STUDY ON THE HEATING IN SKOPJE*

STUGRES - ANALYSIS OF POLICIES AND MEASURES

* City of Skopje and ten municipalities: Aerodrom, Butel, Gazi Baba, Gjorce Petrov, Karpos, Kisela VOda, Sraj, Centar, Cair and Suto Orizari

CLIMATE CHANGE vs LOCAL AIR QUALITY

CLIMATE CHANGE

Result of Greenhouse gas emissions:

$$CO_2 + CH_4 + N_2O = CO_2\text{-eq}$$

AIR QUALITY

Depends on local emissions of

$$PM_{2.5},\ PM_{10},\ CO,\ SO_x,\ NO_x$$

Although climate change and air pollution are caused by different gases, their source is usually the same. However, this is not always the case...

FIREWOOD is the main local air pollutant, especially in the generation of PM particles. However, as a renewable source of energy it reduces greenhouse gas emissions (CO_2 emissions from burning firewood are not taken into account because it is considered that trees absorb as much CO_2 as they produce over their lifetimes.)

ELECTRICITY – does not cause local pollution in Skopje, but it is the largest emitter of greenhouse gases, accounting for over 70% of total emissions. This is because most electricity in Macedonia is obtained from coal.

There are many reasons for the poor quality of air in Skopje, but the primary cause is HOUSEHOLD HEATING, which generates ...

90% of TOTAL AIR POLLUTION with PM_{10} PARTICLES.

POOR THERMAL INSULATION means that buildings and houses require MORE ENERGY for heating, while the use of inefficient stoves and boilers for household heating further CONTRIBUTES TO INCREASED local pollution.

INEFFICIENT USE OF ENERGY is one of the main reasons for INCREASING LEVELS of GHG emissions.

Addressing these causes, including social weaknesses, requires the development and implementation of short-term, medium-term and long-term policies and measures based on systematic analysis of reliable data

Although most residents of Skopje express great concern about local air pollution, especially during the winter months, only **1,5%** of households in the capital base their heating choices on the level of pollution caused by different heating devices.

THIS STUDY EXAMINES THE WAYS IN WHICH DIFFERENT MEASURES RELATED TO HOUSEHOLD HEATING AFFECT THE GREENHOUSE GAS EMISSIONS **(CO_2, CH_4, N_2O)**, LOCAL POLLUTION **($PM_{2,5}$, PM_{10}, CO, SOx, NOx)** AND AIR QUALITY IN THE CAPITAL.

SKOPJE IS SUFFOCATING

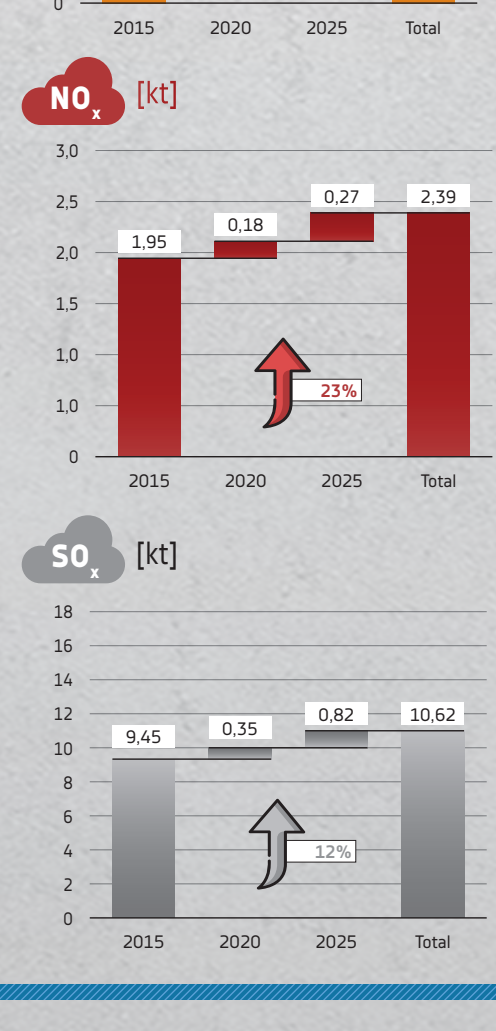
Analysis of existing data shows that unless major changes are made to address these problems – including the way we each use energy – then the city of Skopje can expect the following levels of GHG emissions and air pollution by the year 2025:

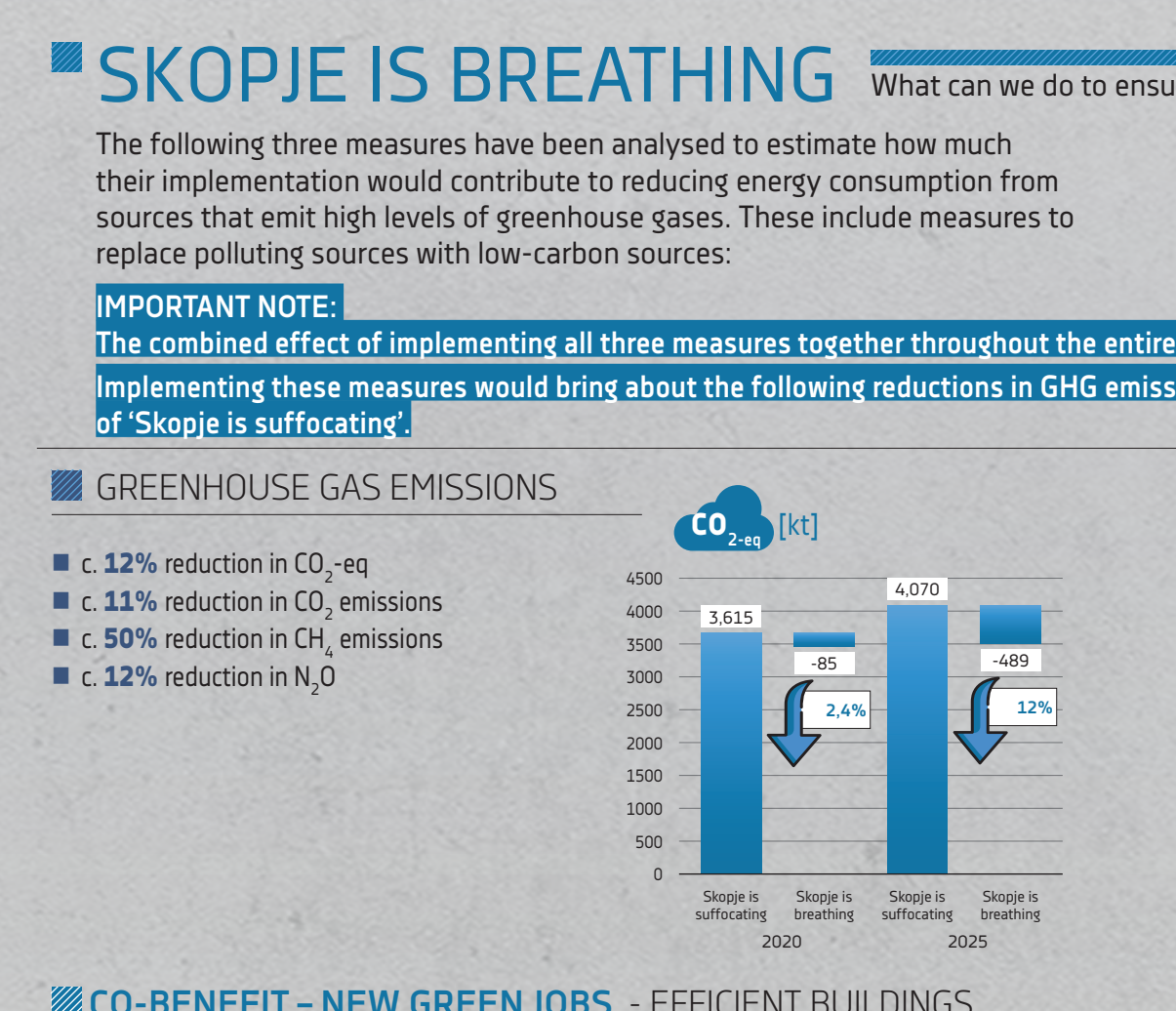
GREENHOUSE GAS EMISSIONS

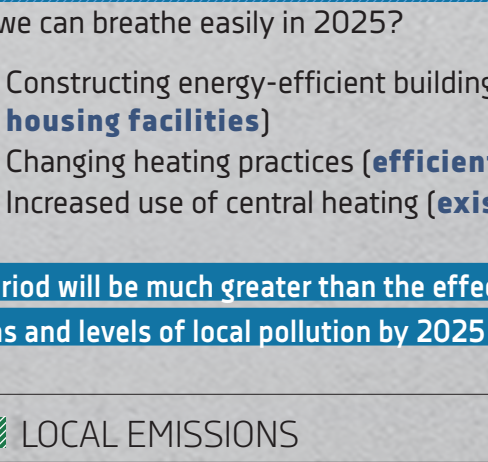
- A **23.3%** increase in 2025 (4,070 kt CO_2-eq) compared to 2015 (3,301 kt CO_2-eq)
- Dominant share of CO_2 in the total GHG emissions, with **96%** throughout the period 2015-2025
- **2.7%** share of CH_4 and **0.9%** of N_2O by 2025

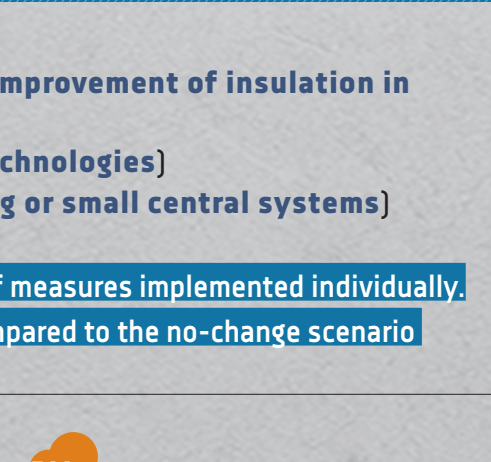
LOCAL EMISSIONS

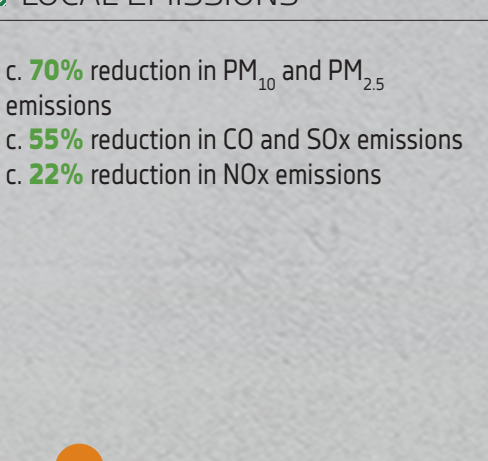
- continuous increase of local emissions
- a **30.5%** increase in PM_{10}, $PM_{2,5}$ and CO by 2025 compared to 2015
- a **23%** increase in NOx by 2025 compared to 2015
- a **12.4%** increase in SOx by 2025 compared to 2015

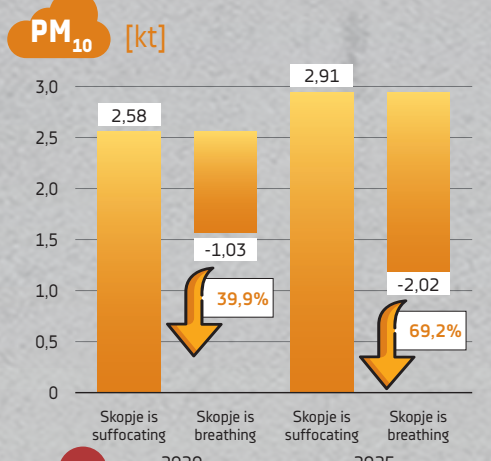












SKOPJE IS BREATHING

What can we do to ensure we can breathe easily in 2025?

The following three measures have been analysed to estimate how much their implementation would contribute to reducing energy consumption from sources that emit high levels of greenhouse gases. These include measures to replace polluting sources with low-carbon sources:

- Constructing energy-efficient buildings (**improvement of insulation in housing facilities**)
- Changing heating practices (**efficient technologies**)
- Increased use of central heating (**existing or small central systems**)

IMPORTANT NOTE:
The combined effect of implementing all three measures together throughout the entire period will be much greater than the effect of measures implemented individually.

Implementing these measures would bring about the following reductions in GHG emissions and levels of local pollution by 2025 compared to the no-change scenario of 'Skopje is suffocating'.

GREENHOUSE GAS EMISSIONS

- c. **12%** reduction in CO_2-eq
- c. **11%** reduction in CO_2 emissions
- c. **50%** reduction in CH_4 emissions
- c. **12%** reduction in N_2O

LOCAL EMISSIONS

- c. **70%** reduction in PM_{10} and $PM_{2.5}$ emissions
- c. **55%** reduction in CO and SOx emissions
- c. **22%** reduction in NOx emissions

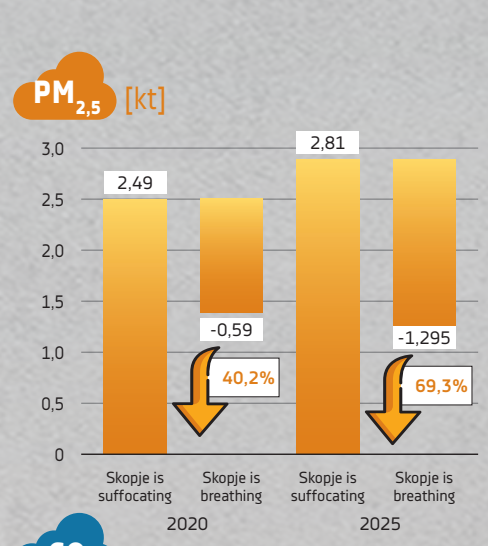
CO-BENEFIT – NEW GREEN JOBS - EFFICIENT BUILDINGS

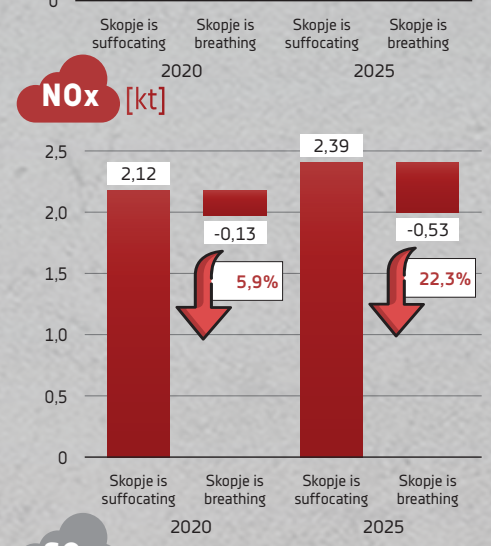
*Number of created jobs

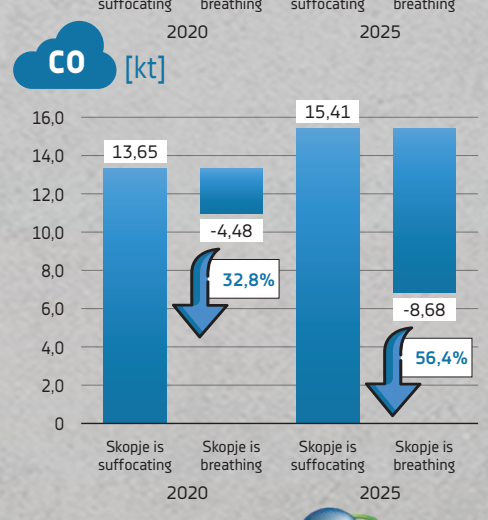
263 buildings retrofit

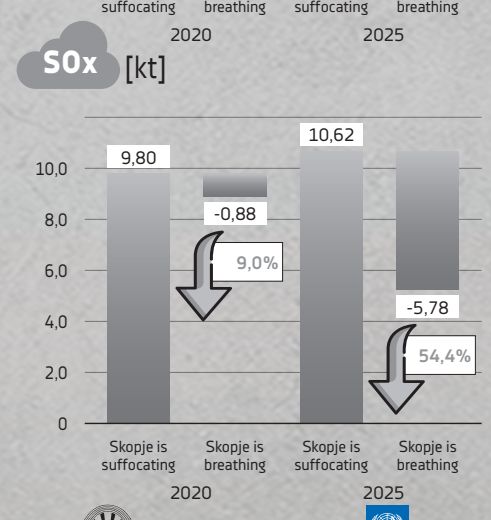
113 new buildings

315 passive buildings









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Министерство за животна средина и просторно планирање

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HOW CAN WE ACHIEVE THE TARGETS?

TO MEET THE TARGETS BY 2025 IT IS NECESSARY TO ENSURE THE FOLLOWING CONDITIONS:

IN URBAN AREAS

- **55,1%** of households will be covered by at least one of the measures
- **15,600** households will meet the strictest criteria for energy-efficient buildings
- **20,400** households will use more efficient stoves for fuel wood
- **7,280** households will use pellet-burning stoves
- **16,280** households will use heat pumps
- **2,700** households will use natural gas heaters
- **21%** more households will be using the central heating system in 2025 compared to 2015

IN RURAL AREAS

- **42%** of households will be covered by one or more of the measures
- **2,500** households will meet the strictest criteria for energy-efficient buildings
- **3,900** households will use more efficient stoves for fuel wood
- **850** households will use pellet-burning stoves
- **3,100** households will use heat pumps
- **260** households will use natural gas heaters

FUNDS NEEDED

356 mil. € will be needed for the IMPLEMENTATION of this SCENARIO in the period 2017–2025.

- **307 mil. €** for energy efficient buildings
- **42,7 mil. €** for changing heating practices
- **6,3 mil. €** to ensure increased acceptance of central heating

A further **212 mil. €** will be needed for the construction of new cogeneration power plants.

COMPARISON:

These investments are expected to come not only from institutions but also from the private sector and the citizens themselves.

THESE INVESTMENTS ARE EXPECTED TO COME NOT ONLY FROM INSTITUTIONS BUT ALSO FROM THE PRIVATE SECTOR AND THE CITIZENS THEMSELVES.

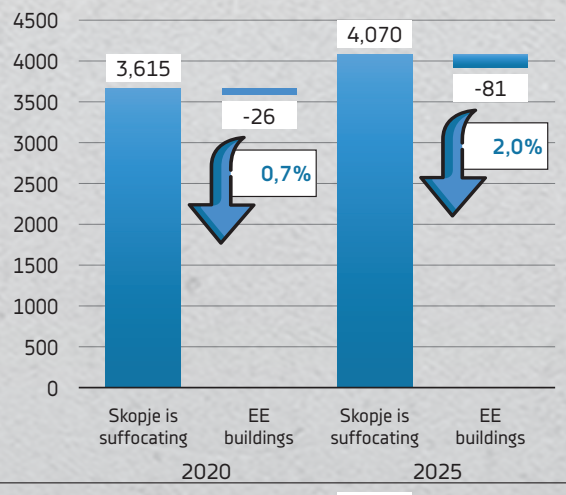
SMART CHOICES MAKE BIG DIFFERENCES!

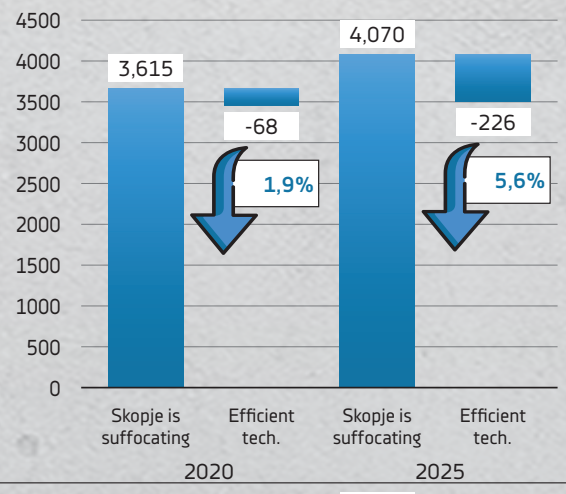
COMPARISON OF THE 3 MEASURES...

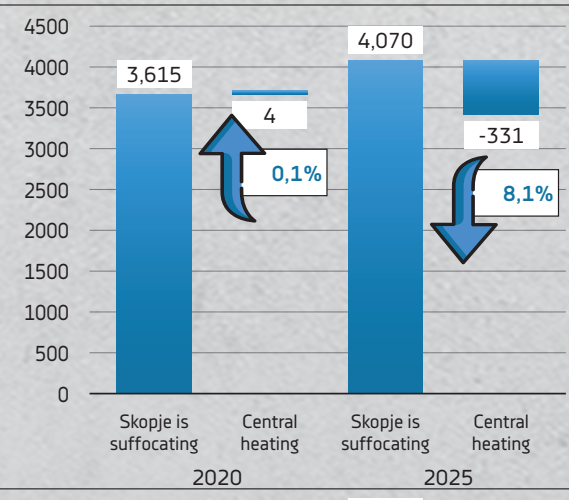
	CONSTRUCTION OF ENERGY-EFFICIENT BUILDINGS	CHANGING HEATING PRACTICES using more efficient technologies and changing the energy sources used for heating	INCREASED ACCEPTANCE OF CENTRAL HEATING
2015	**50%** of residential buildings do not have insulation at all; **42%** have insulation below the level prescribed.	**44.7%** of households use low-efficiency fuelwood stoves. Only **1.6%** of households use pellets or briquettes in stoves, compared to **39.3%** that use firewood. Of the **33.6%** of households that use electricity for heating, only **5.7%** use heat pumps.	**42.5%** of owners of residential facilities would opt for central heating even if the price for central heating were slightly higher. **62%** of households in rural areas would like to join the central heating system.
2025	**15,600** buildings and c. **12%** of the total number of buildings in urban areas would meet the strictest energy-efficiency requirements. Approximately **2,500** buildings in rural areas (c. **9.8%** of the total number) would be energy-efficient.	**42%** of households in urban areas would change their heating practices: **22,600** households would use more efficient stoves for fuel wood **10,000** households would use pellet stoves **17,400** households would use heat pumps **3,000** households would use natural gas heaters **35.6%** of households in rural areas would change their heating practices: **4,400** households would use more efficient stoves for fuel wood **930** households would use pellet stoves **3,450** households would use heat pumps **290** households would use natural gas heaters	c. **30%** more households would use the central heating system network capacity would increase to 850 MW increased use of existing cogeneration plants a small cogeneration power plant (40 MW) would be built in 2021 a large cogeneration power plant of 210 MW would be built in 2025

* It is important to underline that here we are not talking about new households that will use specific technology. For example, when we say that a specific number would use more efficient fuel wood stoves, this does not mean that besides the existing firewood stoves in 2025 there will be additional 22,600 households, but that out of the total number of households which in 2025 will use fuel wood, 22,600 will use efficient fuel wood stoves.

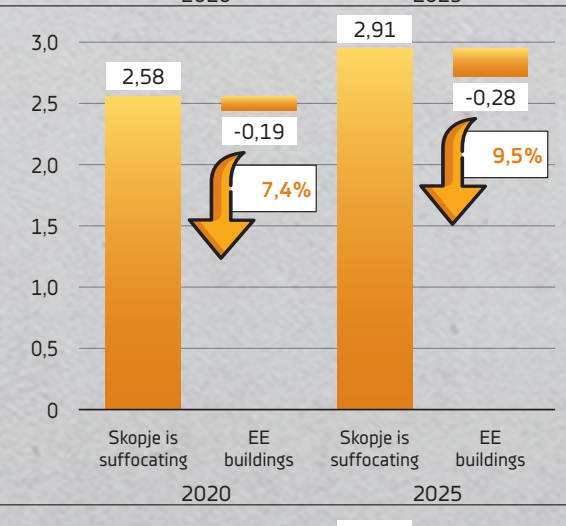
$CO_{12\text{-eq}}$ [kt]

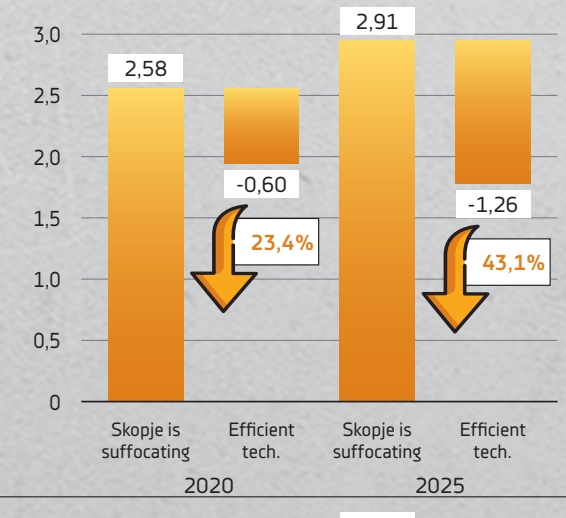


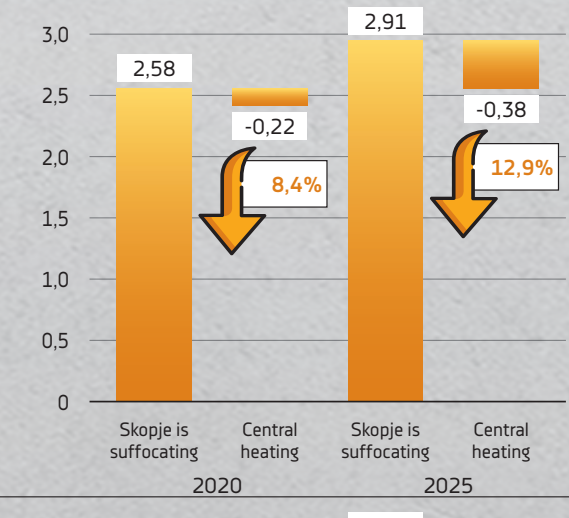




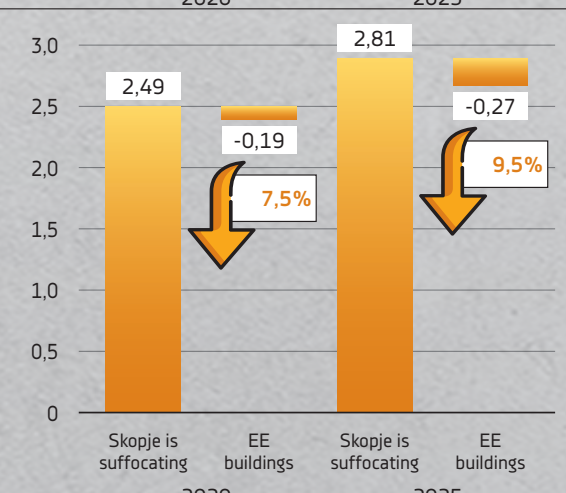
PM_{10} [kt]

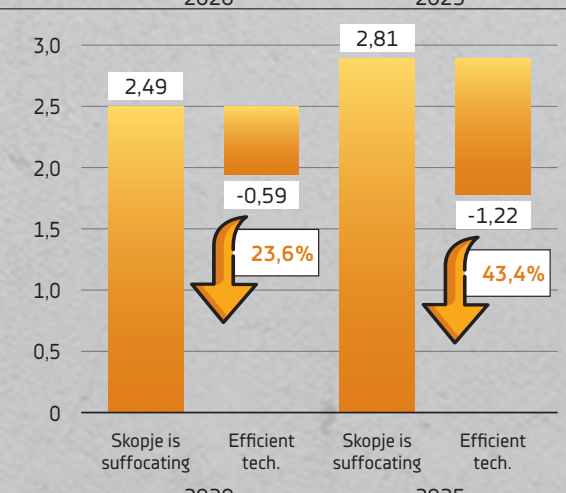


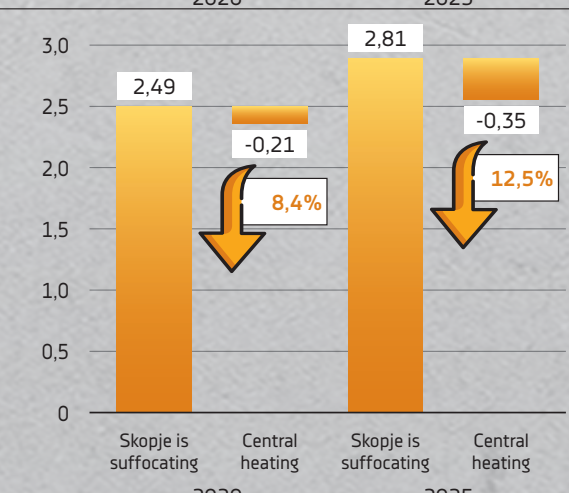




$PM_{2,5}$ [kt]







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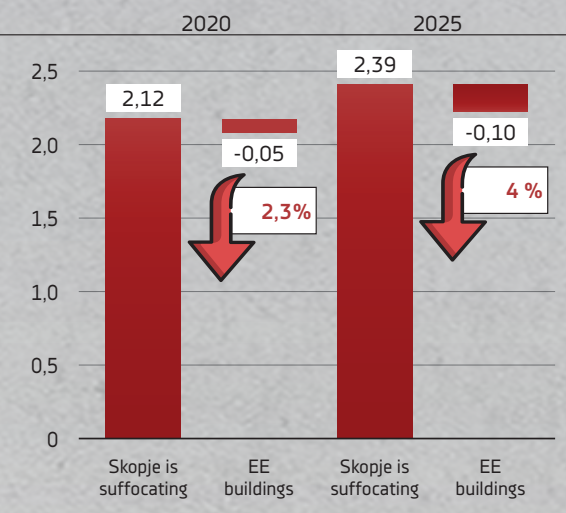

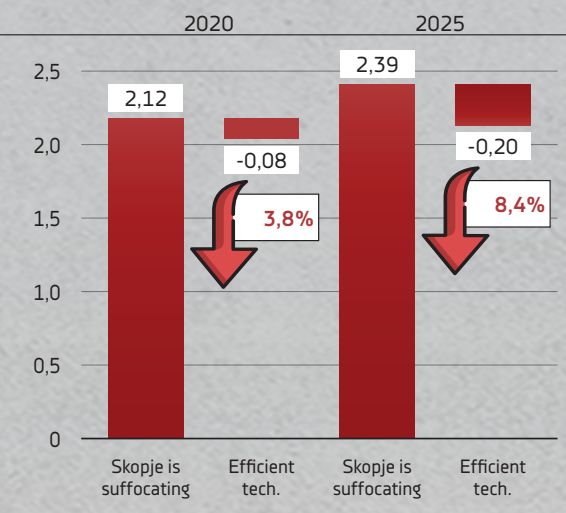

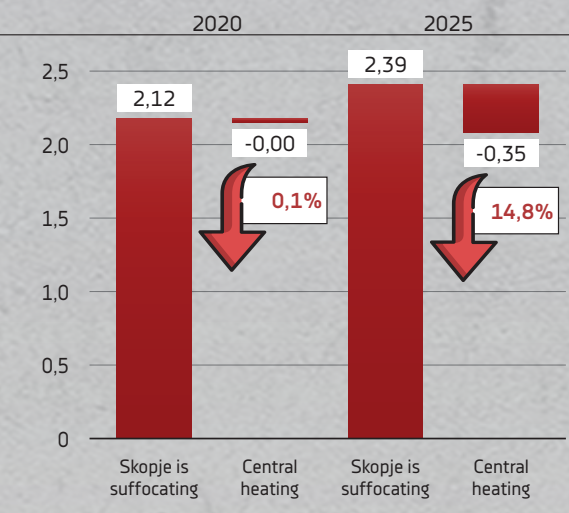

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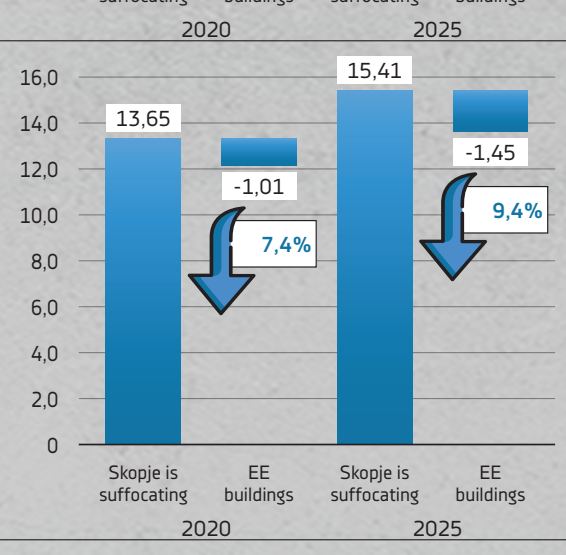

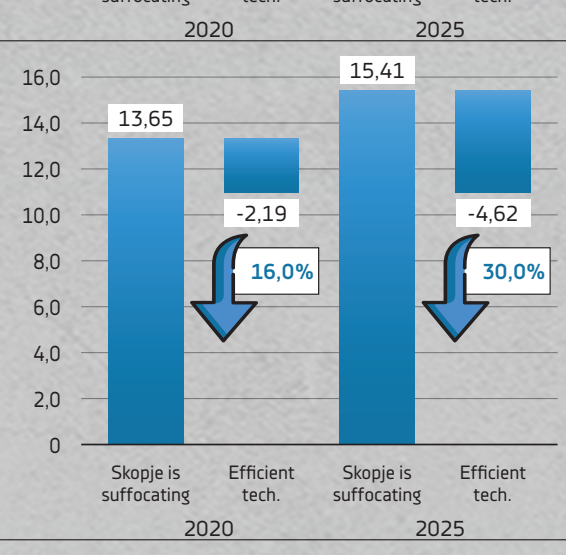

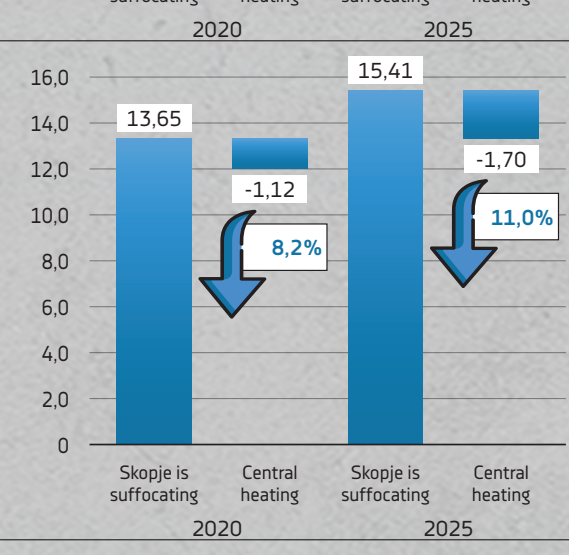
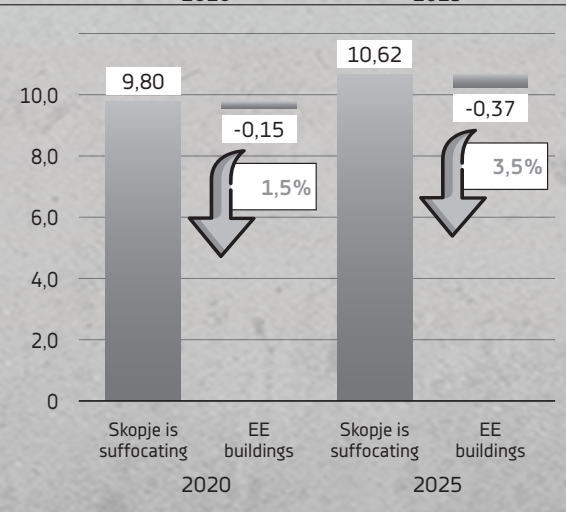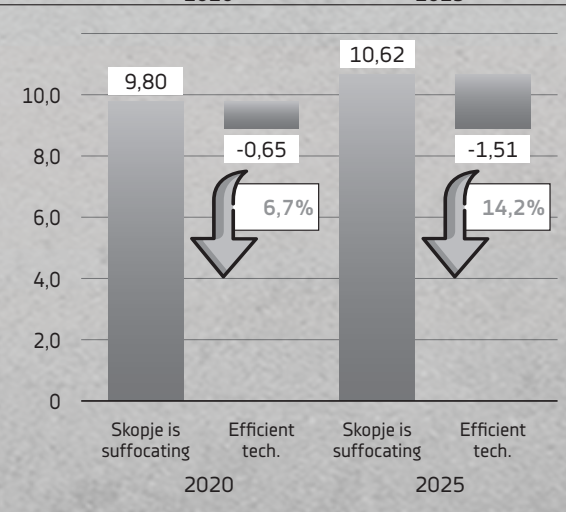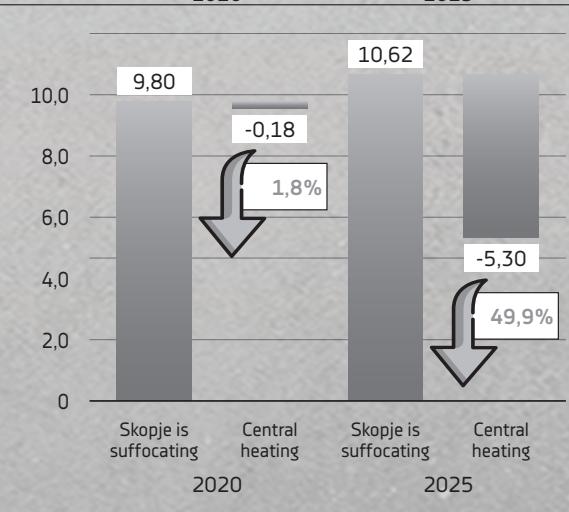
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