C40 CITIES
CLIMATE LEADERSHIP GROUP

BENEFITS OF URBAN CLIMATE ACTION

C40 Cities Technical Assistance Report

VENICE

CLIMATE, AIR QUALITY AND HEALTH

C40 and Johnson & Johnson are working in partnership to connect the dots between climate action, improved air quality in cities and better health amongst citizens.

C40 has undertaken cutting-edge research, working with 26 cities to date to measure the air quality and health benefits of climate action, and use this to make a stronger case for action.

The time for urgent climate action

Cities are responsible for about 70% of global CO_2 emissions and play a leading role in limiting global increases in temperature to 1.5°C, in line with the Paris Agreement. Simultaneously, cities need to take adaptation measures to protect themselves against current and future extreme weather events, such as extreme cold and hot weather, floods and droughts. Finally, cities need to attend local issues of air pollution, including pollutants and toxic compounds.

In order to tackle both air quality and climate change, cities need clean and efficient transport, buildings and industry solutions.

VENICE

Venice is the capital city of the Veneto Region, located in the north-eastern part of Italy. With an area of 416 km^2, spanning the mainland and 118 islands, Venice is the most populous city in the region. Home to approximately 263,000 people, it is one of the most visited cities in Italy.

Venice's road transport sector represents 8.4% of the total Scope 2 greenhouse gas (GHG) emissions in the city[1].

8.4% OF THE CITY'S GHG EMISSIONS COME FROM THE ROAD TRANSPORT

THE NEED TO TACKLE AIR QUALITY

In recent years, air pollution has become a serious problem in Venice and the region as a whole. Veneto, together with the Piedmont, Lombardy and Emilia-Romagna regions, is part of the Pianura Padana Area. The particular orographic and climatic conditions prevent air pollutant dispersion, therefore exacerbating air quality issues.

According to the World Health Organization (WHO), the annual average concentration of $PM_{2.5}$ should not exceed 10 µg/m^3. In Venice, the annual average is around 28 µg/m^3, showing that people are exposed to very harmful levels of air pollution. Peak concentrations are also an issue, with the daily mean concentration of PM_{10} being exceeded about 70 times in 2016.

$PM_{2.5}$ CONCENTRATION IS 2.8 TIMES GREATER THAN THE WHO RECOMMENDED VALUE

THE HEALTH BURDEN

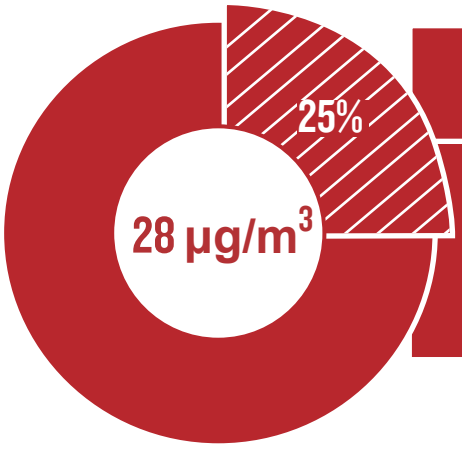
Pollutants such as $PM_{2.5}$ and NO_2 represent a major risk to people's health, particularly affecting children and older people. Often used as an indicator of air pollution, $PM_{2.5}$ can penetrate deep into lungs and is linked to respiratory and cardiovascular morbidity and mortality, even at low concentrations.

In the city of Venice, about 470 premature deaths every year are attributable to the current $PM_{2.5}$ levels. More alarmingly, figures are estimated for the city's metropolitan area, where the analysis has shown 1,200 premature deaths to be linked to $PM_{2.5}$ levels.

1,200 PREMATURE DEATHS EACH YEAR IN THE VENICE METROPOLITAN AREA ARE DUE TO $PM_{2.5}$ LEVELS

Understanding the problem

The road transport sector is responsible for 25% of the total $PM_{2.5}$ concentration in mainland Venice. $PM_{2.5}$ and PM_{10} concentrations have been progressively increasing, often exceeding alert levels. This issue is common to other cities in the Veneto region and Pianura Padana Area, where polluting activities, geography and climate contribute to the high $PM_{2.5}$ and PM_{10} concentrations.



VENICE URBAN AGGLOMERATION

25% OF PM2.5 CONCENTRATION COMES FROM THE ROAD TRANSPORT SECTOR

AROUND 200,000 VEHICLES

42% OF THE TOTAL FLEET IS BELOW EURO4 STANDARDS

The action

In June 2017, the Italian Minister of the Environment launched the Bacino Padano Agreement, a programme aimed at implementing emissions limitations from agriculture, road traffic and domestic sectors in the Pianura Padana Area regions (these being Veneto, Piedmont, Lombardy and Emilia-Romagna). The agreement came into effect in October 2018 and is valid until March 2026. Every year the typologies of vehicles affected by the restrictions will be updated, with a plan to progressively reduce the emissions of the road fleet.

Different restrictions will be applicable based on air pollution alert level. In particular, the city of Venice has studied the benefits of banning the circulation of Euro 0 motorcycles, Euro 0-1 petrol cars, Euro 0-4 diesel car and Euro 0-3 diesel LDV vehicles (corresponding to the medium alert level).

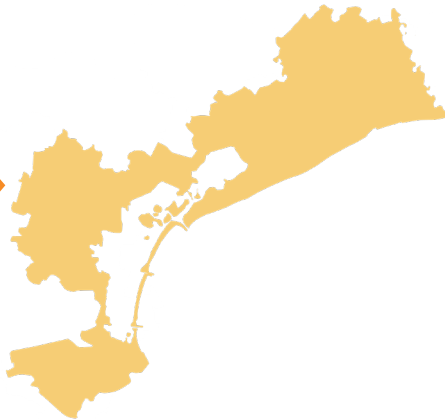
The traffic limitations will apply during the winter season, from Monday to Friday between 08.30 and 18.30 and are valid across the urban agglomeration within the Veneto region.

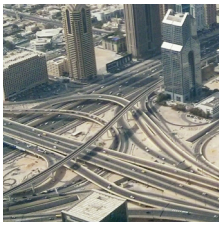
PADANA AGREEMENT

During a medium alert event (PM_{10}>50ug/m³ for four days), the city will ban:

EURO 0 MOTORCYCLES
EURO 0-1 PETROL CARS
EURO 0-3 DIESEL LDV VEHICLES
EURO 0-4 DIESEL CARS

ACROSS THE URBAN AGGLOMERATION OF THE VENETO REGION





The benefits

With support from C40, the city analysed the social and economic impacts of banning highly polluting vehicles. The results showed that this would have a massive improvement on air quality, which would in turn improve the population's health and produce considerable economic benefits.

Air quality, expressed here in terms of $PM_{2.5}$ concentration, is expected to improve both in the intervention area and in the whole metropolitan area.

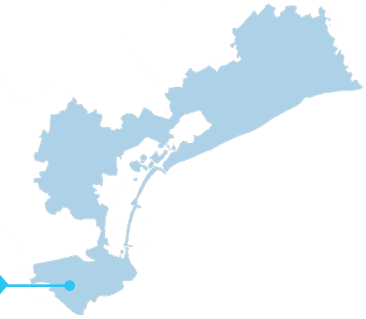
The air quality improvement leads to a reduction in the health burden of cardiovascular- and respiratory-related diseases and deaths. Hospital admissions are used as an indicator for morbidity, while the change in premature deaths, life expectancy and life years gained are used to quantify mortality impacts.

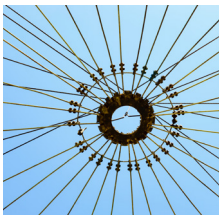
The economic impact represents the monetary value of averting a hospital admission and of gaining an extra year of life.

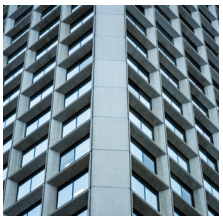
AIR QUALITY

2% $PM_{2.5}$ REDUCTION IN METROPOLITAN AREA

12% $PM_{2.5}$ REDUCTION IN INTERVENTION AREA







12 PREMATURE DEATHS AVERTED PER YEAR

+66 LIFE YEARS GAINED OVER THE WHOLE POPULATION

HEALTH

+2 DAYS IN LIFE EXPECTANCY PER CITIZEN

2 day increase in life expectancy for each citizen. For those living in the intervention area, it increases to 4 days.

25 AVERTED HOSPITAL ADMISSIONS PER YEAR

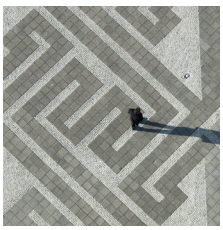
25 averted hospital admissions per year, including 12 for respiratory diseases, and 13 for cardiovascular diseases.

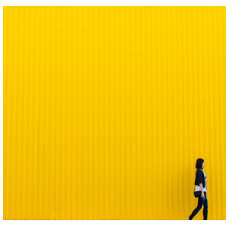
The value of averted hospital admissions is €41,000 for respiratory and €40,000 for cardiovascular diseases.

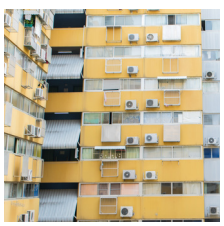
€2M TOTAL VALUE OF AVERTED DEATHS

€81,000 AVOIDED HEALTHCARE COSTS

ECONOMICS







Next steps

Venice is leading the way in evaluating the environmental, social and economic benefits of banning highly polluting vehicles. The positive results presented in this report can support cities in Veneto, and in the other regions part of the Bacino Padano Agreement, in making the case for bigger and bolder actions to tackle air pollution.

An initial analysis has been carried out that includes Turin, Milan and Bologna showing significant benefits in air quality and health, such as 1,900 life years gained across the total population and 312 premature deaths averted.

DRIVING ACTION

INFORM THE PUBLIC

While political parties have already signed the agreement and funds have been allocated, the action lacks public support. This will challenge the implementation of the action, especially regarding updates and scaling-up to extend the ban to more vehicles. Therefore, communicating the benefits of improved air quality and health will be critical for driving the action further.

BOOST COLLABORATION

The air quality and health benefits will also be communicated to the relevant departments within the city and within the region. This will consolidate the existing collaboration, accelerate implementation and improve the analysis with more accurate data.

DRIVE ACTIONS FOR AIR QUALITY

Boats are responsible for a large share of pollutant's concentration in Venice. It is expected that introducing pollutant's limitations for boats will produce considerable benefits for the city. The city will use the same methodology to quantify these.

NEXT STEPS

The city will organise a press release to share the results of the air quality and health benefits analysis, with the aim of further building consensus and widely increasing public participation.

The city will promote a yearly awareness campaign to inform the citizens about the new waves of restrictions up to 2025. By coordinating with other cities and regions in the agreement, the campaign will be more effective and generate wider consensus.

The city will organise a workshop with various departments (for example, Environmental, Health, Transport) on collaboration and data improvement.

The city will also organise meetings and improve coordination with the Veneto region and with the other three regions involved in the Bacino Padana Agreement, in order to secure an effective implementation of the action.

The city will pilot boat limitations in Rio Novo, which will last for about six months starting in 2019.

The results will then help the city show progress and make a stronger case for extending the ban in the future.

METHOD AND ASSUMPTIONS

Methodology available here.

Key assumptions:

- *Annual average concentrations were converted from PM_{10} to $PM_{2.5}$.*
- *$PM_{2.5}$ source apportionment refers to the road transport sector as opposed to the light duty vehicles.*
- *Mortality and hospital admission rates by age and gender in the metropolitan area were assumed to be the same as in the city of Venice.*
- *VOLY and VHA are not calculated at Italian level, but European level.*
- *Burden of air pollution on mortality was calculated by using the relative risk from published studies relating air pollution concentrations to health outcomes. This was applied to the difference between city-wide annual average $PM_{2.5}$ concentration and the GBD's theoretical minimum exposure (5.8 $\mu g/m^3$), and to the mortality rate in the local population. This is assuming impacts only in adults (ages 30+).*

The analysis has been carried out following the methodology outlined in the BUCA Guidance Manual.

Next steps for the analysis:

Future data collection activities based on the data gaps in the analysis include:

- *Collecting data for NO_x and NO_2*
- *Collecting hospital admission data by gender and age for the metropolitan area.*

Notes [1] *C40 Cities, Global Protocol for Community-scale GHG Emission Inventories (GPC).*

Cover page picture *: Candre Mandawe, unsplash.*

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