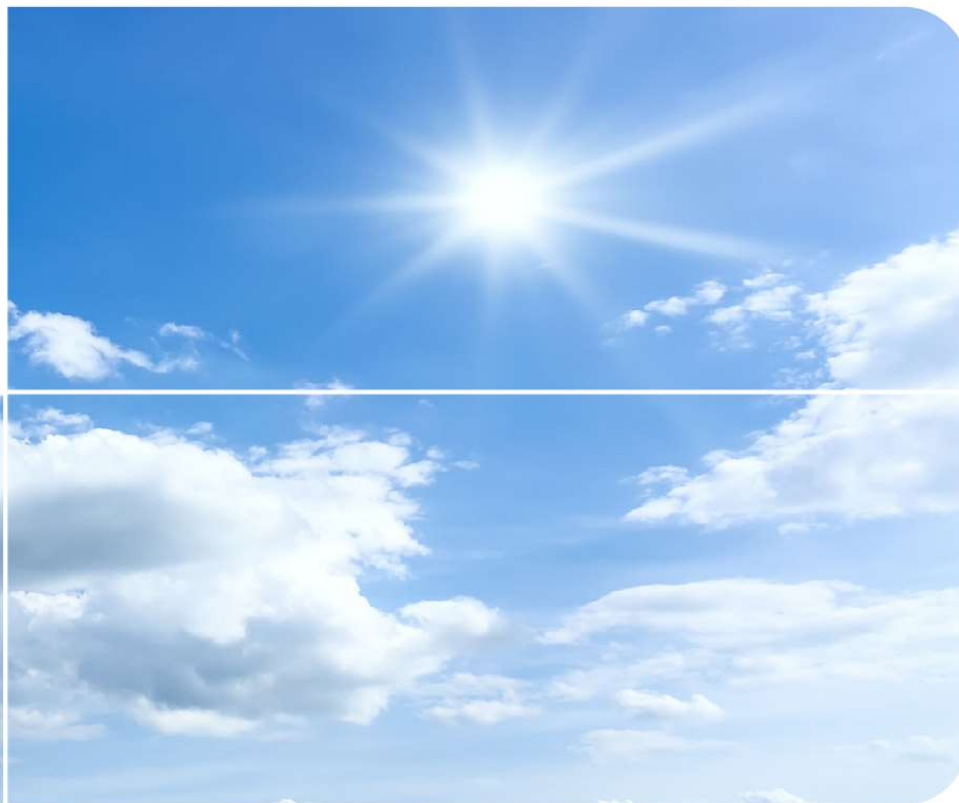


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ЗА ТЕБЕ**

Investments for implementation of measures needed to improve air quality by 2030 (all three mitigation scenarios) and their cost efficiencies

**Public event for the preparation of the draft Programme of Air protection
of the Republic of Serbia with Action plan**

Nadine Allemand, deputy director of CITEPA, EAS3 Senior non-key expert

10 September 2021

Outline

- What economic data determined for the different scenarios?
- Investments required for the different scenarios
- Ratio Cost / Effectiveness
- National budgets to support the implementation of measures

Outline

- What economic data determined for the different measures?

Cost data available for each measure

Investments:

- Investments to be made to reduce emissions in the different sectors: industry, residential and tertiary sectors, transports, agriculture and other sources...
 - Best available techniques in industry, in combustion plants,
 - Use of eco-designed appliances,
 - Import of newer second-hand vehicles (to avoid imports of old second-hand vehicles),
 - Best practices in agriculture
 - ...
- Available for the period 2022-2030, expressed in Millions Euros

Cost data available for each measure

Investments:

- Information on the organisation paying: investors, consumers, state
 - Different according the measures.
 - Most often investors for activities such as industry, combustion plants, distribution of petrol...
 - Consumers for measures related to the import of newer second-hand vehicles and replacement of old domestic heating appliances
- Information on the source of finance:
 - Private: may be 100 % or less in case of State financial support to increase the rate of application of measures
 - EU or other funds: in case of additional studies to be carried out to finalise the implementation of measures which can be supported by EU funds such as twinning, IPA... or other donors
 - National budgets: to ensure the correct implementation of the measures (additional staff in ministries...) and to financially support some measures

Cost data available for each measure

Annual costs, expressed in €/year:

Annual cost of a measure, a reduction technique: [A] $C_t \left[\frac{\text{€}}{\text{year}} \right] = C_a \left[\frac{\text{€}}{\text{year}} \right] + C_o \left[\frac{\text{€}}{\text{year}} \right]$

$$[B] \quad C_a \left[\frac{\text{€}}{\text{year}} \right] = I [\text{€}] \cdot \frac{(1+p)^n}{(1+p)^n - 1} \cdot p$$

Annualised investment, for an equipment ready to work, a measure:

I [€] Investment in €

n: annualisation period, corresponding to the lifetime of the equipment

P: annualisation rate (4% in this study, consistent with international practices (GAINS))

$$[C] \quad C_o \left[\frac{\text{€}}{\text{year}} \right]$$

Annual operating costs, constituted of fixed operating costs (maintenance, insurance...) and variable operating costs (reagents, electricity, waste disposal...)

Cost data available for each measure

Cost effectiveness ratio:

Cost for a tonne of pollutant abated or ratio cost effectiveness

$$R_{\text{eff}} (\text{€/t poll abated}) = C_t (\text{€/year}) / M_{\text{poll}} (\text{t/year})$$

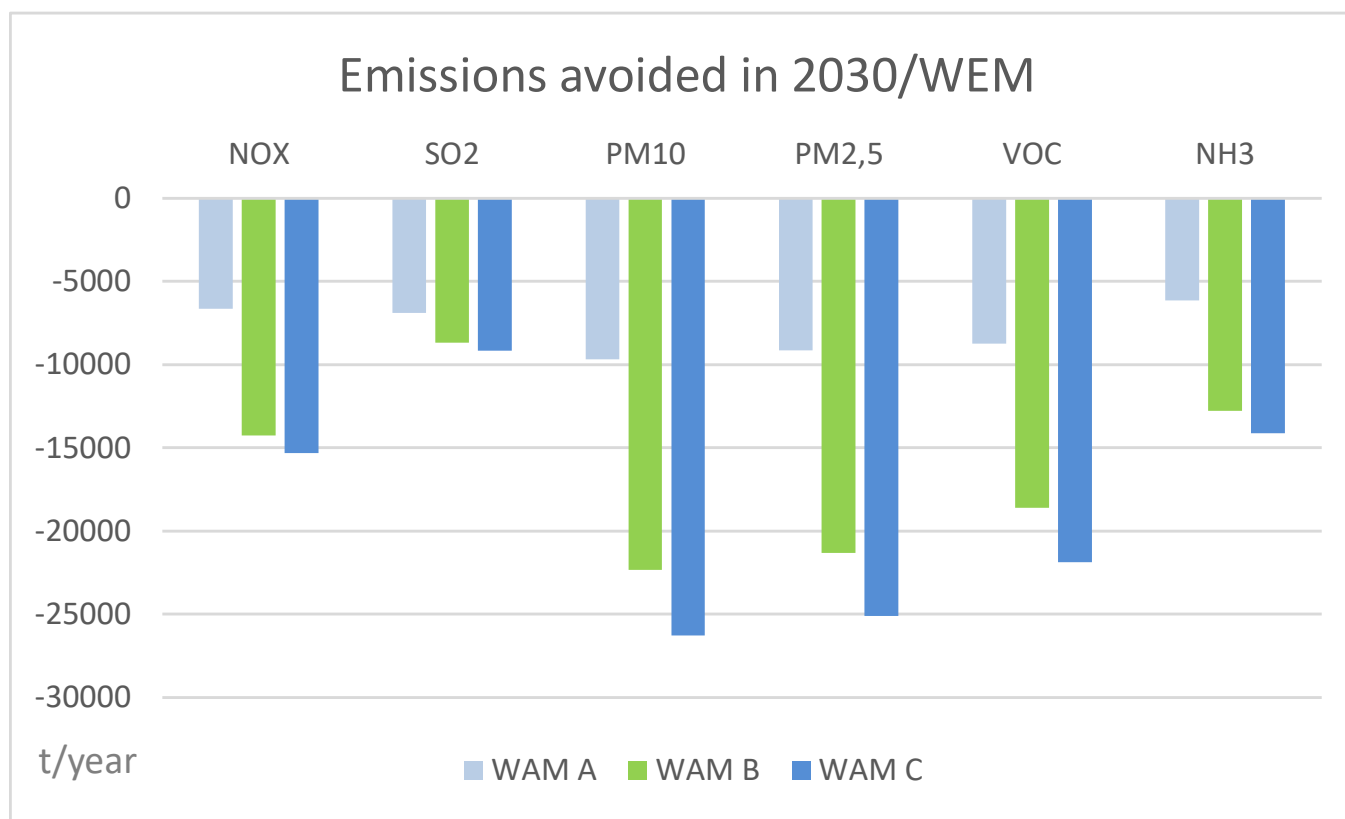
$M_{\text{poll}} (\text{t/year})$: mass of pollutant abated per year

In case of measures abating several pollutants simultaneously (such as a scrubber (SO₂, PM), a new eco design domestic heating appliance (PM, VOC)), the costs are expressed to the main pollutant the measure is focussed (based on international practices, GAINS)

Outline

- Investments required for the different scenarios

Emissions avoided in 2030 in the different scenarios/WEM



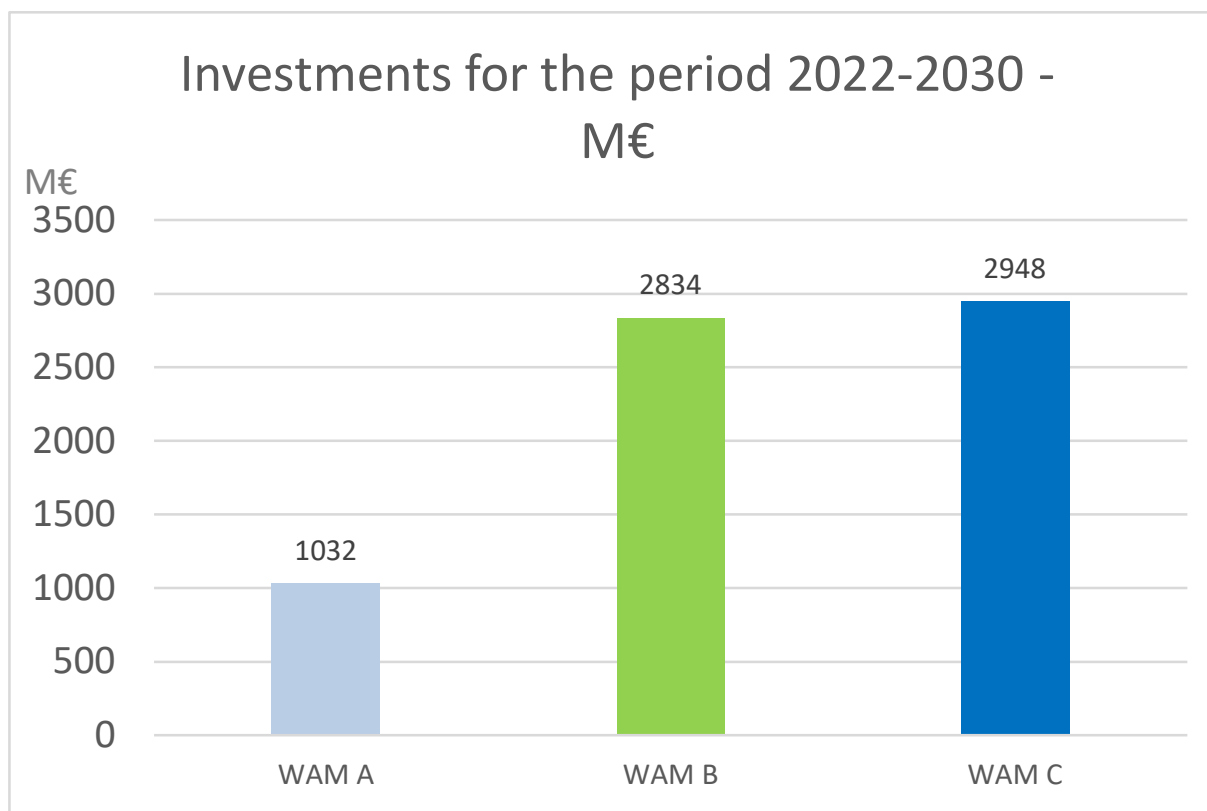
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Investments for the different scenarios



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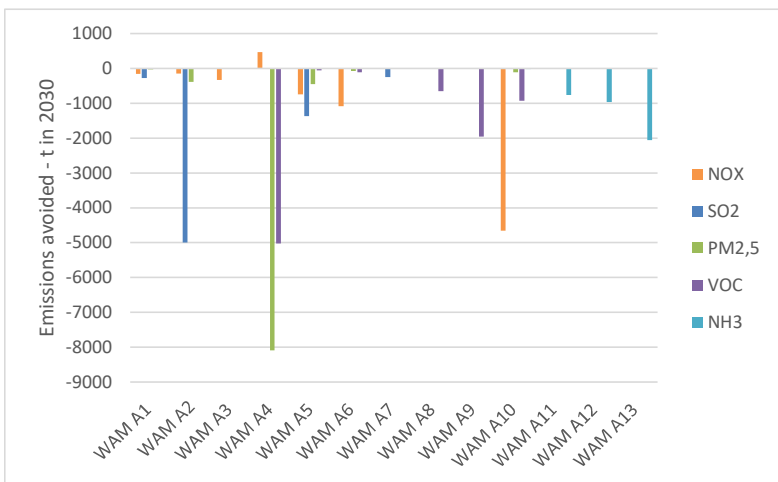


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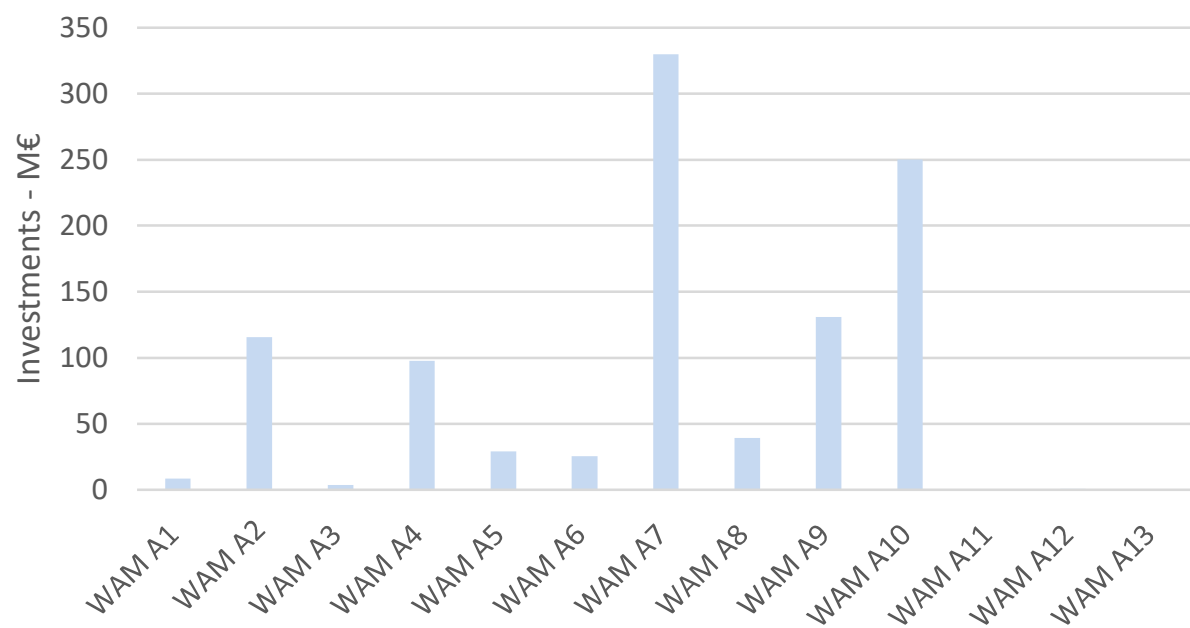
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Investments in the WAM A per measure

Emissions avoided in 2030/WEM



Investments per measure (M€)



WAM A1 - IED LCP upper level of BAT AELS

WAM A2 - MCP

WAM A3 - SCP

WAM A4 - Domestic appliances replacement without financial incentives

WAM A5 - IED industry upper level of BAT AELS

WAM A6 - Regulation (EU) 2016/1628 for Non Road Mobile Machinery

WAM A7 - Sulphur reduction

WAM A8 - Stage I and II for petrol distribution

WAM A9 - IED for activities using solvents (ch II and V)

WAM A10 - Ban of import of second hand vehicles

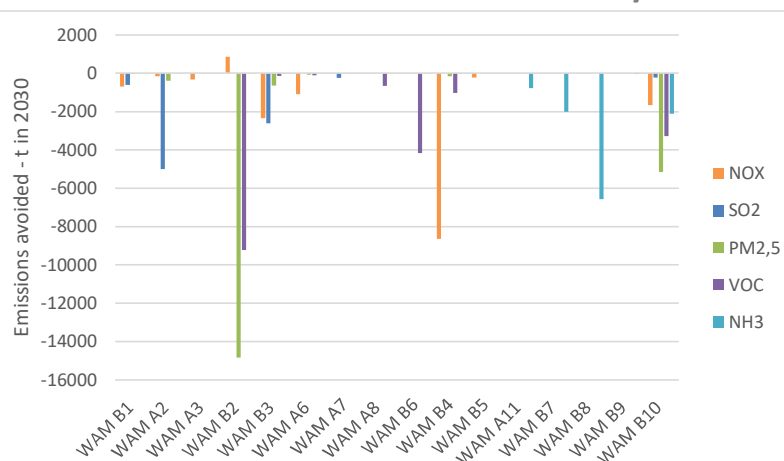
WAM A11 - Best practices for manure management

WAM A12 - Best practices for slurry management

WAM A13 - Rapid incorporation of Urea

Investments in the WAM B per measure

Emissions avoided in 2030/WEM



WAM B1 - IED LCP average level of BAT AELS

WAM A2 - MCP

WAM A3 - SCP

WAM B2 - domestic appliances - financial incentives for replacement

WAM B3 - IED industry average level of BAT AELS

WAM A6 - Regulation (EU) 2016/1628 for Non Road Mobile Machinery

WAM A7 - Sulphur reduction

WAM A8 - Stage I and II for petrol distribution

WAM B6 - IED for activities using solvents (ch II and V)

WAM B4 - Ban of imports of second vehicles

WAM B5 - Scrapping scheme of old vehicles from 2024 to 2026

WAM A11 - Best practices for manure management

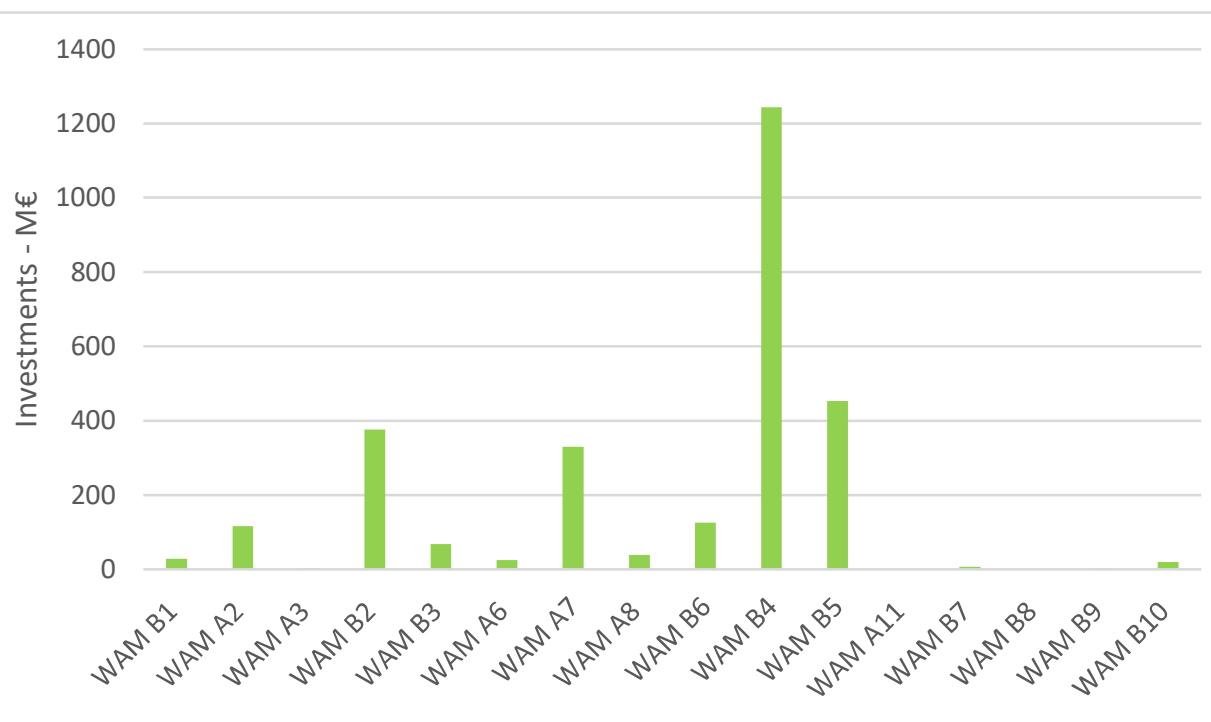
WAM B7 - Best practices for slurry management

WAM B8 - Substitution of urea

WAM B9 - Best practices for slurry storages

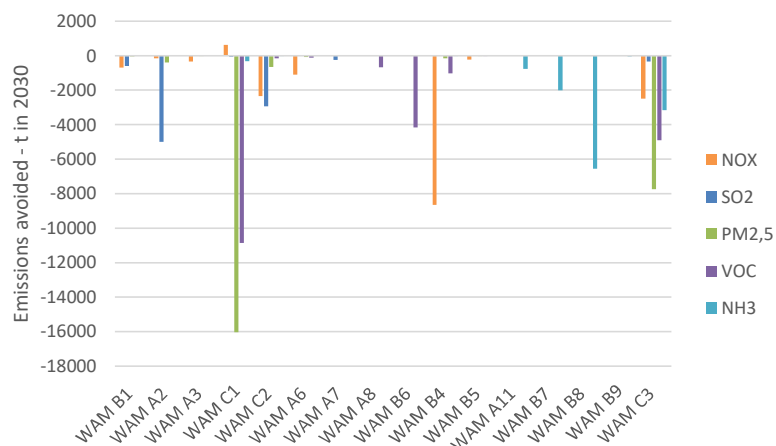
WAM B10 - Ban agriculture waste burning in 2035

Investments per measure (M€)

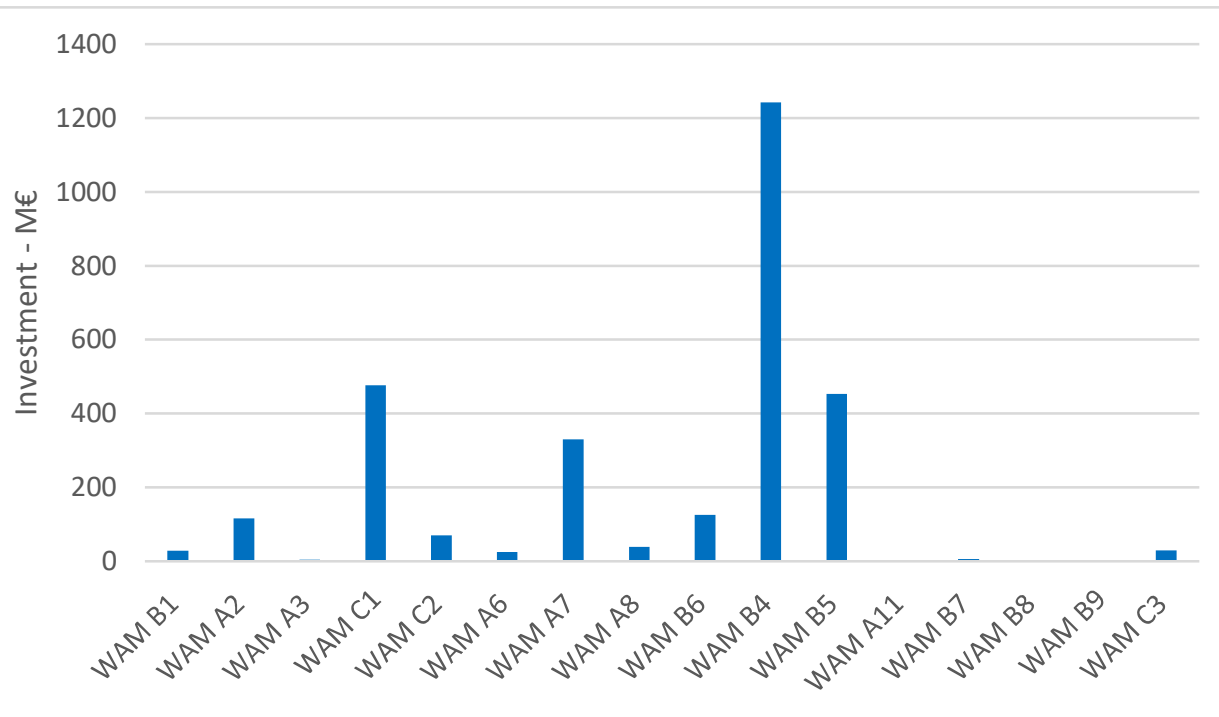


Investments in the WAM C per measure

Emissions avoided in 2030/WEM



Investments per measure (M€)



WAM B1 - IED LCP average level of BAT AELS

WAM A2 - MCP

WAM A3 - SCP

WAM C1 - Domestic appliances: higher replacement rates in 5 cities

WAM C2 - IED industry average level of BAT AELS + stricter limits in Bor

WAM A6 - Regulation (EU) 2016/1628 for Non Road Mobile Machinery

WAM A7 - Sulphur reduction

WAM A8 - Stage I and II for petrol distribution

WAM B6 - IED for activities using solvents (ch II and V)

WAM B4 - Ban of imports of second vehicles

WAM B5 - Scrapping scheme of old vehicles from 2024 to 2026

WAM A11 - Best practices for manure management

WAM B7 - Best practices for slurry management

WAM B8 - Substitution of urea

WAM B9 - Best practices for slurry storages

WAM C3 - Ban of agriculture waste burning in 2030

Outline

- Ratio Cost - Effectiveness

Range of cost effectiveness ratio observed

Range of cost effectiveness ratios in the different scenarios:

€/t pollutant	WAM A	WAM B	WAM C
Measures focussing NOx	0.8 to 4.0	0.8 to 33.4	
Measures focussing SO2	0.2 to 1.1	0.2 to 1.3	
Measures focussing PM	0.1 to 7.8		
Measures focussing VOC	1.7 to 9.4		
Measures focussing NH3	0 to 3.1		

Example: measures on old domestic heating appliances with solid fuels

- Domestic heating appliances using solid fuels : largest source of emissions of PM10 and PM2.5 in Serbia in 2015 and still in 2030 according to the WEM scenario
- Enforcement of EU Eco-design Directive and its regulations 2015/1185 and 2015/1189 for solid fuel stoves and boilers considered in the three scenarios from 2024:
 - In WAM A: natural replacement of appliances (30% replaced in 2030)
 - In WAM B: faster replacement of appliances allowed by financial incentives (55% replaced in 2030)
 - In WAM C: additional efforts for 5 cities to reduce their air quality remaining problems, with financial incentives
 - Kragujevac : 58%
 - with eco-labelled appliances with high proportion of pellet appliances 25%
 - Beograd: 58 %
 - with only pellet appliances
 - Valjevo, Nis: 74%
 - with 50% pellet appliances and 50% heat pumps
 - Uzice: 80%
 - with 15% pellet appliances and 85% heat pumps

Example: measures on old domestic heating appliances with solid fuels

- Evolution of costs in 2030:

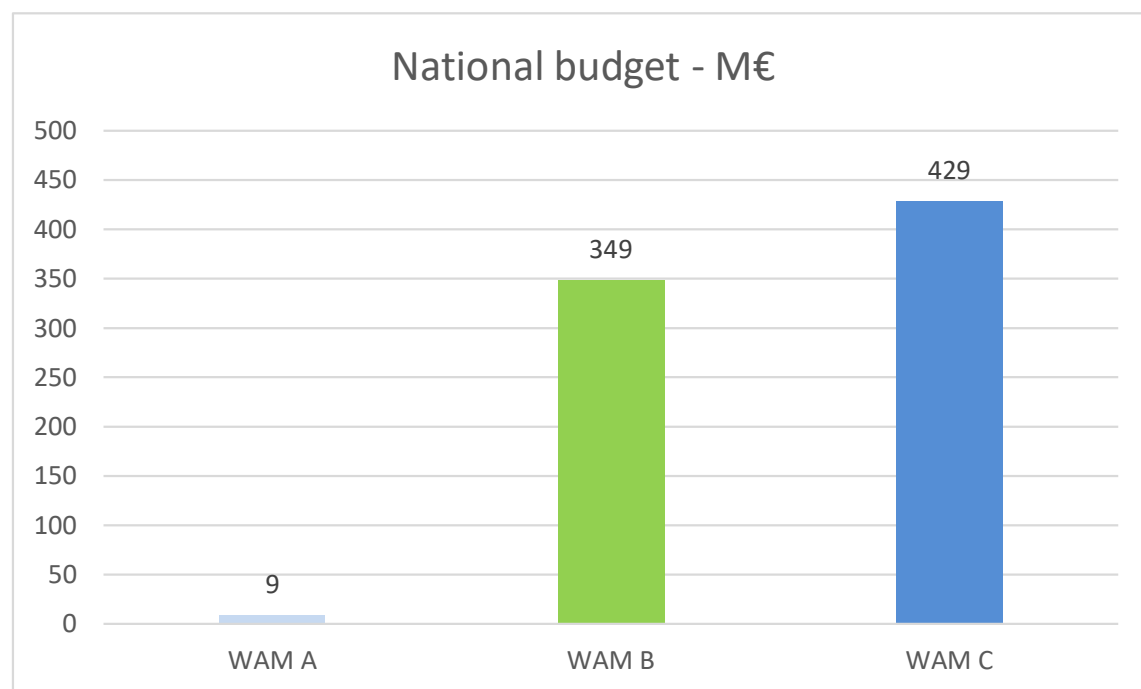
In 2030	WAM A	WAM B	WAM C
Emissions PM2.5 avoided - t	8090	14830	16050
Investments – M€	97.6	376.3	476.9
Annual total costs in 2030 M€/year	0.4	16.8	33.9
Cost effectiveness ratio €/kg PM2.5 avoided	0.05	1.1	2.1

- In the WAM A: only additional costs for Eco design appliances are considered
- In the WAM B and C: the total costs are considered as appliances are replaced before their end of life

Outline

- National budgets to support the implementation of measures

National budgets to support the implementation of measures



In WAM B:

- 179 M€ to financially support the replacement of old domestic appliances from 2024 to 2030
- 159 M€ to financially support the scrapping of around 140 000 oldest vehicles from 2024 to 2026

In WAM C:

- 258 M€ to financially support the replacement of old domestic appliances from 2024 to 2030
- 159 M€ to financially support the scrapping of around 140 000 oldest vehicles from 2024 to 2026

Other costs are due to budgets for additional studies but mainly additional staff in different institutions to ensure full implementation of measures

Conclusions

- A set of cost data determined for each scenario and each measure
- Used for the cost benefit analysis and the multi criteria analysis
- Will be essential for the elaboration of the draft Programme of Air protection of the Republic of Serbia with Action plan

Questions ?

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Thank you for your attention!

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