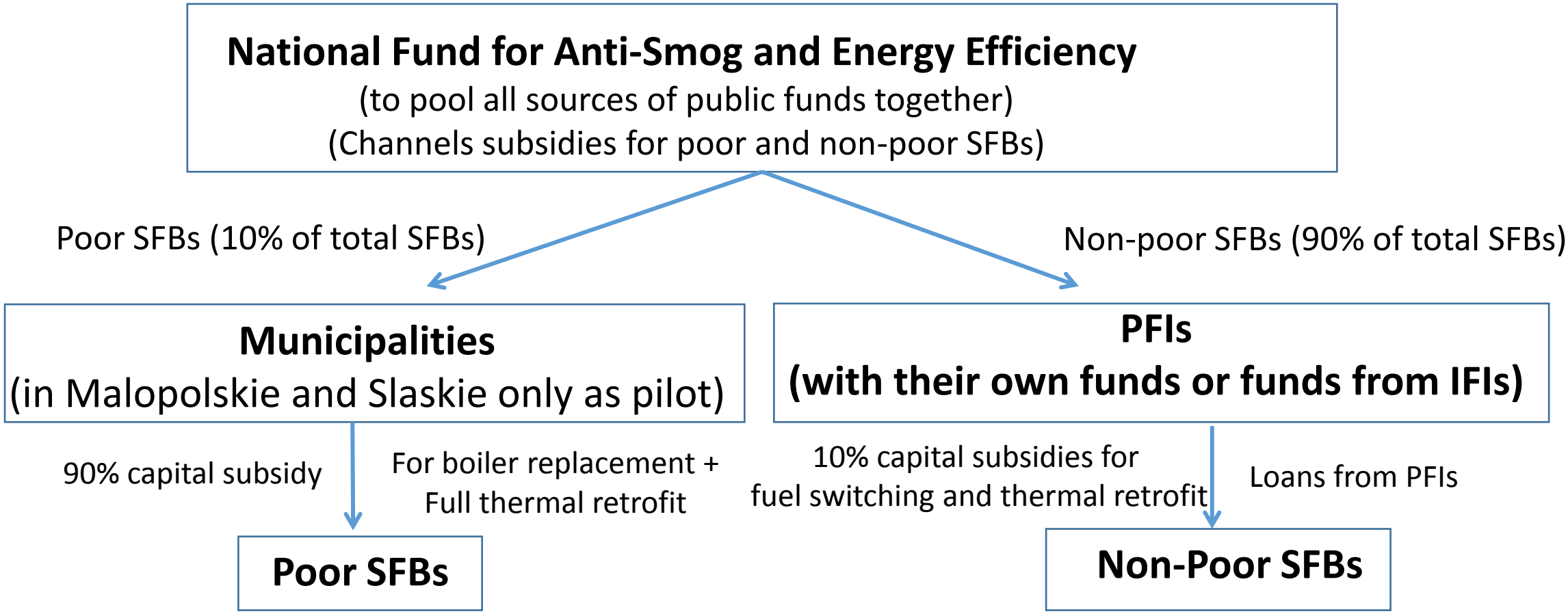
Fiscal incentives is critical for thermal retrofit and fuel switching

- Subsidy of 10% to increase market uptake
- Income tax credits for thermal retrofit
- Upfront subsidies are more effective than tax credits

Support mechanisms for poor SFBs:

- Mostly subsidies (up to 100%)

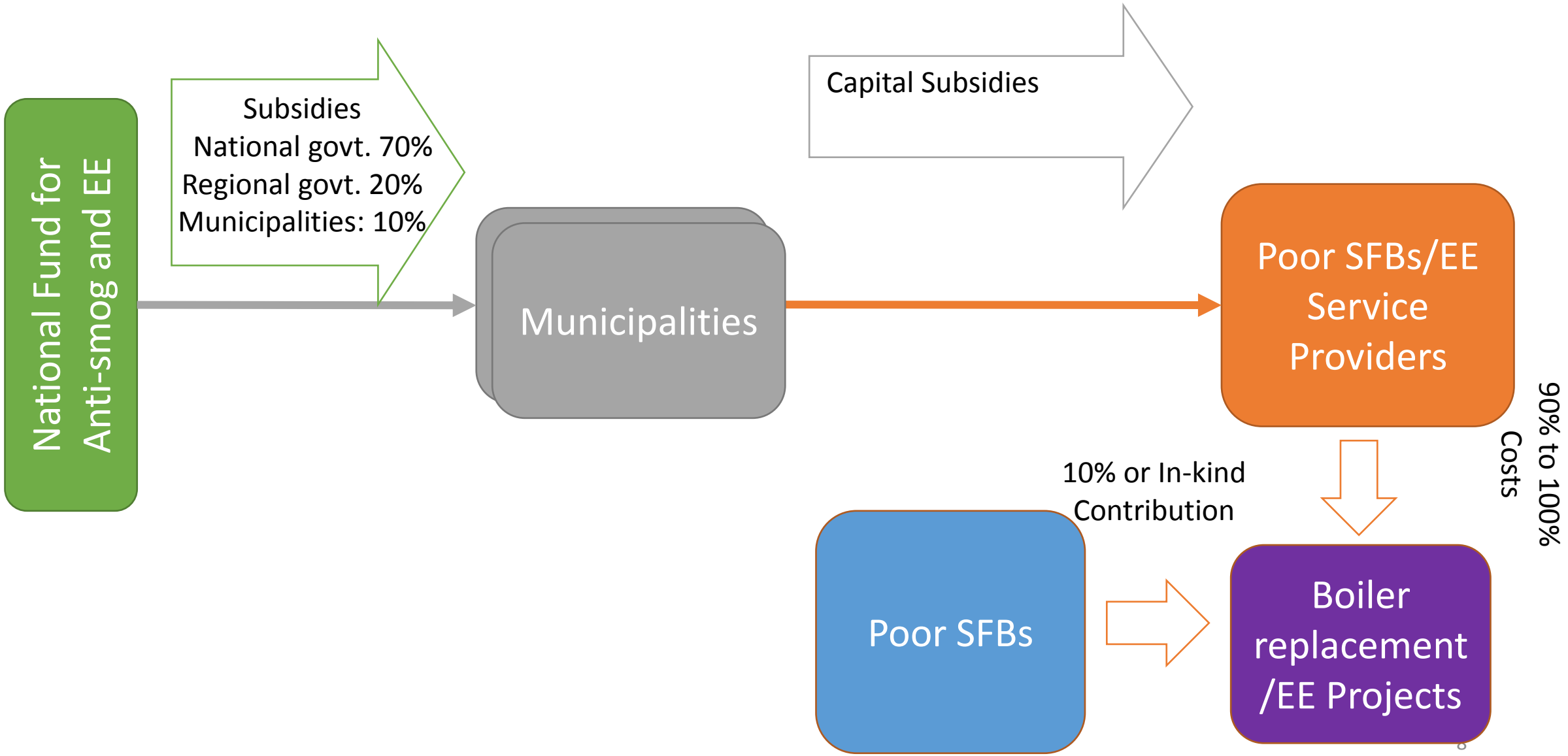
A National Fund for Anti-Smog EE in SFBs should be established



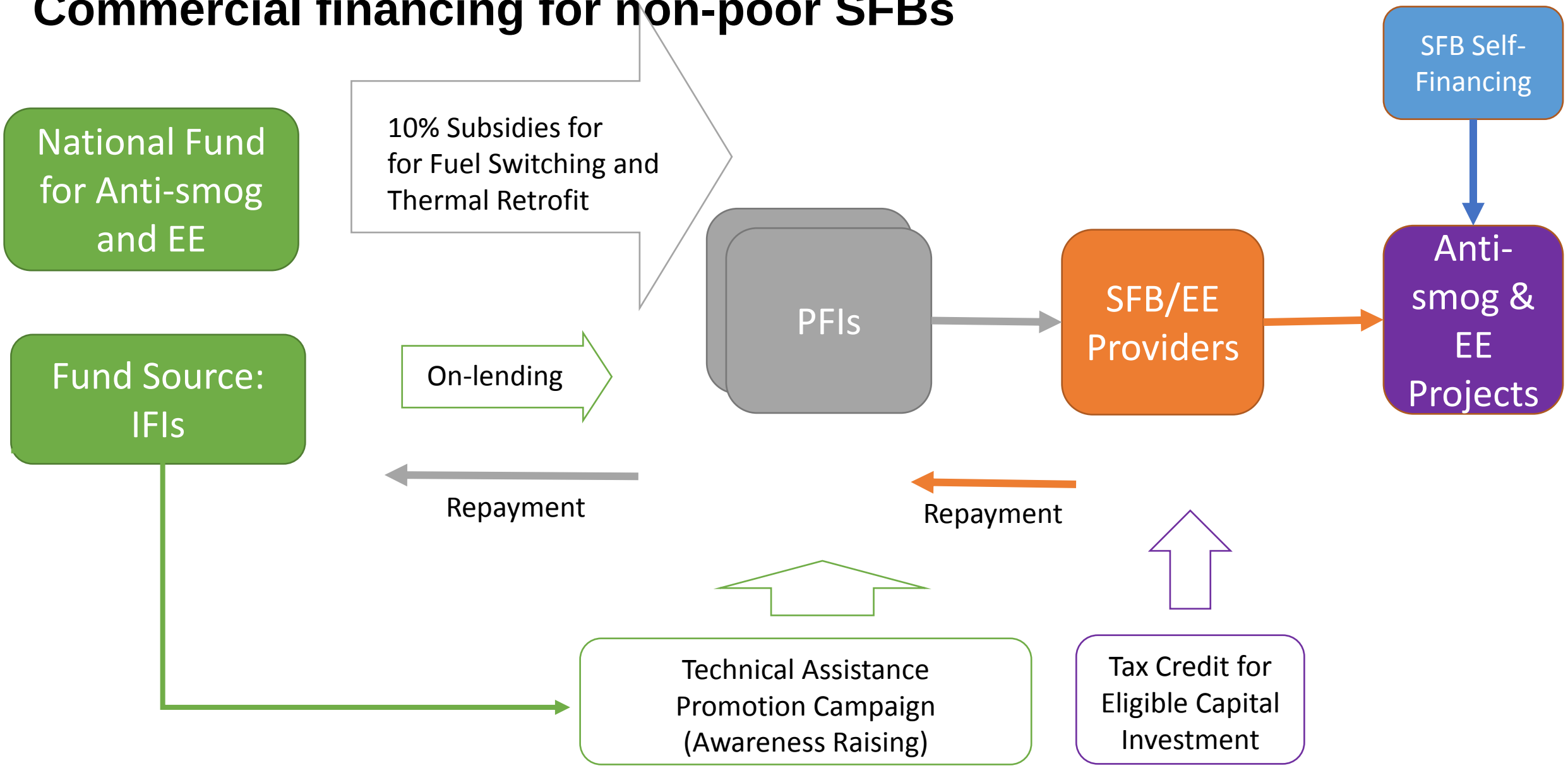
Program costs to finance anti-smog and energy efficiency for poor SFBs in Małopolskie and Śląskie and non-poor SFBs in Poland

Funding Source	Poor SFBs in Two Regions	Non-poor SFBs in Poland
Subsidies:	PLN 4.9-7.2 b / EUR 1.1-1.7 b	PLN 9.4-14.6 b / EUR 2.2-3.2 b
National government (70%)	PLN 3.4-5.0 b / EUR 0.8-1.2 b	PLN 6.6-10.2 b / EUR 1.5-2.2 b
Regional governments (20%)	PLN 0.97-1.4 b / EUR 0.2-0.3 b	PLN 1.9-2.9 b / EUR 0.4-0.6 b
Municipal governments (10%)	PLN 0.5-0.7 b / EUR 0.11-0.17 B	PLN 0.9-1.5 b / EUR 0.2-0.3 b
Investments through commercial financing	0	PLN 121.1-167.4b / EUR 28.5-39.6 b
Administrative costs, technical assistance, capacity building, awareness raising	Tens of million EUR	Tens of million EUR

Public financing support mechanism for poor SFBs



Commercial financing for non-poor SFBs



Fiscal incentives (Income tax credits) to incentivize thermal retrofit and fuel switching in non-poor SFBs