

An aerial photograph of a large, circular public square, likely in Mexico City, featuring a prominent golden statue of an angel on a pedestal in the center. The square is paved with light-colored tiles and surrounded by greenery and trees. Numerous people are seen walking and cycling throughout the square. The image is overlaid with a semi-transparent blue filter.

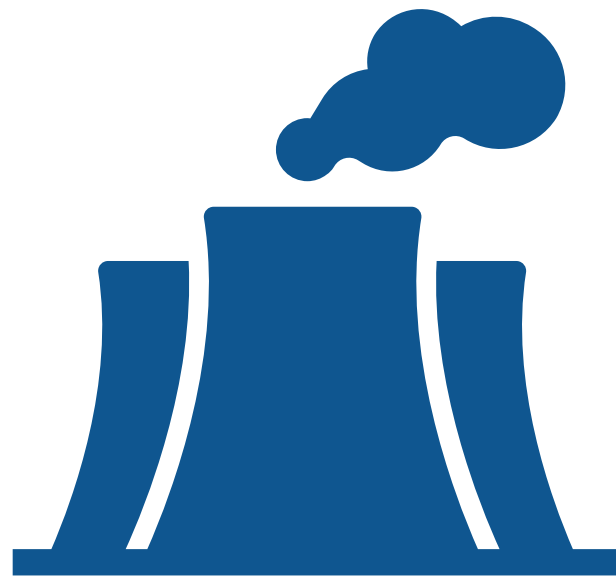
Integración de herramientas para evaluación de impactos en salud pública

DAVID ROJAS, MD, MPH, PhD

HERRAMIENTAS DE CO-BENEFICIOS EN SALUD



Contaminación
del Aire

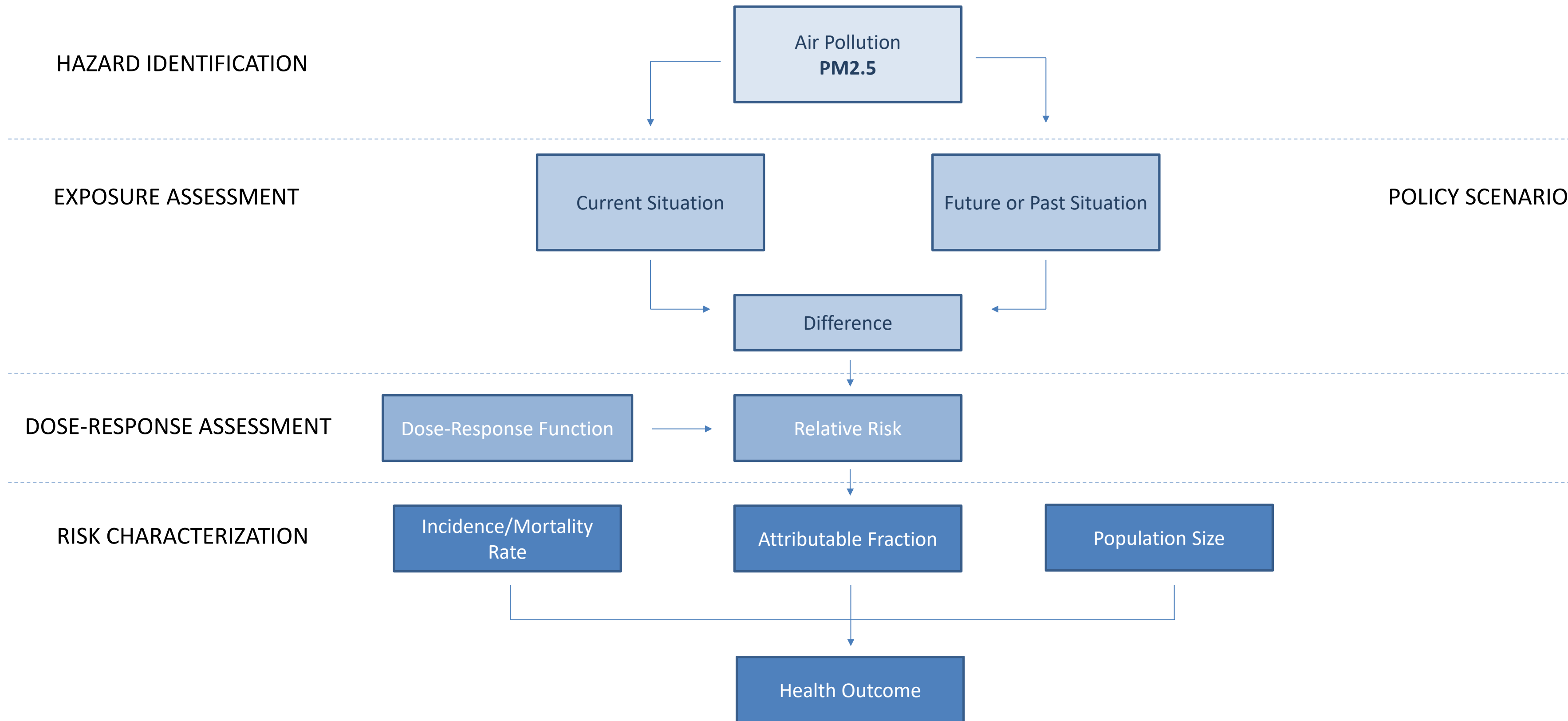


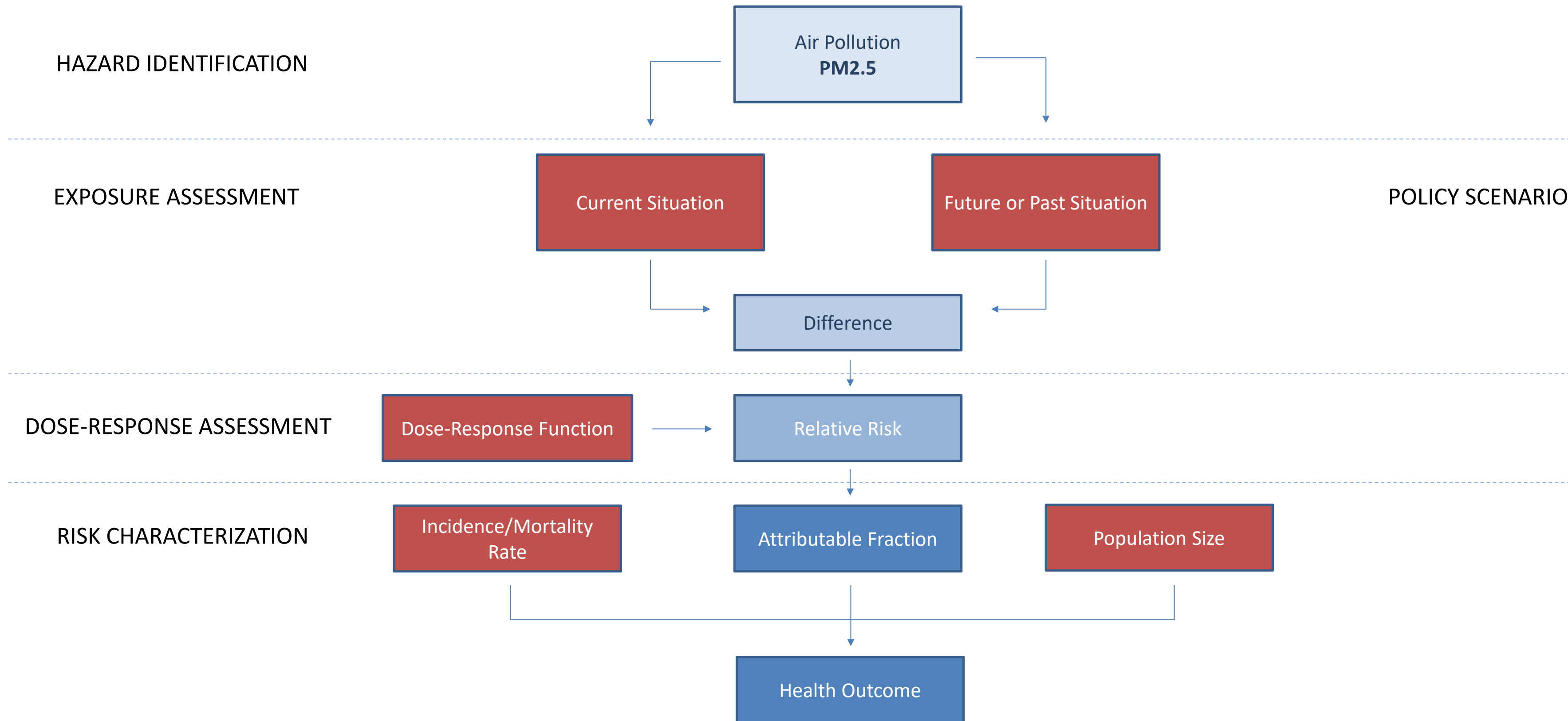
Transporte
Activo



Vegetación



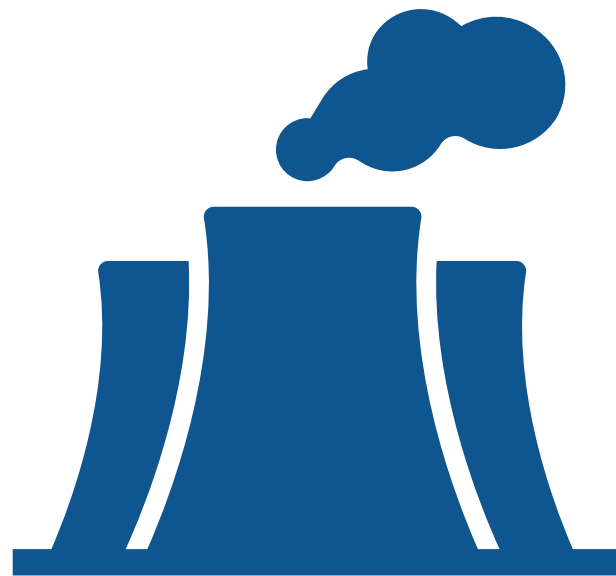




HERRAMIENTAS DE CO-BENEFICIOS EN SALUD



Contaminación
del Aire



Transporte
Activo



Vegetación



An aerial photograph of a city, likely Bogotá, Colombia, showing a dense urban landscape with numerous high-rise apartment buildings and some green spaces. The image is overlaid with a semi-transparent blue filter. In the upper center, there is a dark blue rectangular box containing the 'AirQ+' logo in white. Across the middle of the image, the text 'Contaminación del Aire' is written in a large, white, sans-serif font.

AirQ+

Contaminación del Aire

Descripción general
de proyectos

- Evaluación del impacto
- Carga de enfermedad
- Análisis de riesgo

Bienvenido a AirQ+

Inicie un nuevo análisis o seleccione un análisis existente de la lista de resumen de proyectos a la izquierda.

¿Qué es AirQ+?



Comenzando



Agradecimientos



¿Cuál sería el cambio en la salud si el nivel de contaminación del aire disminuye o aumenta?

[+ Crear nueva evaluación de impacto](#)

¿Cuánto de un resultado de salud particular (por ejemplo, mortalidad) es atribuible a la exposición actual a un contaminante del aire?

[+ Crear nueva carga de enfermedad](#)

¿Cuál es el riesgo de cáncer asociado con la exposición de por vida a contaminantes atmosféricos seleccionados para los cuales el "riesgo unitario" está disponible?

[+ Crear un nuevo análisis de riesgos](#)

AirQ+

AirQ+ is a software tool for quantifying the health burden and impact of air pollution.

Long-term and short-term exposure.

PM2.5, PM10, NO2, O3, and black carbon (BC).

Solid Fuel Use (SFU).

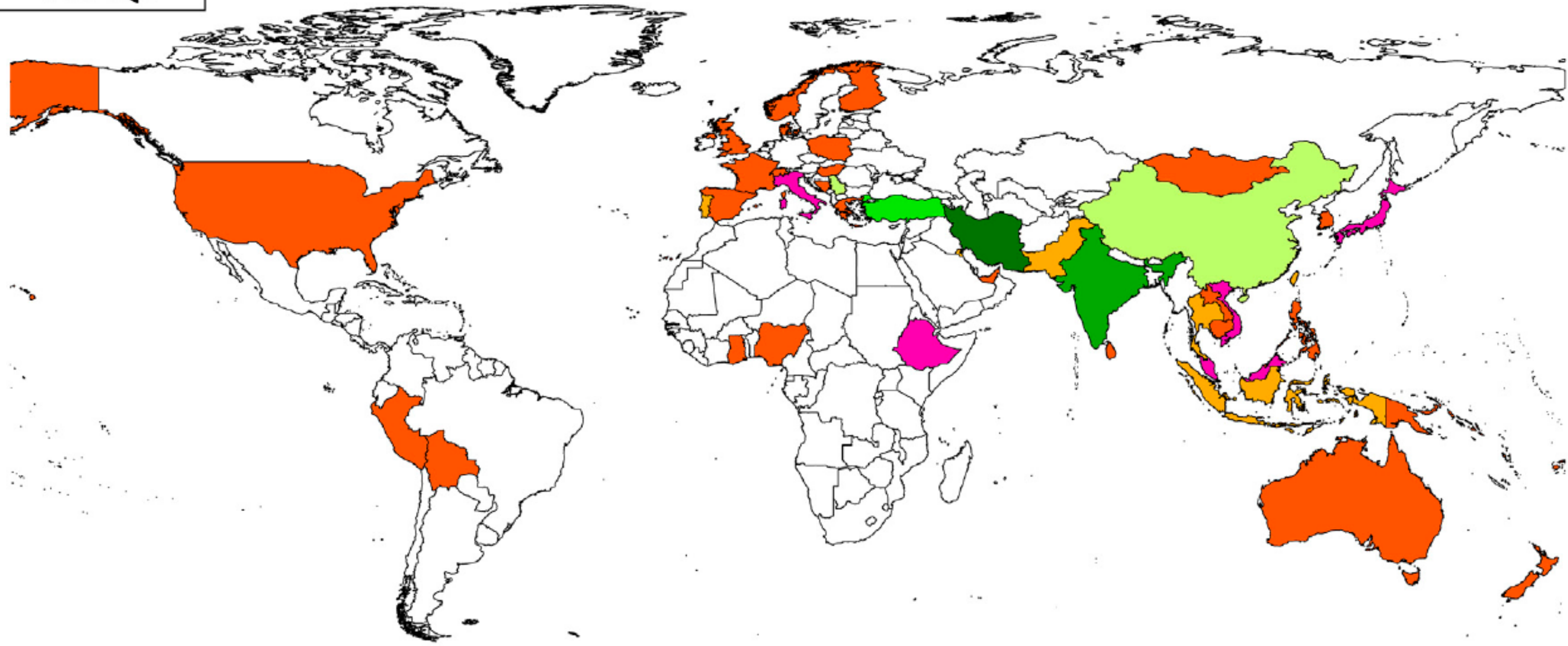
Mortality and morbidity,

Acute and chronic conditions.

Objetivos de AirQ+:

- Impacto de la contaminación del aire en la salud.
- Cuántas muertes prematuras se podrían evitar si mejorara la calidad del aire?

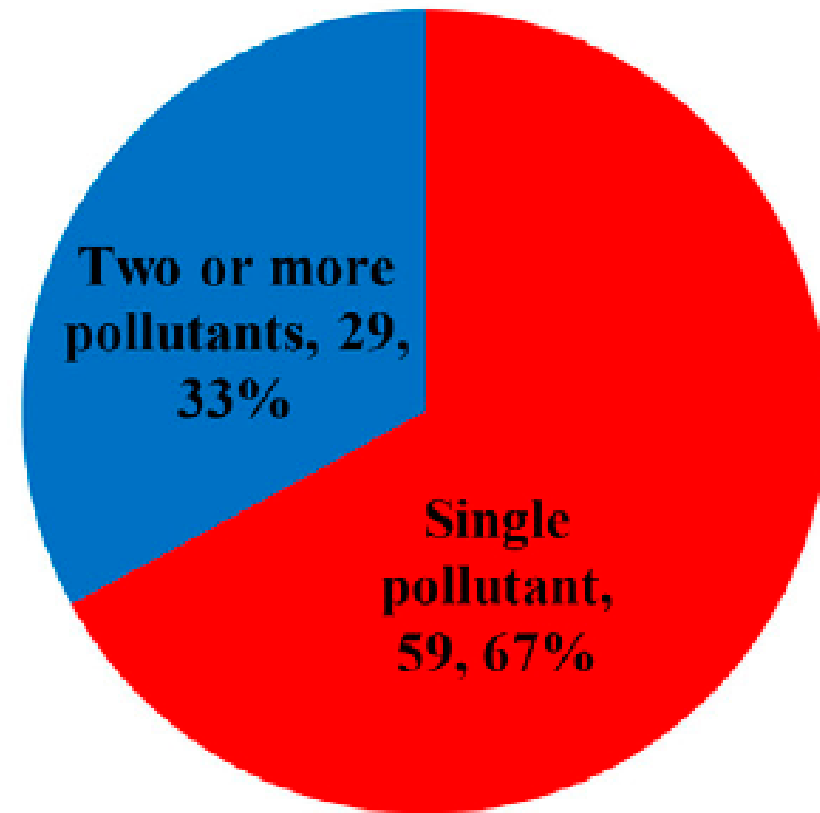




Number of Studies (Country)

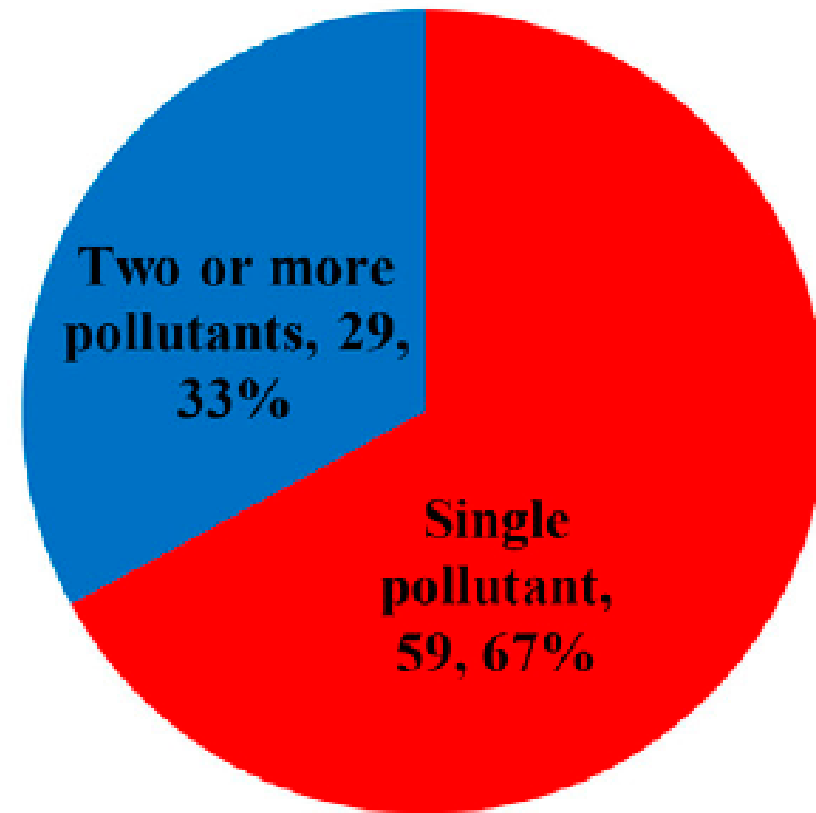
- 30 (Iran)
- 18 (India)
- 8 (Turkey)
- 4 (China, Serbia)
- 3 (Ethiopia, Italy, Japan, Malaysia, Vietnam)
- 2 (Indonesia, Kuwait, Pakistan, Portugal, Taiwan, Thailand)
- 1 (Australia, Bolivia, Bosnia and Herzegovina, Cambodia, Denmark, Fiji, Finland, France, Ghana, Greece, Hungary, Kiribati, Lao People's Democratic Republic, Mongolia, New Zealand, Nigeria, Norway, Papua New Guinea, Peru, Philippines, Poland, Samoa, Singapore, Solomon Islands, South Korea, Spain, Sri Lanka, Switzerland, Tonga, Tuvalu, United Arab Emirates, United Kingdom, United States, Vanuatu)

AirQ+



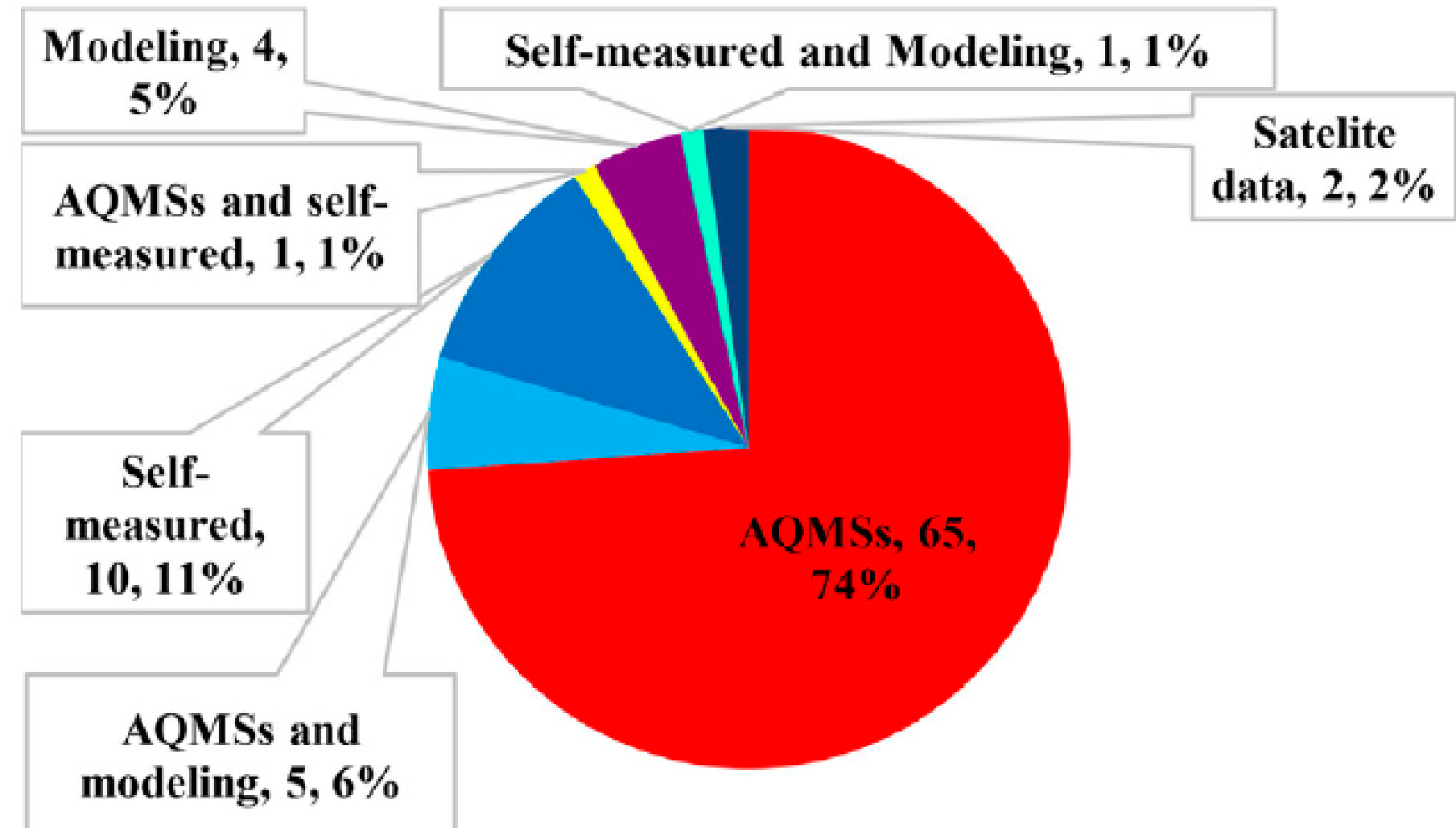
PM_{2.5} (# of studies: 70), PM₁₀ (23), O₃ (18), NO₂ (17), SO₂ (3), CO (1), Household air pollution (1)

AirQ+



PM_{2.5} (# of studies: 70), PM₁₀ (23), O₃ (18), NO₂ (17), SO₂ (3), CO (1), Household air pollution (1)

AirQ+



AQMS = Air Quality Monitoring System

AirQ+ - Datos

- X Ciudad
- Población 2025 (DANE)
- Adultos (>30 años)
- Tasa de mortalidad/
incidencia



AirQ+ - Datos

- PM2.5 (partículas suspendidas)
- 2025 (?)
- Estación/es fija/s
- 15 mcg/m³
- *Guías de la calidad del aire de la OMS = 5 mcg/m³*

AirQ+ - Análisis basal vs

Guías de Calidad de Aire de la OMS

PM2.5				
Categoría	Tipo	Estimación central	Intervalo de confianza bajo	Intervalo de confianza alto
Proporción atribuible estimada	Todas >30 años	8%	6%	9%
Número atribuible de casos estimados		600	450	700
Tasa por 100.000		75	55	80

Interpretación

- Alcanzar los niveles de las **Guías de Calidad del Aire de las OMS** en la ciudad de X puede evitar **600** muertes prematuras anualmente

Opciones de análisis con AirQ+

- PM2.5, NO2, PM10, O3 y carbono negro (BC),
- Análisis por zonas / barrios,
- Diferentes años (19?? -2040),
- Políticas específicas (ej. transporte, electrificación, zonas de bajas emisiones, Cambio Climático, etc.)



Caminar y Viajar en Bicicleta

 YOUR ASSESSMENT < DATA INPUT < DATA ADJUSTMENT < ADDITIONAL PARAMETERS < PARAMETER REVIEW < RESULTS < INTRODUCTION TO RESULTS GENERAL RESULTS

General results

Results for your assessment

Summary of your input data

The volume data you have entered corresponds to an increase of 10 min. per person and day.

Your assessed population of cyclists is 100 000.

Summary of impacts for mortality and carbon emissions

As a result, 15.0 premature deaths are prevented per year.

Over the full assessment period of 10 years, 148 premature deaths are prevented.

As a result, carbon emissions are increased by 426 tons of CO2 equivalent per year.

Over the full assessment period of 10 years, carbon emissions are increased by 4 258 tons of CO2 equivalent.

Economic value of impacts

Mortality is monetized using value of statistical life (VSL) of 1 790 000 USD(MER) per premature death.

Carbon emissions have been monetized using an average carbon value of USD 89.5 per ton of CO2 equivalent. This corresponds to an economic value of USD 26 400 000 per year.

Over the full assessment period of 10 years, the total economic impact is USD 264 000 000.

Adjusted to 2022 value (i.e. discounted/inflated), the total economic impact is USD 194 000 000. 

Benefit-cost ratio

The benefit-cost ratio for this assessment based on costs of USD 100 000 and impacts of USD 194 000 000 (adjusted to 2022 value) is 1 938.000.

 Download General Results As PDF

< - BACK

Detailed Results - >

Disclaimer

Please bear in mind that HEAT does not calculate risk reductions for individual persons but an average across the population under study. The results should not be misunderstood to represent individual risk reductions. Also note that the "value of statistical life" does not assign a value to the life of one particular person but refers to an average value of a "statistical life". It is important to remember that many of the variables used within HEAT are estimates and therefore liable to some degree of uncertainty. You are reminded that the HEAT tools provide you with an approximation of the order of magnitude of the impacts. To get a better sense for the robustness of the results, you are strongly advised to rerun the model, entering low and high values for variables where you have provided a "best guess".

HEAT

Health Economic Assessment Tool (**HEAT**)
for Walking and Cycling

¿Qué es le herramienta HEAT?

Una herramienta **en línea** para:



Impactos en salud del caminar y viajar en bicicleta



Impactos económicos en salud del caminar y viajar en bicicleta,



Emisiones de eCO2 relacionadas con el caminar y viajar en bicicleta.

¿Qué es la herramienta HEAT?

Peatones y/o ciclistas,



Actividad física,



Accidentes de tráfico,



Inhalación de contaminación del aire, y



Emisiones de eCO2

 YOUR ASSESSMENT < DATA INPUT < DATA ADJUSTMENT < ADDITIONAL PARAMETERS < PARAMETER REVIEW < RESULTS < INTRODUCTION TO RESULTS GENERAL RESULTS

General results

Results for your assessment

Summary of your input data

The volume data you have entered corresponds to 20 minutes per person per day. Your assessed population is 4,911,594.

Summary of impacts for mortality and carbon emissions

As a result, 866 premature deaths are prevented per year and carbon emissions are reduced by 88,614 metric tons of CO₂ per year. Over the full assessment period of 10 years, 8,662 premature deaths are prevented and carbon emissions are reduced by 886,137 metric tons of CO₂.

Economic value of impacts

Mortality is monetized using Value of Statistical Life (VSL) of 475,000 (US\$) per premature death and carbon emissions are monetized using social cost of carbon (SCC) of 96 (US\$) per metric ton of CO₂.

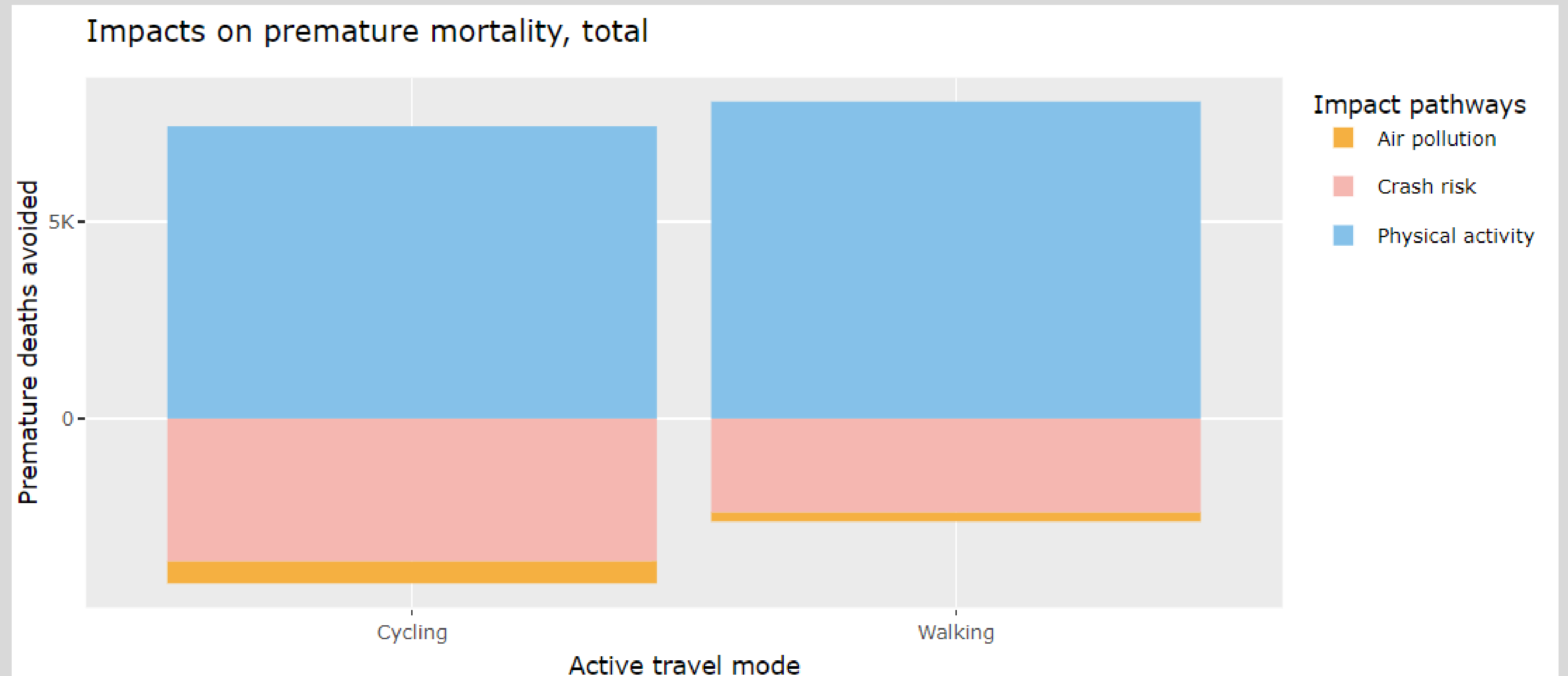
This corresponds to an economic value of 420,000,000 (US\$) per year .

Over the full assessment period of 10 years, the total economic impact is 4,200,000,000 (US\$).

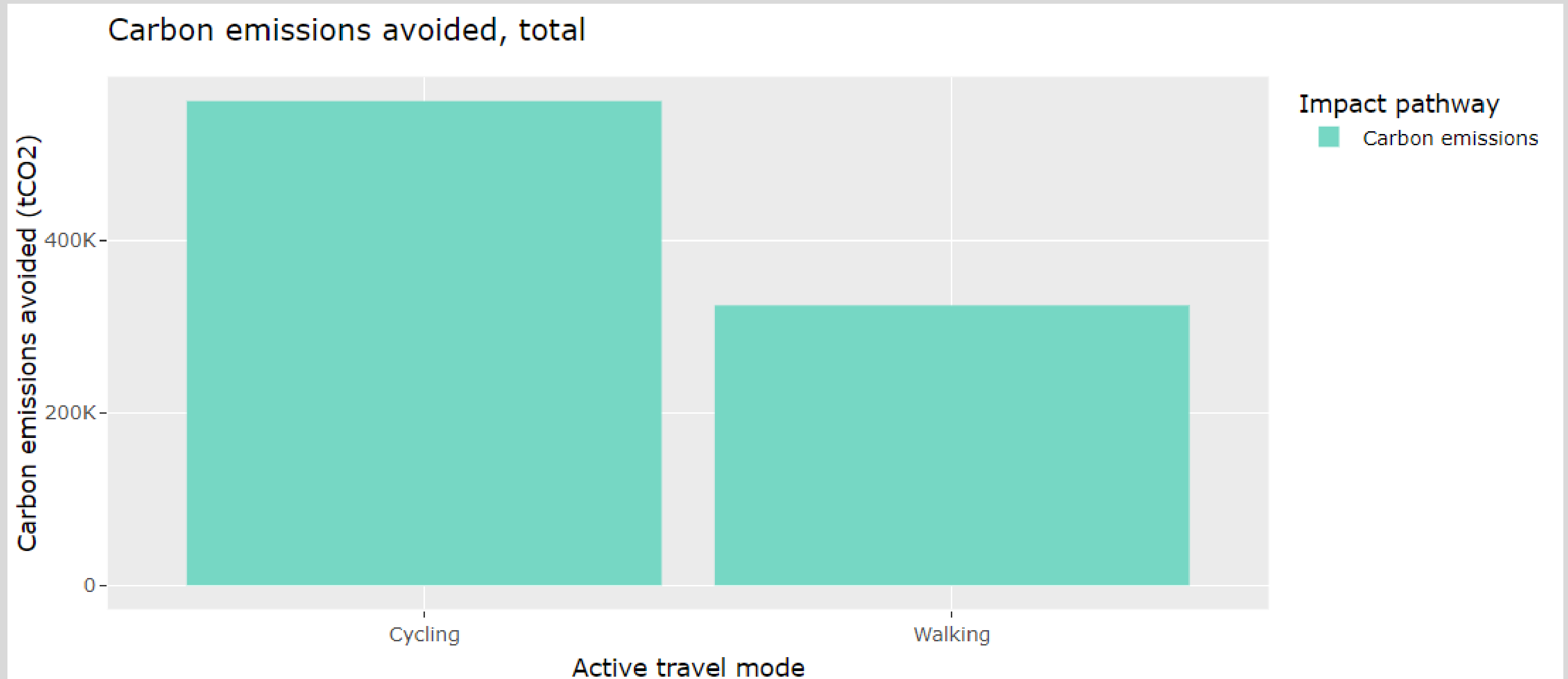
Adjusted to 2024 value (i.e. discounted/inflated), the total economic impact is 3,240,000,000 (US\$).

Figures for your assessment

Figures for impacts on premature mortality



Figures for impacts on carbon emissions, single case assessment



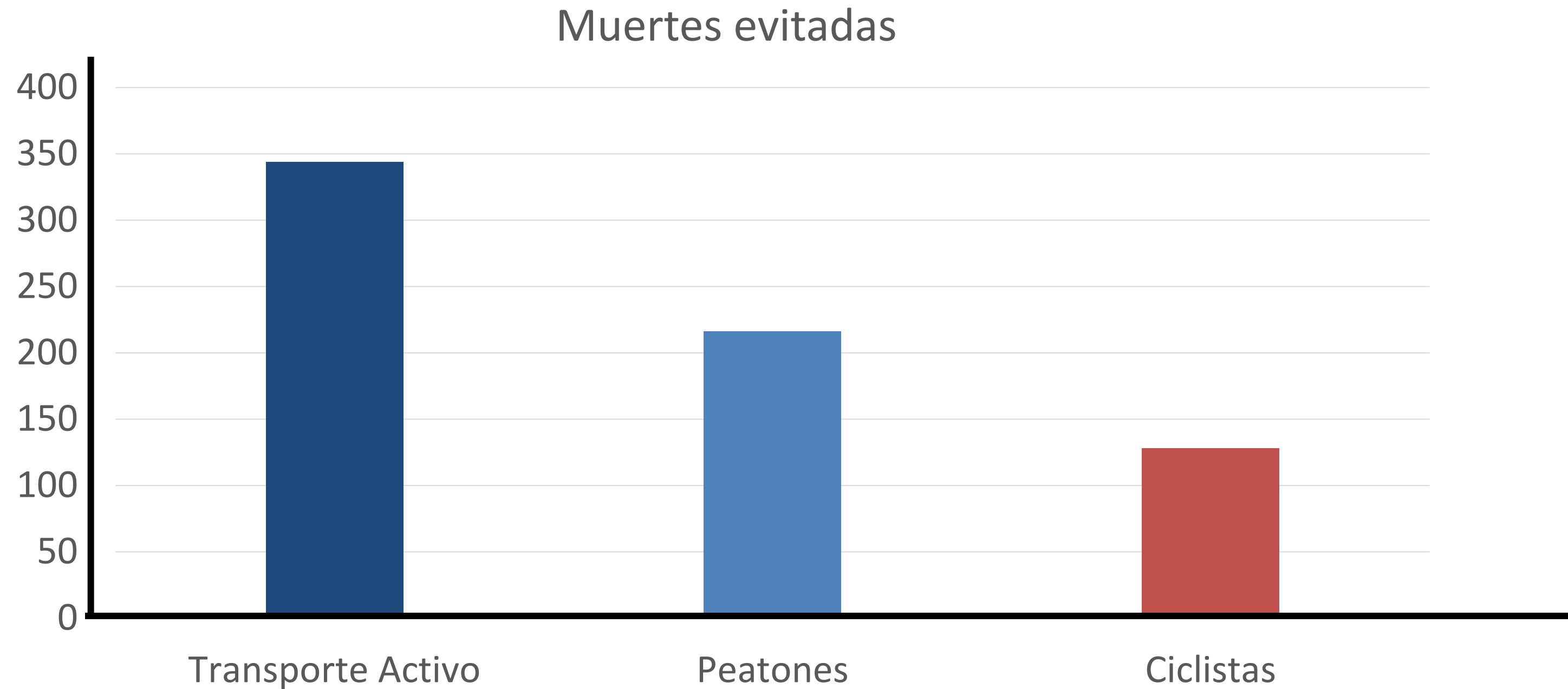
HEAT - Análisis basal

- Ciudad X
- Población 2025 (DANE)
- Adultos (20-74 años)
- PM2.5 2025
- Tasa de mortalidad
- Niveles actuales de peatones y ciclistas

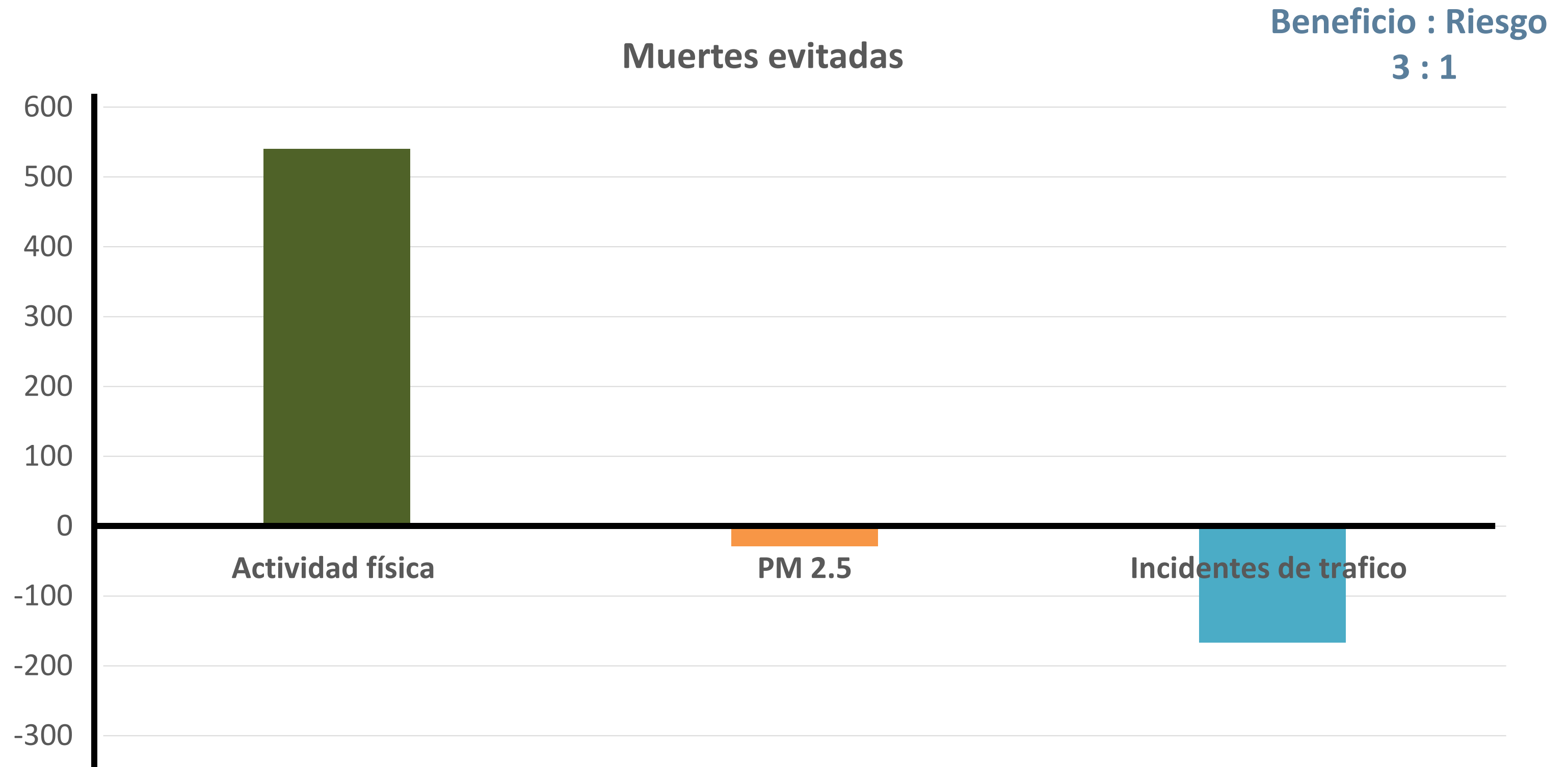
HEAT - Análisis basal

Resultados de peatones y ciclistas combinados	
Muertes prematuras evitadas cada año	400
Emisiones de CO2e evitadas cada año	35,000 toneladas
Valor económico total por año combinando mortalidad y eCO2 (dólares americanos)	\$ 180,000,000

HEAT - Análisis basal



HEAT - Análisis basal



Interpretación

- Los niveles actuales de ciclistas y peatones se pueden traducir en beneficios en salud de **400** muertes prematuras prevenidas cada año (**\$180** millones / **35,000** toneladas de eCO₂).

Opciones de análisis con HEAT

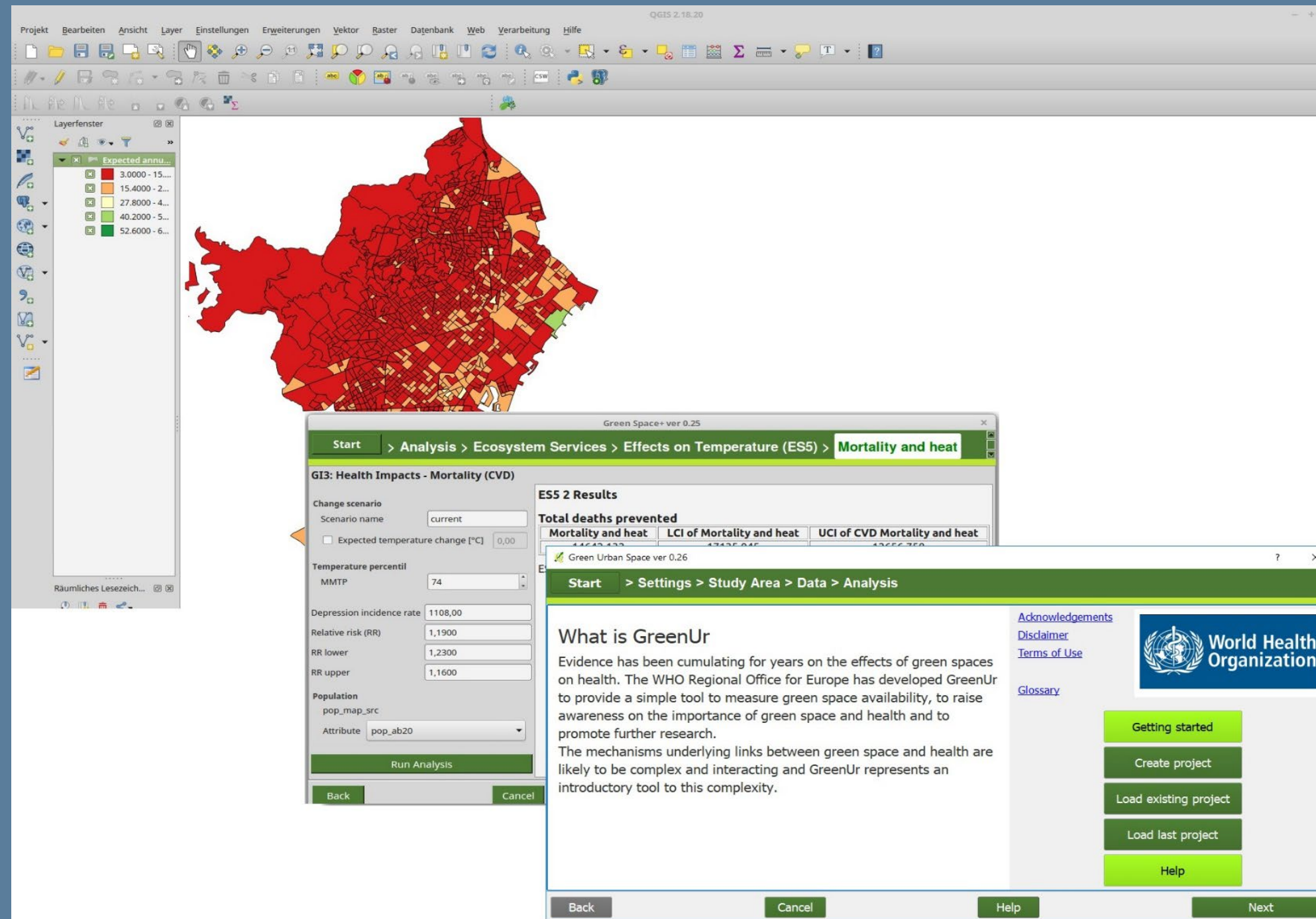
- **Análisis por zonas / barrios,**
- **Diferentes años (19?? -2040),**
- **Políticas específicas**
(ej. Bicicletas, e-bike, peatonalización, buses, malecón, Cambio Climático, etc.)
- **Escenarios futuros (ej. 10%, doble, Copenhagen)**



VEGETACIÓN

¿Qué es GreenUr?

Sistema de Información Geográfica (QGIS)



¿Qué es GreenUr?

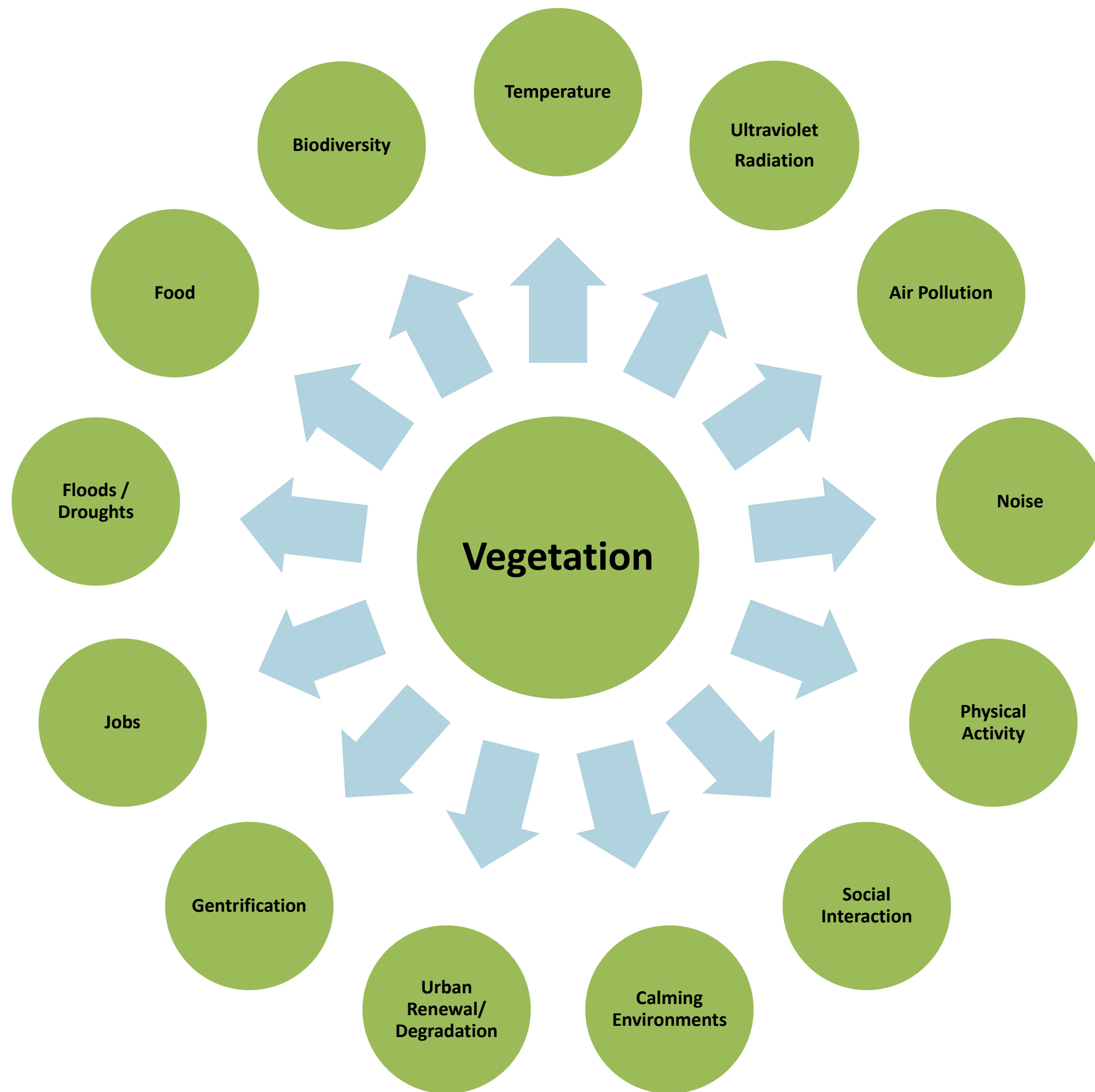


Disponibilidad de espacios verdes,



Estimar el impacto de los espacios verdes en la salud





Objetivos de GreenUr:



Cuál es el % de áreas verdes en la ciudad



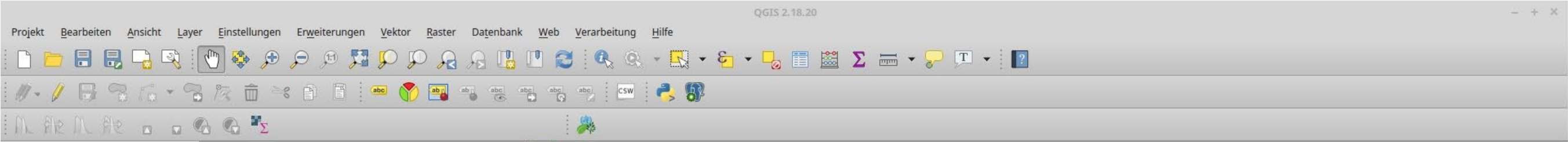
Cuántas personas viven cerca de las áreas verdes



Cuántas muertes prematuras se evitan cada año por la presencia de áreas verdes

GreenUr Análisis basal

- Barranquilla
- Población 2018 (DANE)
- Tasas de mortalidad 2018
- Adultos (>20 años)
- NDVI 30 metros (2018)
- Tasa de mortalidad



Layerfenster

Expected annu...

- 3.0000 - 15...
- 15.4000 - 2...
- 27.8000 - 4...
- 40.2000 - 5...
- 52.6000 - 6...

Räumliches Lesezeich...

Green Space+ ver 0.25

Start > Analysis > Ecosystem Services > Effects on Temperature (ES5) > Mortality and heat

GI3: Health Impacts - Mortality (CVD)

Change scenario

Scenario name: current

☐ Expected temperature change [°C]: 0,00

Temperature percentil

MMTP: 74

Depression incidence rate: 1108,00

Relative risk (RR): 1,1900

RR lower: 1,2300

RR upper: 1,1600

Population

pop_map_src

Attribute: pop_ab20

Run Analysis

Back Cancel

ES5 2 Results

Total deaths prevented

Mortality and heat	LCI of Mortality and heat	UCI of CVD Mortality and heat
44643.423	47435.045	42656.350

Green Urban Space ver 0.26

Green Urban Space ver 0.26

Start > Settings > Study Area > Data > Analysis

[Acknowledgements](#)
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[Terms of Use](#)
[Glossary](#)

 World Health Organization

Getting started

Create project

Load existing project

Load last project

Help

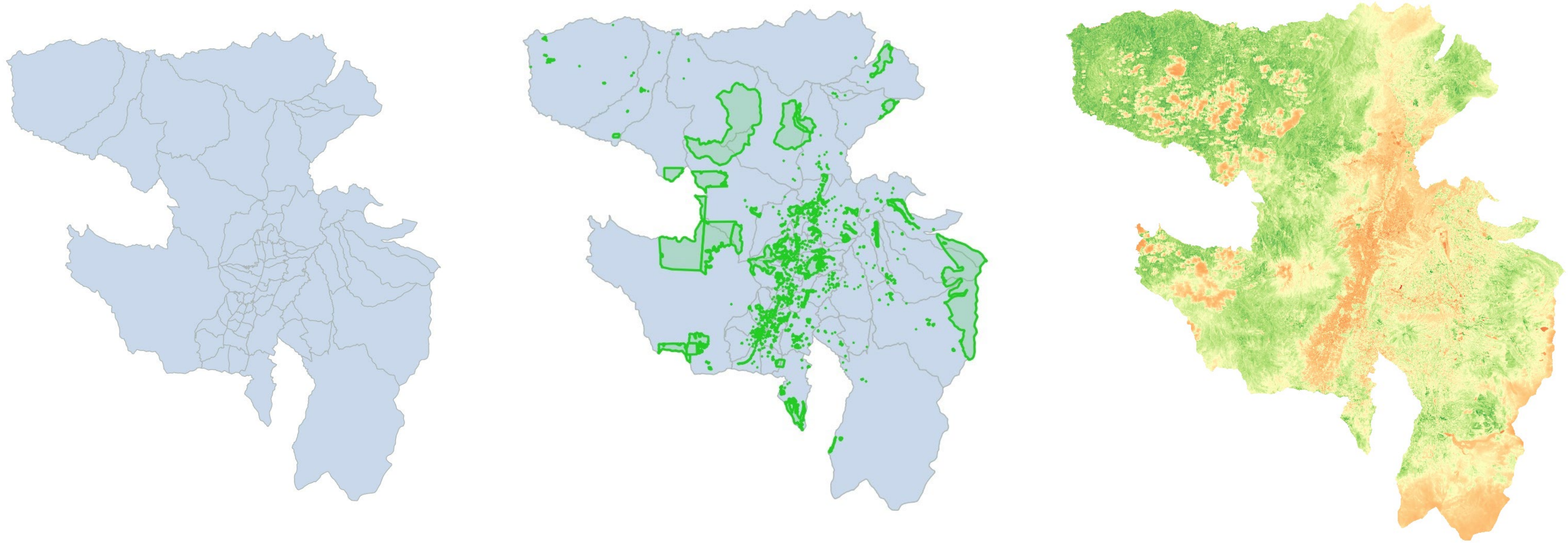
Back Cancel Help Next

What is GreenUr

Evidence has been cumulating for years on the effects of green spaces on health. The WHO Regional Office for Europe has developed GreenUr to provide a simple tool to measure green space availability, to raise awareness on the importance of green space and health and to promote further research.

The mechanisms underlying links between green space and health are likely to be complex and interacting and GreenUr represents an introductory tool to this complexity.

GreenUr – Basal analysis (Example)



GreenUr – Basal analysis (Example)

Premature deaths – vegetation	48
Total surface area	4,230.950 km2
Area dedicated to parks	449.485 km2
% of area dedicated to parks	10.62%
Total inhabitants	2,733,414 (100%)
Inhabitant living 500m or less from parks	1,243,695 (45%)

Interpretación

- Los niveles actuales de vegetación urbana evita **48** muertes prematuras cada año.

Opciones de análisis con GreenUr

- **Análisis por zonas / barrios,**
- **Diferentes años (20?? -2040),**
- **Escenarios (ej. 20%, doble, áreas con menos vegetación)**
- **Políticas específicas (pasadas o futuras)**

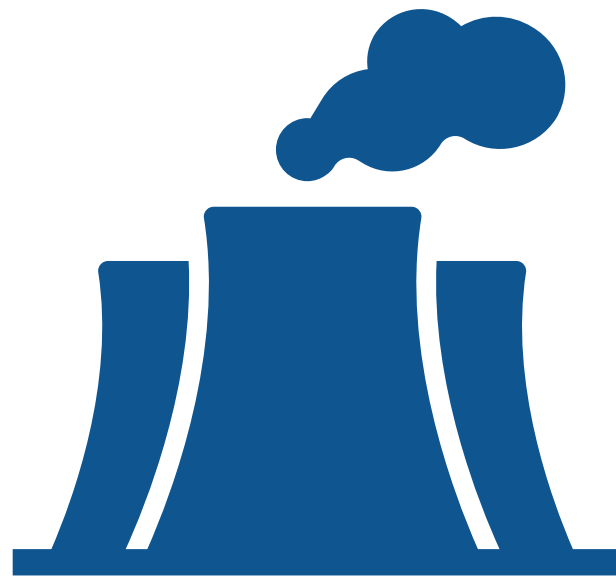
(ej. Arbolado, red verde urbana, corredores seguros, utopías, soluciones basadas en la naturaleza, Cambio Climático, etc.)

HIA Tools

PAHO



Air Pollution

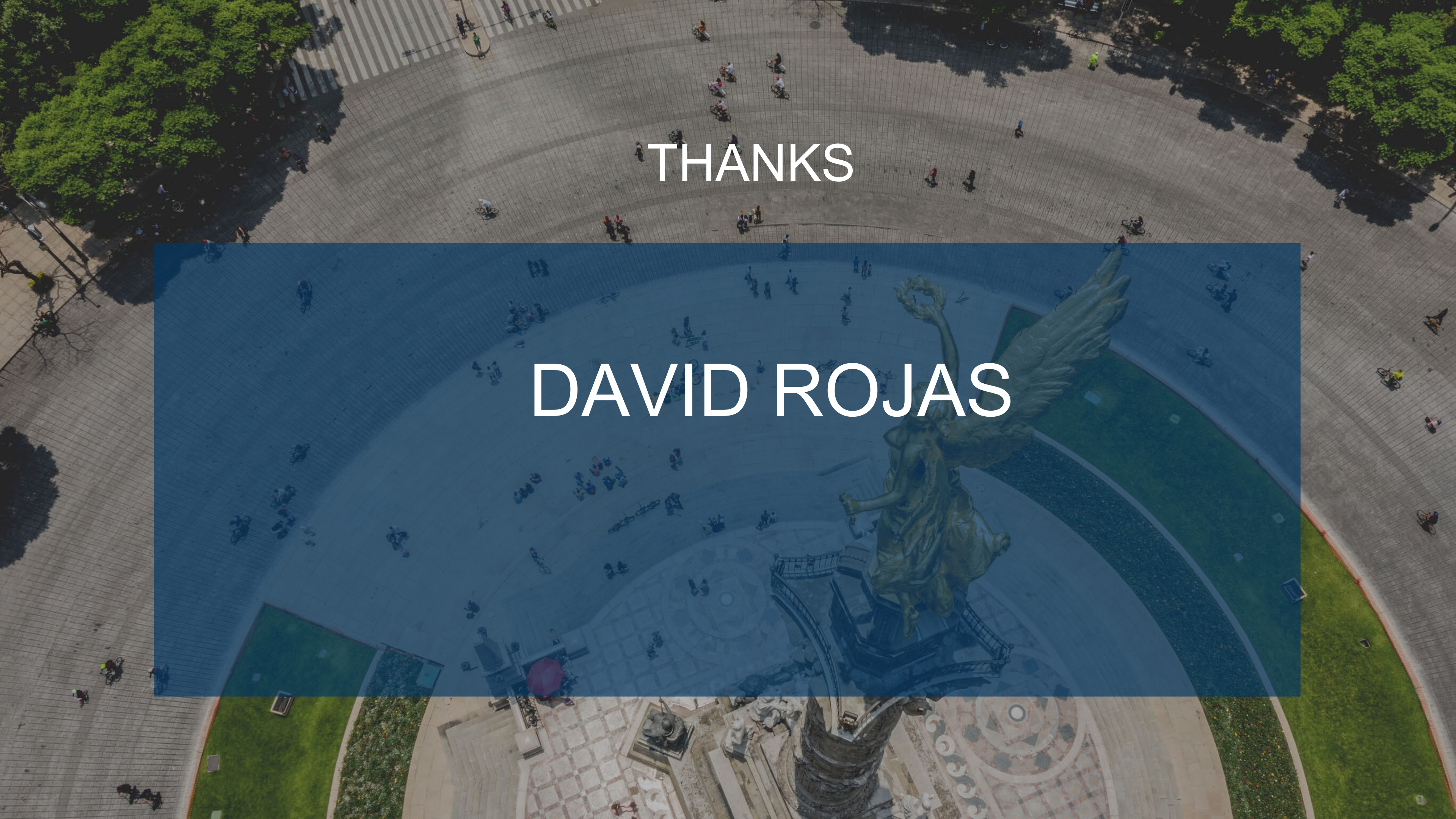


Active Transport



Vegetation



An aerial photograph of a large, circular plaza paved with light-colored tiles. In the center of the plaza stands a large, ornate statue of a winged figure, possibly an angel or a personification of Liberty, holding a torch and a laurel wreath. The statue is surrounded by a circular path. Numerous people are seen walking and cycling throughout the plaza. The edges of the plaza are bordered by green trees and grass. A semi-transparent blue rectangular overlay covers the middle portion of the image, containing the text "DAVID ROJAS".

THANKS

DAVID ROJAS