



MINISTRY
OF THE ENVIRONMENT

Air Emission Reduction Programme for household heating installations in Tychy, Poland

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Air Emission Reduction Programmes (AERPs) targeted at individual household heating installations are a good example of measures employed in Poland to implement obligations under:

- the 1988 Sofia Protocol
- the 1999 Gothenburg Protocol

The main goal of the AERPs is to improve air quality in the cities by taking appropriate measures to reduce emissions at small sources (emitters up to 10 metres high). These Programmes are voluntary and concern the residential sector on the municipal level.



Photo: Tomasz Pecka



Tychy is located in:

- The south of Poland (near Katowice)
- The Uppersilesian Industrial District
- The Silesian Voivodeship

Tychy characteristics:

- Area:
around 82 km²
- Population:
almost 130,000
- Households:
around 47,000



Driving Forces

Among 4500 small stationary emission sources identified in Tychy in 2001 around **4 thousand were boiler houses equipped with old heating boilers.**

Reduction of the emissions from the combustion of various fuels in low-efficiency household furnaces or in small local boiler houses was an important challenge considering:

- social circumstances (low level of public environmental awareness),
- technical problems with choosing appropriate installations,
- economic conditions (lack of required financial resources).

Objectives

The initiative of the Tychy local authorities:

- focused on the improvement of air quality in the city,
- enabled the provision of financial and technical support for the citizens interested in joining the AERP to reduce emissions at source.

The integrated air emission reduction programme for **2200 single-family houses** equipped with individual non-ecological and low-efficiency coal boilers was implemented in two stages:

- Stage I in 2002-2004
- Stage II in 2006-2007.

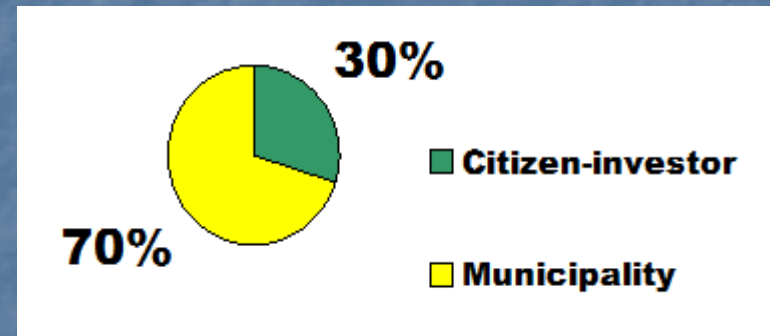


Scope

The conditions for the voluntary participation in the AERP:

- A house declared in the application had to be located in Tychy with a construction permit dated before 1 January 1996 and equipped with an old coal-fired boiler/furnace,
- Its owner was obliged to participate in the costs of the whole investment, selected individually by the owner.

If a more expensive option was chosen by the citizen or additional tasks proposed beyond the scope of the AERP, the surplus costs were to be covered totally by the investor with his own sources.



The payback time for an investment connected with money saving due to the reduction of operation costs of a single boiler was 4 years.

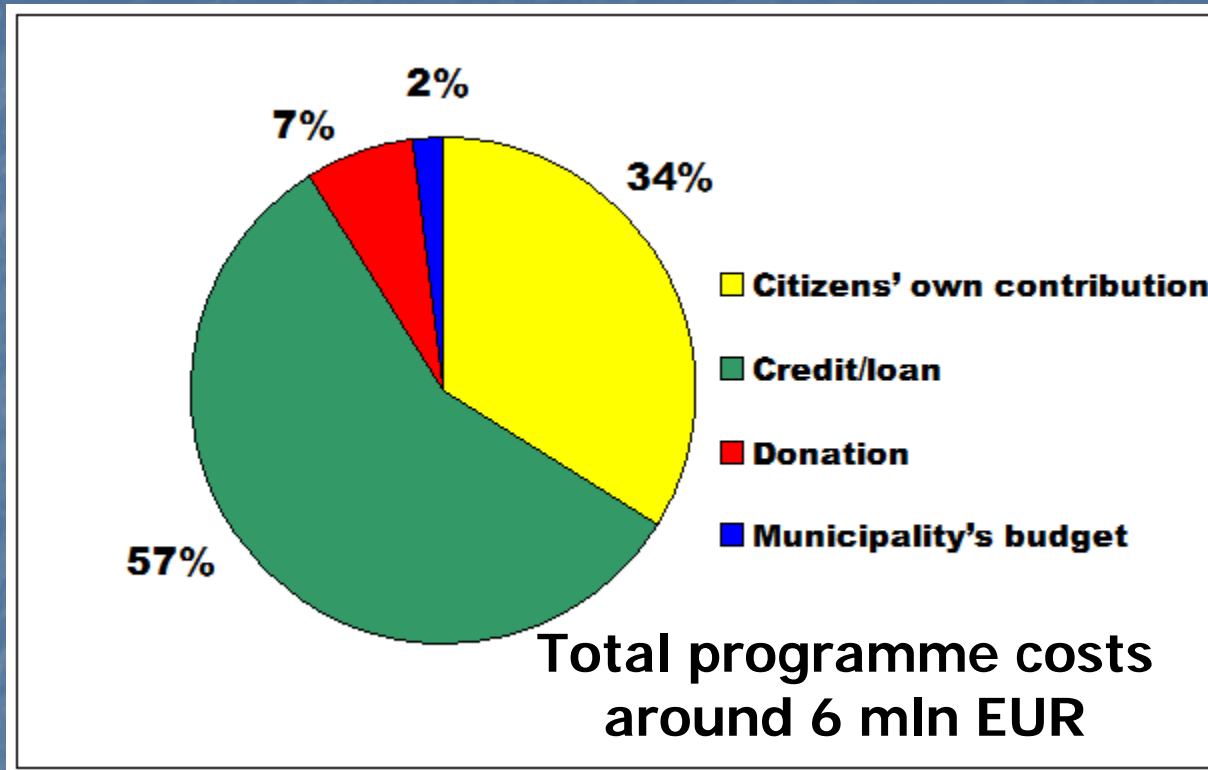
Scope

The technical work under the Programme included:

- technical and economic analysis of the solution selected by the house owner,
- financing options for the investment and facilitation of the necessary formal arrangements,
- assembly and start-up of new boilers and central heating installations,
- testing of the functioning of the complete installation,
- carrying out training on the servicing of the boilers.
- guarantee and post-guarantee service.



Share in the AERP funding



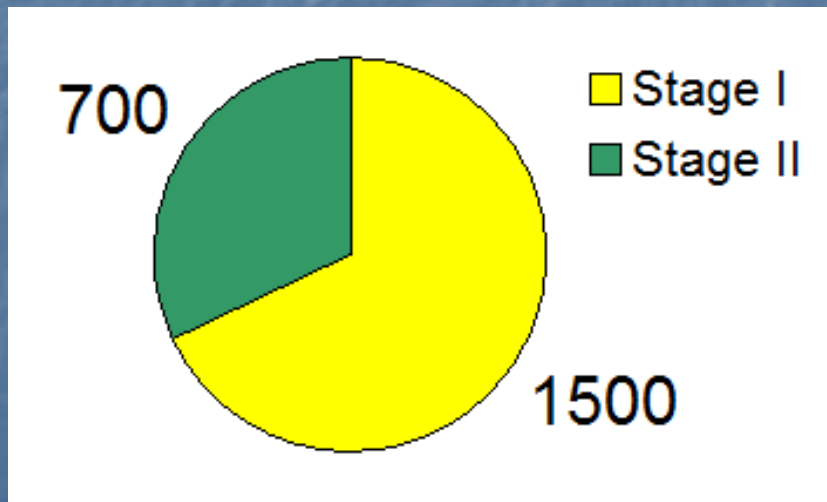
Credits/loans were repaid along with their interest rates from taxes and local fees in the period of 5 years.

General share in the overall Programme expenses:

- 2% - project development, investment supervision, operator services and information and promotion activities,
- 98% - modernization of heating installations

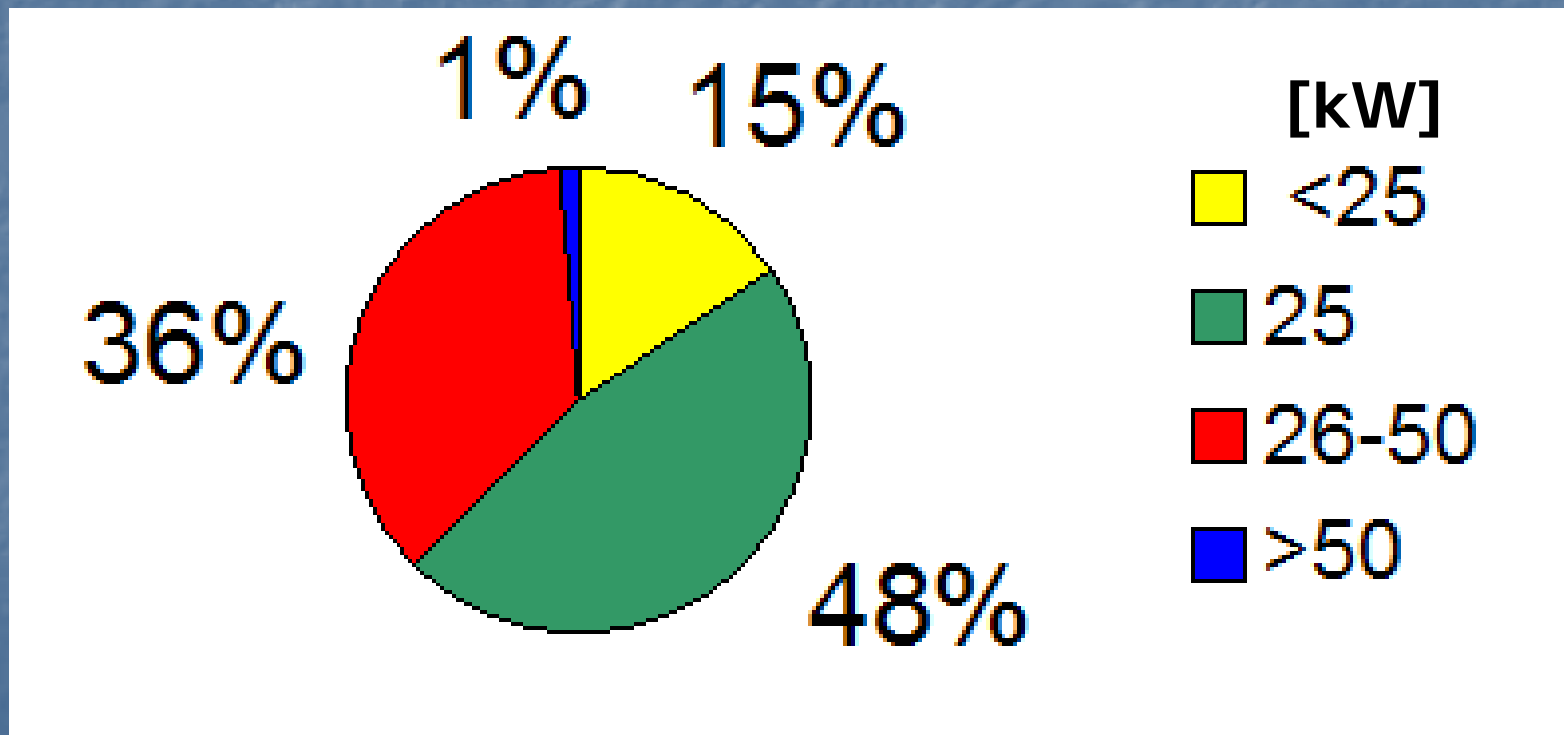
Effects

2200 old, low-efficient coal-fired furnaces and boilers were replaced with modern low-emission coal, gas or oil boilers. Number of boilers replaced in two stages are presented below.



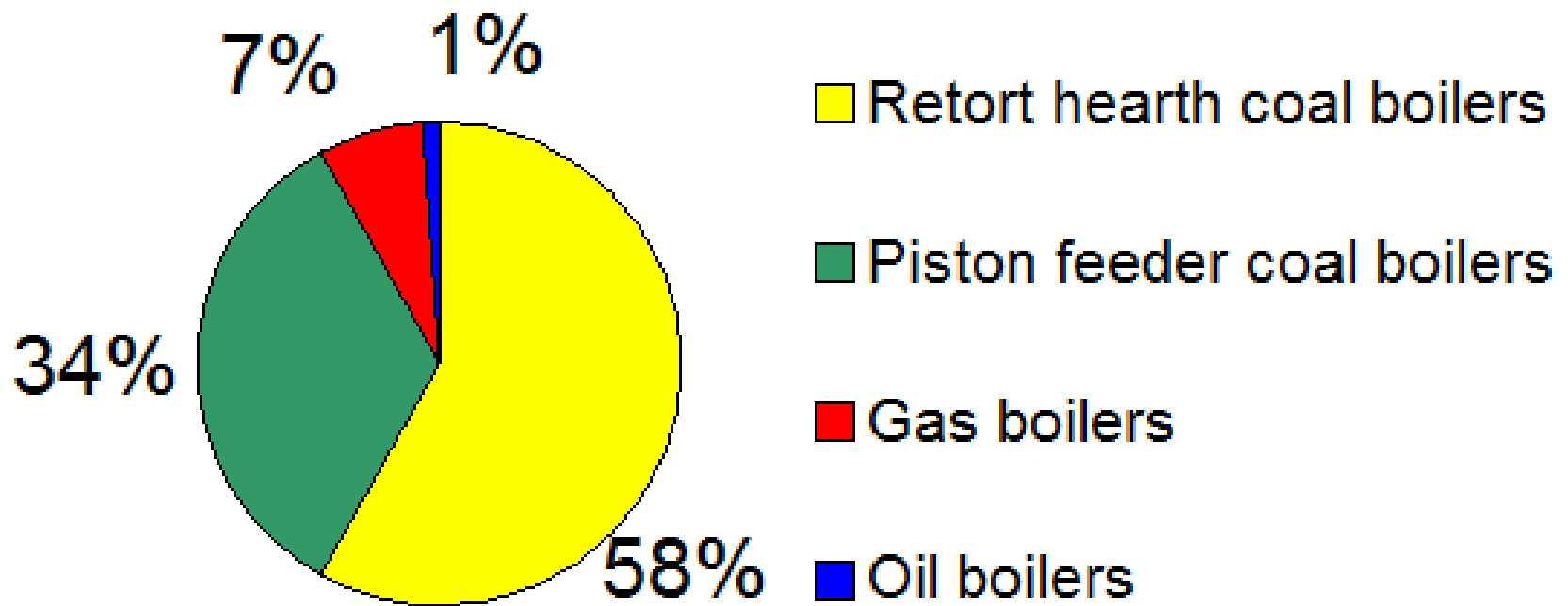
Effects

The number of replaced boilers depending on their heating capacity



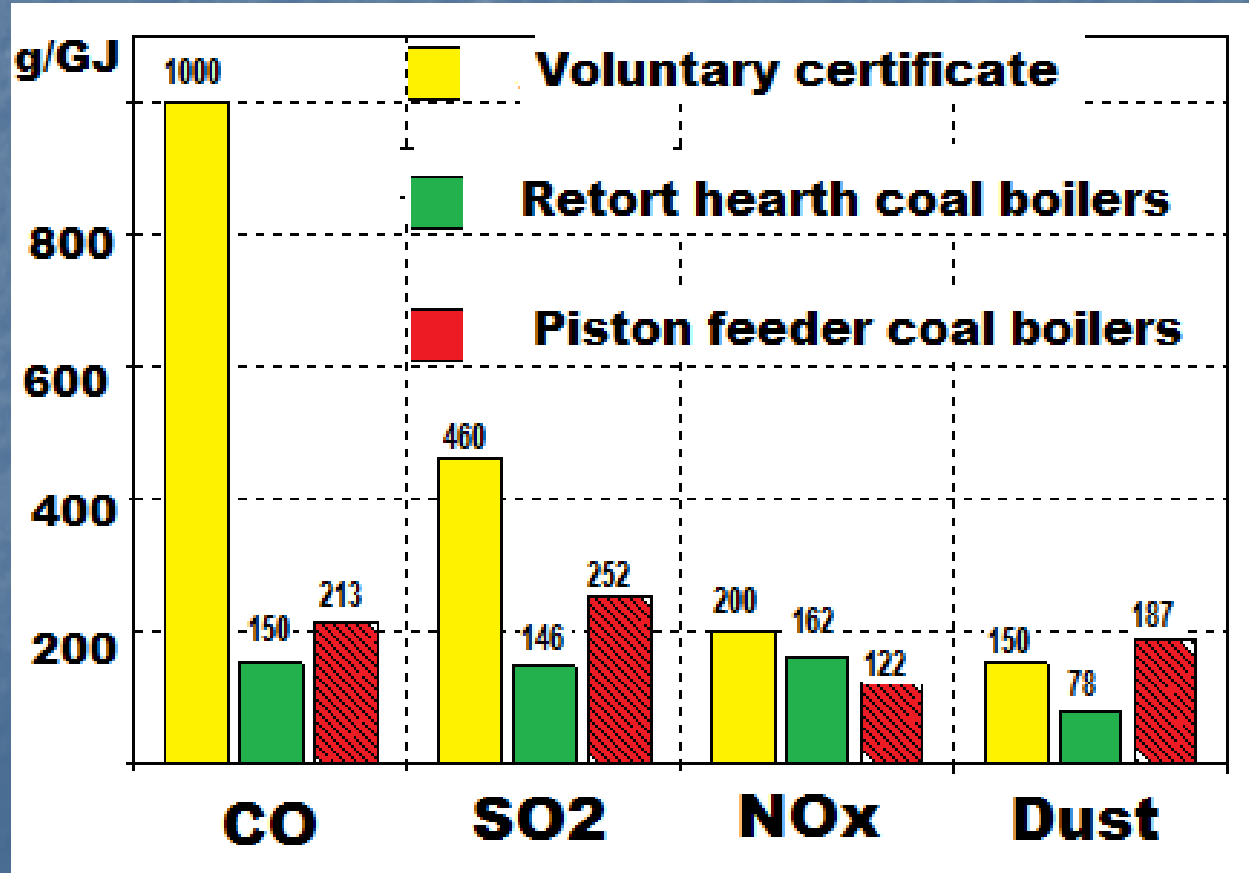
Effects

4 types of boilers from 22 companies were installed under the Programme



Effects

New boilers had lower emission levels reflected by lower emission factors compared to the old ones and met the requirements of a special voluntary certificate granted by the Institute for Chemical Processing of Coal in Zabrze



Effects

Emission factors for new boilers were calculated on the basis of measurements carried out for 200 new installed selected boilers fired with different fuels

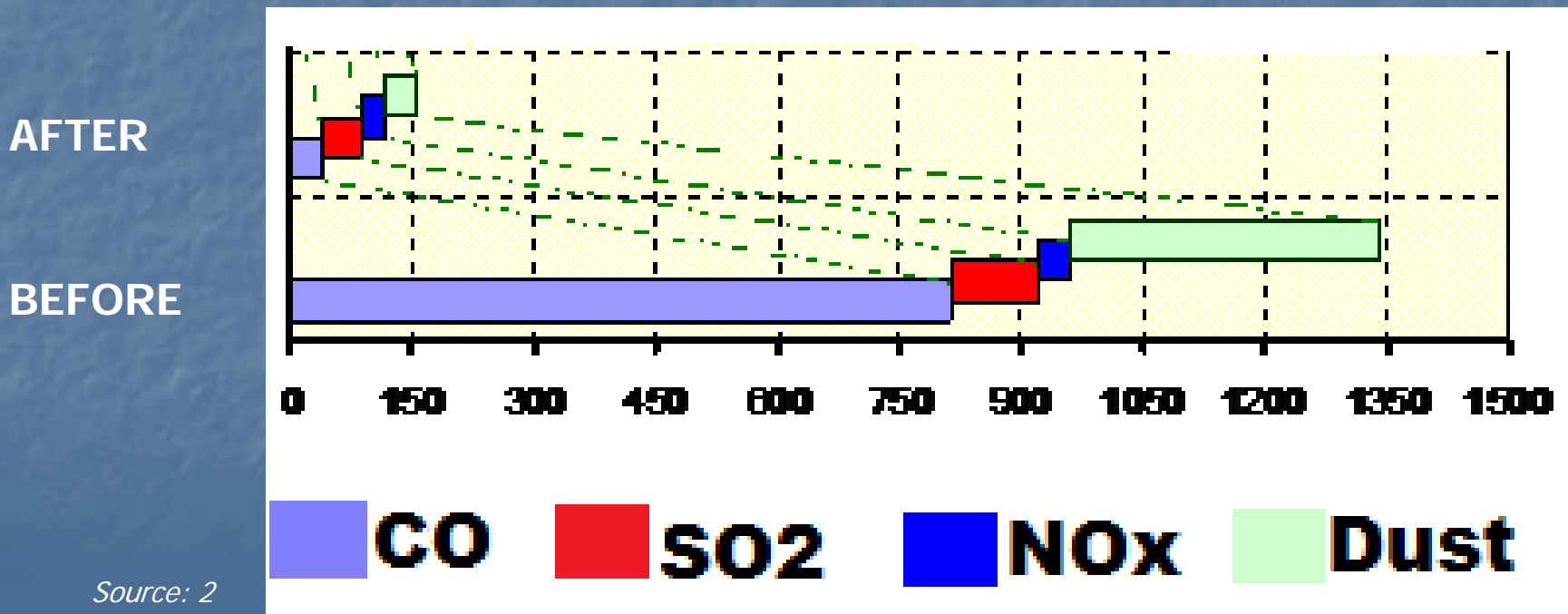
Parameters	Type of the boiler	Oil boilers	Gas boilers	Automatically fuelled coal boilers:	
				Retort hearth	Piston feeder
Heating capacity [kW]		25-30	25-30	15-30	20-35
Average fuel consumption [Mg/y]		2.1	2.2	5.9	7
Average caloric value [MJ/kg; MJ/m _n ³ for gas boilers]		42	35	26	23.7
CO emission factor [g/Mg]		0.3	0.2	5.8	9.0
Dust emission factor [g/Mg]		*	*	3.0	10.4
SO ₂ emission factor [g/Mg]		3.3	*	5.6	10.6
NO _x emission factor [g/Mg]		0.9	0.6	6.2	5.2

* below detection limit

Source: 2

Effects

Reduction of average annual summarised emissions of CO, dust, SO₂, NO_x for a single house covered by the Programme from around 1340 kg to 155 kg (by 88%)



Source: 2

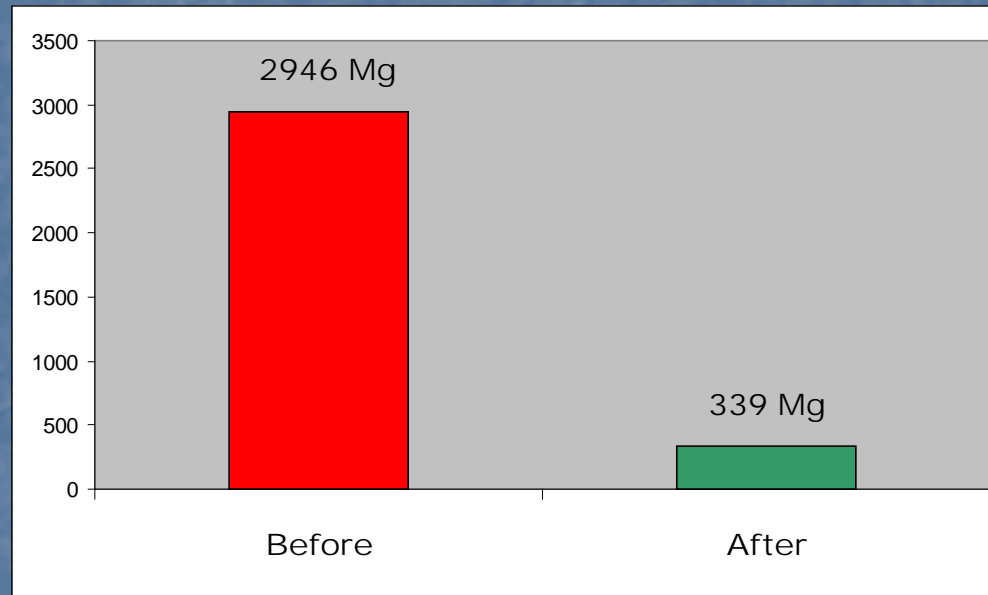
Effects

Emission reduction resulting
from the Programme implementation
(2200 boilers)

Pollutants	Emission [Mg/y]		Reduction [%]
	Before	After	
CO	1787	90	94.9
SO ₂	238	98	58.8
NOx	87	74	15.9
Dust	834	77	90.6
Total	2946	339	88.5

Effects

The total average sum of annual emissions of 4 pollutants from 2200 new boilers was reduced by around **89%**



Nitrogen dioxide concentrations (set for the protection of human health) are not exceeded in Tychy, which is confirmed by the measurement results from the Tolstoj Street Monitoring Station.

Effects

Additional Programme results

A. Improved quality of life of the citizens:

- increased safety and comfort of boiler maintenance,
- reduced potential for smog occurrence in the heating season,
- reduced negative impact of pollution on human health by lower emissions of pollutants and elimination of the possibility of firing waste in boilers.

B. Economic benefits:

- reduced house heating costs,
- significant reduction (by 54%) of exploitation costs (from almost 692 EUR to around 370 EUR),
- further development of local installation companies and increased employment rate.

Effects

Database on good practise
(experience exchange
platform for local authorities)

<http://www.dobrepraktyki.pl/>

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Many Polish cities used the experiences of Tychy in their own Air Emission Reduction Programmes. Air quality standards for boilers are becoming more stringent nowadays.

The European Standard EN 303-5:2012 for class 5 must be met by new boilers if they are to be covered by the reduction programmes (ELVs for dust: 40 mg/m³ and recommended for NOx : 400 mg/m³)

Effects

The Air eEmission Reduction Programme in Tychy targeted at individual household heating installations **is continued** as one of the tasks included in the Air Protection Programme for zones in the Uppersilesian Agglomeration which exceed PM10 air quality standard. It was adopted in 2010.

The rest of the old heating boilers in Tychy **will be replaced** by 2020 to improve the quality of air in the city.



Reference

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2. Kubica K., Kubica R., Zawiejska A., Szyrwińska I. Ocena efektów ekologicznych i społecznych programu obniżenia niskiej emisji zrealizowanego w Tychach w latach 2002-2004 w dzielnicach obrzeżnych miasta, Katowice 2005 (*Assessment of environmental and social effects of the emission reduction programme implemented in Tychy between 2002-2004 in the surrounding areas of the town*)
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4. Kubica K., Paradyz B., Dilara P. *Small combustion installations: Techniques, emissions and measures for emission reduction*. Scientific Reports of the IES, EU 2007, JRC42208, <http://publications.jrc.ec.europa.eu/repository/handle/JRC42208>
5. EN 303-5 Heating boilers. Part 5: Heating boilers for solid fuels, manually and automatically stoked, nominal heat output of up to 500 kW —Terminology, requirements, testing and marking (amended in 2012)