A brief study on IAQ in Pljevlja's households heated with different fuels and health impacts

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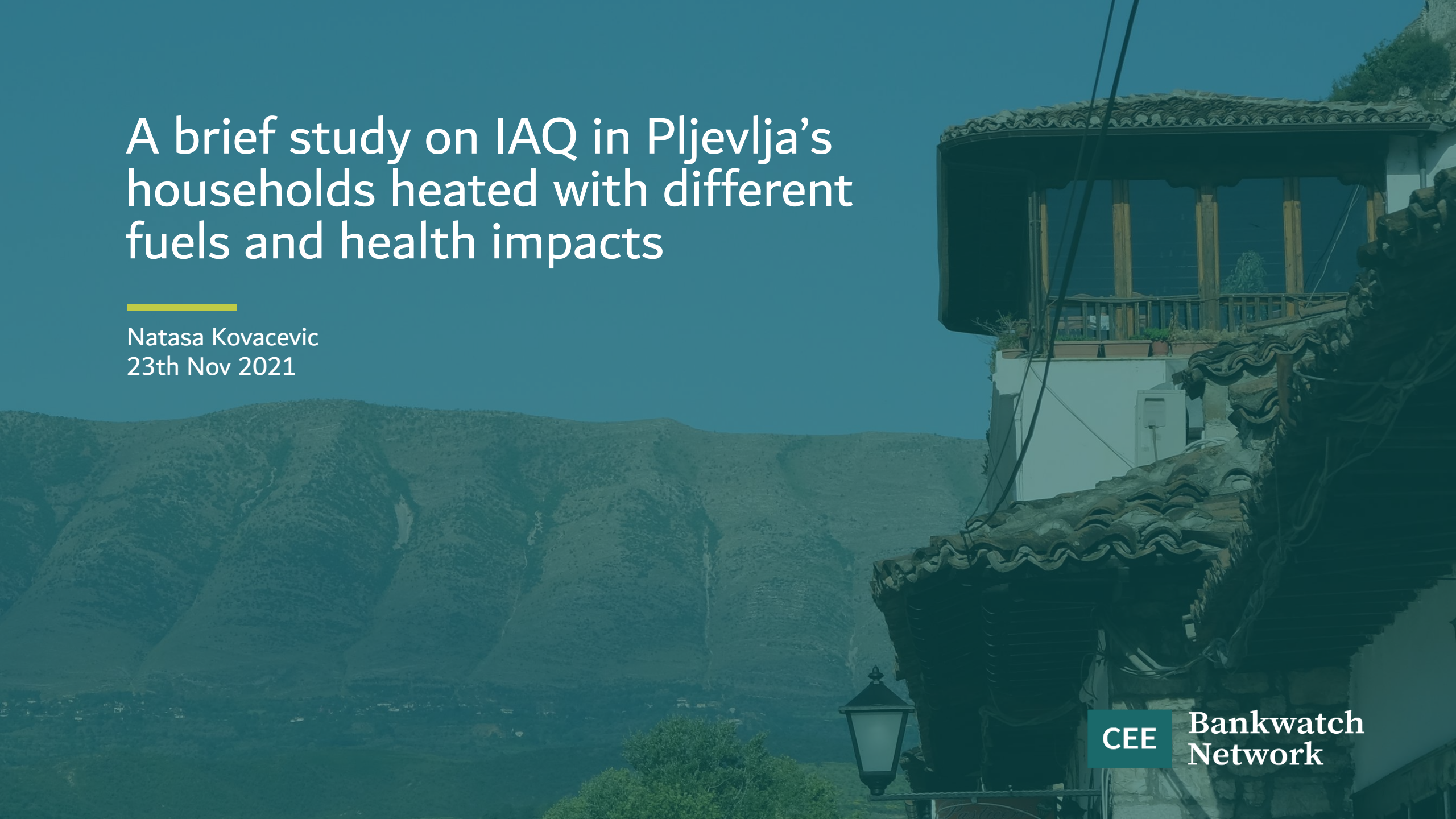

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Introduction

In Montenegro, 7.22% (6.08%-8.44%) of all deaths are attributable to air pollution, where 2.61% (1.74%-3.68%) of all death cases are from indoor air pollution

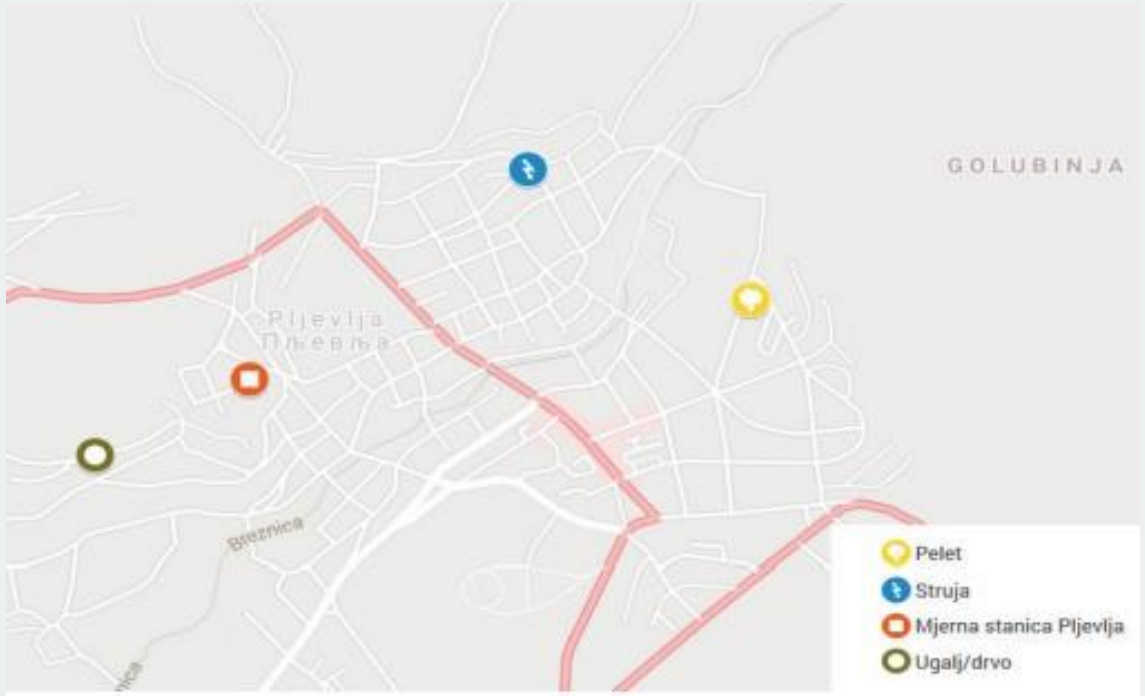
The mortality rate due to air pollution in Montenegro is one of the highest in Europe, 78.6 deaths at each 100.000 citizens

Only Bosnia & Herzegovina and Northern Macedonia have higher mortality rates

IAQI assessment performed in 2020

Objective to improve awareness of Pljevlja's citizens on health impacts of the heating based on fossil fuels

Methodology



The locations map of of households where indoor air quality measurements are carried out

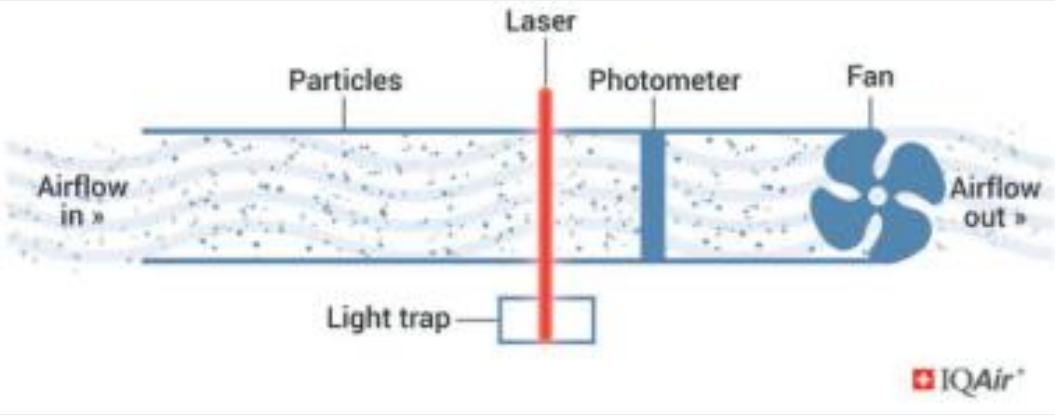
IAQ is measured in 3 households that use different fuels: 1) pellet, 2) electricity and 3) combination of coal and wood

Measurement period: 17 February -20 April 2020 (74 days)

Households selected according to the following criteria:

1. non smoking
2. situated away of the large crossroads
3. measurements are conducted in the living room (surface area not exceeding 40m2)
4. households dwell in houses/not apartments

Instruments



AirVisual Pro, source: www.iqair.com

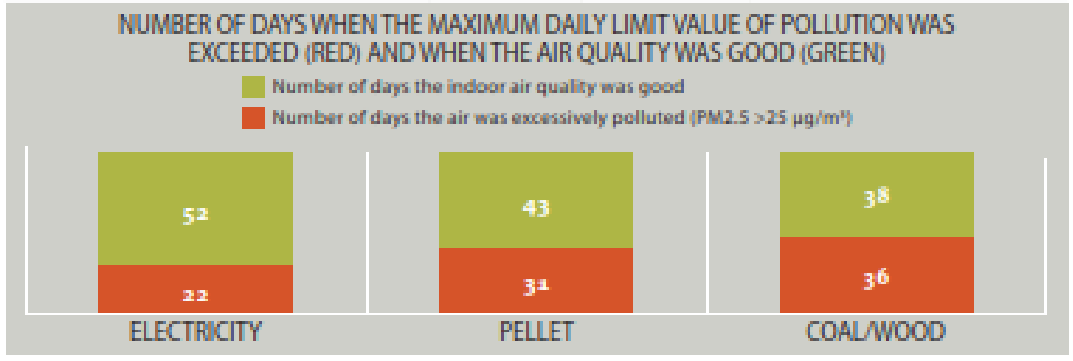
- AirVisual Pro, PM10 and PM2.5, ambient AQ based on information from nearest station
- A light scattering laser sensor for PM2.5 (0.3 to 2.5µm) and air flow through the chamber
- Quantitative health impact estimate AirQ + software version 2.0
- Functions 'pollution concentration->health outcome' (in accordance with WHO Guidelines)
- Population and health – MONSTAT and Pljevlja Municipality
- Data regarding the % of households that use different type of fuels for heating - Municipality of Pljevlja

Results of indoor air quality measurement

AVERAGE PM VALUE MEASURED IN THE PERIOD OF 17 FEBRUARY TO 30 APRIL 30 2020	LIMIT VALUES FOR THE PROTECTION OF HEALTH*	PELLET MG/M³	ELECTRICITY MG/M³	COAL/ WOOD MG/M³	PLJEVLJA AMBIENT AIR**
PM10	20	32	33.6	38.3	51
PM2.5	10	26	26.1	30	57.9

Average value of indoor air pollution for particulate matters, PM10 and PM2.5, in households, by types of fuels used for heating, expressed in µg/m3

NUMBER OF DAYS WHEN THE MAXIMUM DAILY LIMIT VALUE OF POLLUTION WAS EXCEEDED, FOR	PELLET	ELECTRICITY	COAL/WOOD
PM10 >50µg/m³	10	10	16
PM2.5 >25µg/m³	31	22	36



Number of days with excessive indoor air pollution for particulate matters, by types of fuel used for heating of households

- The household with combustion of coal for heating had the poorest indoor air quality - 3 times larger value for PM2.5 than the recommended health level
- The households that used pellet and electricity for heating had excessive indoor air pollution, with the unhealthy pollution level, 26.0 and 26.1 µg/m3 of PM2.5
- Ambient air quality (PM2.5) in Pljevlja was very bad, and 6 times exceeded the limits set for health preservation (10 µg/m3), while in Pljevlja that value was 57.9 µg/m, causing less ventilation of the households
- Number of days exceeding MDL for PM:
  - Coal based 21% days PM10 and 49% PM2.5
  - Pellet: 14% PM10 and 42% PM2.5
  - Electricity: 14% PM10 and 30%PM2.5

Indicative health impacts of indoor air polution

DISEASES IN PLJEVLJA, INDICATIVE	TOTAL NUMBER (RANGE)	WOMEN (NUMBER)	RANGE (LOWER-UPPER LIMIT)	MEN (NUMBER)	RANGE (LOWER-UPPER LIMIT)
RESPIRATORY SYSTEM DISEASES	156 (119-179)				
TRACHEA INFLAMMATION AND OTHER OBSTRUCTIVE LUNG DISEASES	1,264	693	(490-848)	571	(190-848)
LUNG CANCER	93	51	(28-58)	42	(24-51)
ISCHEMIC HEART DISEASES	217	117	(67-136)	100	(67-136)
STROKE	36	18	(10-22)	18	(8-22)

Indicative number of annual cases of disease in Pljevlja due to the indoor air pollution caused by combustion of coal and wood

Percentage of households that use coal and wood for heating is 83% (5000 households) used for calculation the Burden of Disease (annual number of cases of disease)

Important note: not appropriate to use these results of burden calculation to show how the burden is distributed among specific individuals in the population

- Indoor air pollution causes more than a half of all respiratory diseases in Pljevlja - 51.9%
- 1264 persons had trachea inflammation and other obstructive lung diseases (woman 52%, men 43%)
- Indoor air pollution caused 93 cases of lung cancer (women 51 cases and 42 in men)
- 217 cases of ischemic heart disease is caused by indoor air pollution (women 43% in men 37%)
- Indoor air pollution caused 36 cases of stroke, 43%

To set acceptable levels of polutants for indoor air quality within the Montenegrin legislation

Summary of the study: 'Identification and analysis of potential sustainable heating solutions in Pljevlja, Montenegro' - Bankwatch

Summary of the study 'Analysis of Sustainable Heating Options for the City of Tuzla, Federation of Bosnia and Herzegovina' - Bankwatch

Recommendations for improving the AQ and heating systems

- Start shifting towards clean heating solutions (individual furnances, microgrids, district heating)
- Municipalities to take a lead in process of decarbonisation of the district heating system
- Need to map the possible clean heat sources and start action planning now
- Build a consenzus of all stakeholders
- Complete the research missing in order to better quantify potentials (geothermal, seasonal storage capacities, energy saving and waste heat potential etc.)
- Start negotiations for ongoing funding opportunities and conduct financing plan combined with subventions (WBIF, ReDEWeb, WeBSEFF, GEFF, CARI, EBRD, EIB...)

Thank you!

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