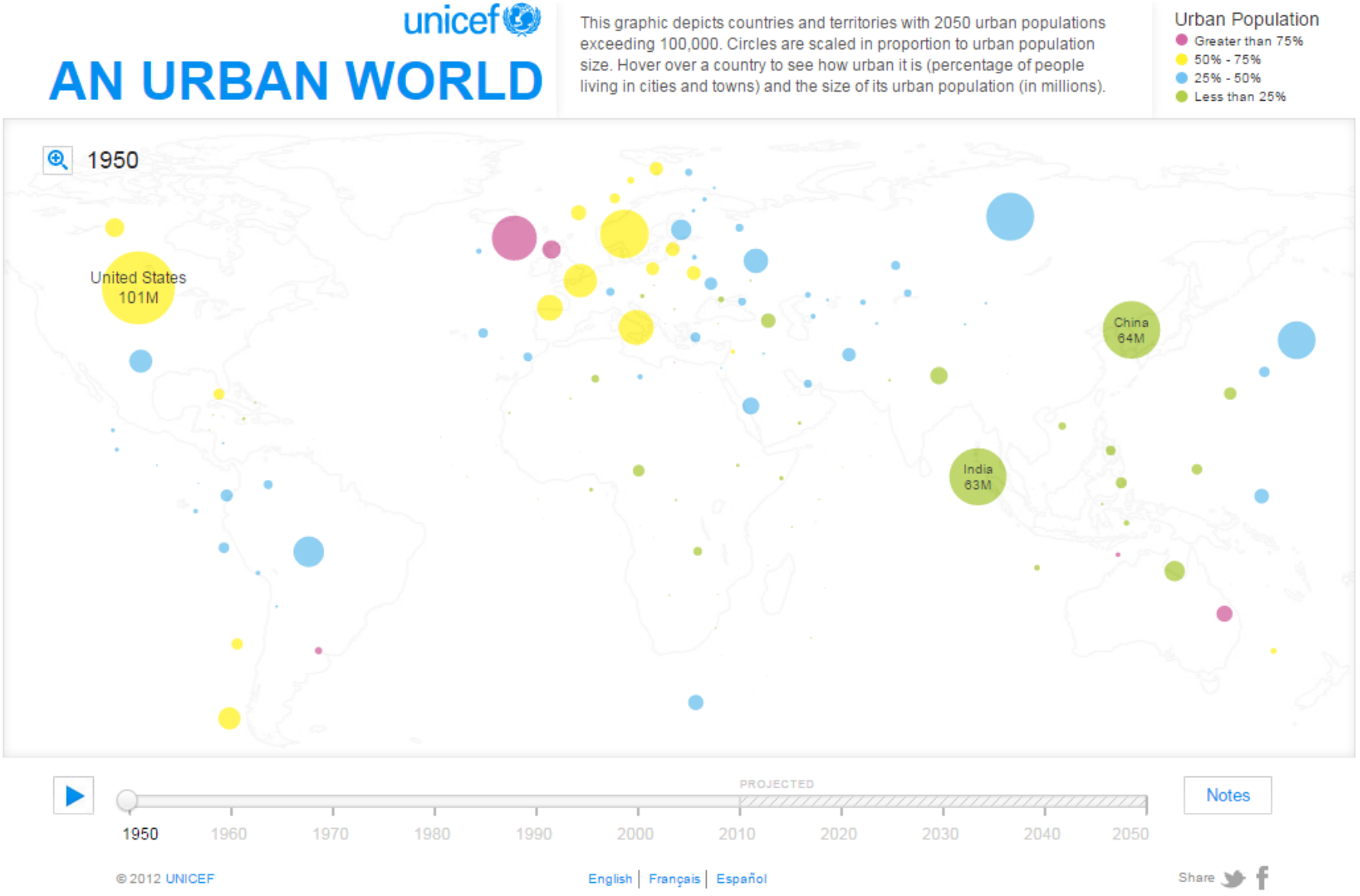
HEALTH IMPACT ASSESSMENT OF URBAN AND TRANSPORT PLANNING

David Rojas-Rueda, MD PhD
ISGlobal-CREAL
8 JUIN 2016



http://www.unicef.org/sowc2012/urbanmap/#

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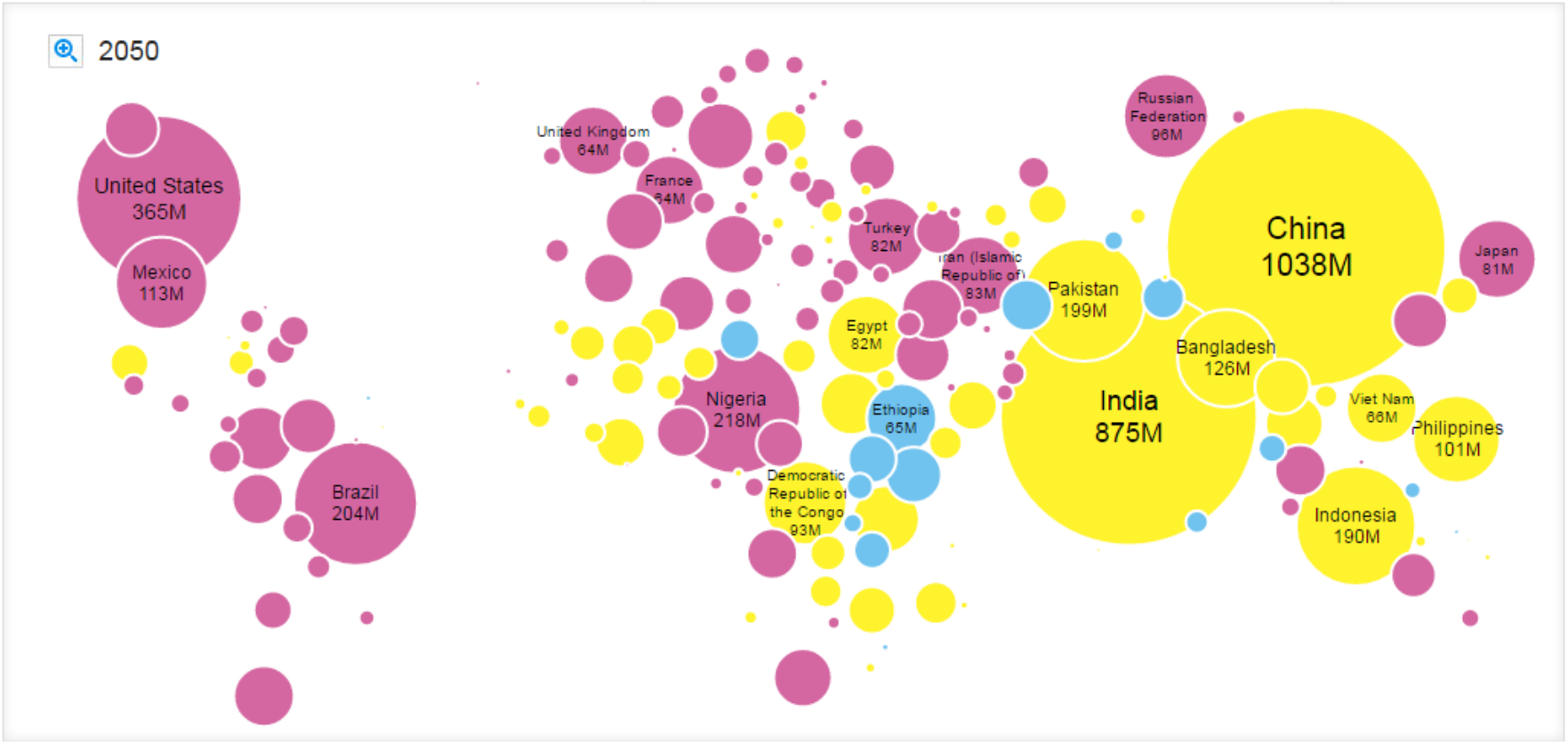
unicef

AN URBAN WORLD

This graphic depicts countries and territories with 2050 urban populations exceeding 100,000. Circles are scaled in proportion to urban population size. Hover over a country to see how urban it is (percentage of people living in cities and towns) and the size of its urban population (in millions).

Urban Population
- Greater than 75%
- 50% - 75%
- 25% - 50%
- Less than 25%



http://www.unicef.org/sowc2012/urbanmap/#

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CHALLENGES

The global challenges we are trying to solve

Rapid unplanned urbanization

- Rising prevalence of NCDs (non communicable diseases) and emerging infectious diseases
- Need for improved access to affordable, quality health services
- Increased greenhouse gas emissions that contribute to climate change, pollution, and poor health
- Unsafe housing, transportation, and physical environments
- Need for enhanced access to healthy foods, clean water, and sanitation
- Vast inequities in opportunities that are compounded by poverty, race, ethnicity, gender, age, migration status, and place of habitation

Cities are the main drivers of national development and present opportunities to transform a nation's health

Opportunities for healthy and sustainable urbanization

- Implement evidence-based programs at the local level and scale them to reduce disease prevalence and incidence
- Develop public-private solutions to create integrated health and social services that are high quality and affordable
- Increase opportunities for pioneering solutions in alternative energy
- Promote innovative policies that change the built environment to promote health and minimize risk of violence and injury
- Support advocacy efforts that encourage good governance, allowing all sectors to come together to enhance access to healthy foods, clean water, sanitation, and social engagement
- Educate and train global leaders in evidence-based and locally relevant solutions to minimize inequities in opportunities

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TOSHIBA
TOSHIBA
TOSHIBA
TOSHIBA
STDK
CHEVROLET
SOUTHPOLE
Kodak
Kodak
Bank of America
WELCOME
AMERICAN EAGLE OUTFITTERS
TOSHIBA
Kodak
Kodak
VORNADO
Yahoo!
NEWSSTAND

Cities

Will we ever get a truly car-free city?

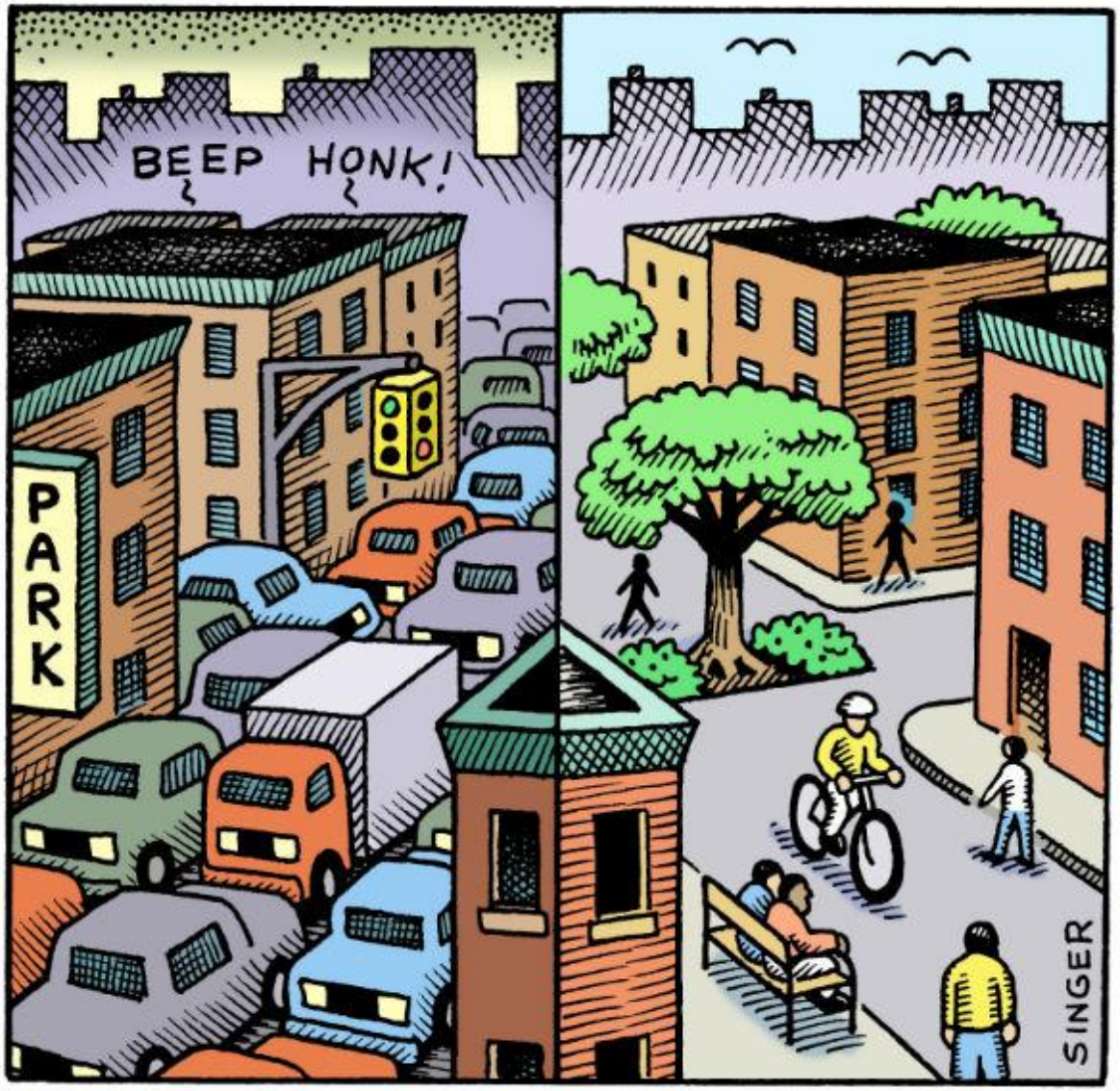
Oslo is the latest city to announce plans which shift the focus away from cars – by banning all private vehicles from the centre by 2019. Car-free days have slashed pollution in Paris while new eco-cities are aiming to design out the need for vehicles – but will cars in cities ever be consigned to history?

Oslo moves to ban cars from city centre within four years

Proposed ban on private vehicles is part of a plan to slash greenhouse gas emissions 50% by 2020 compared to 1990 levels

Downtown Oslo's prioritised bike lane with red tarmac, bus lane and a congested lane of ordinary traffic. Photograph: Grethe Ulgjell/Alamy

DIVIDE CITIES INTO TWO SECTIONS: DRIVING AND NON-DRIVING

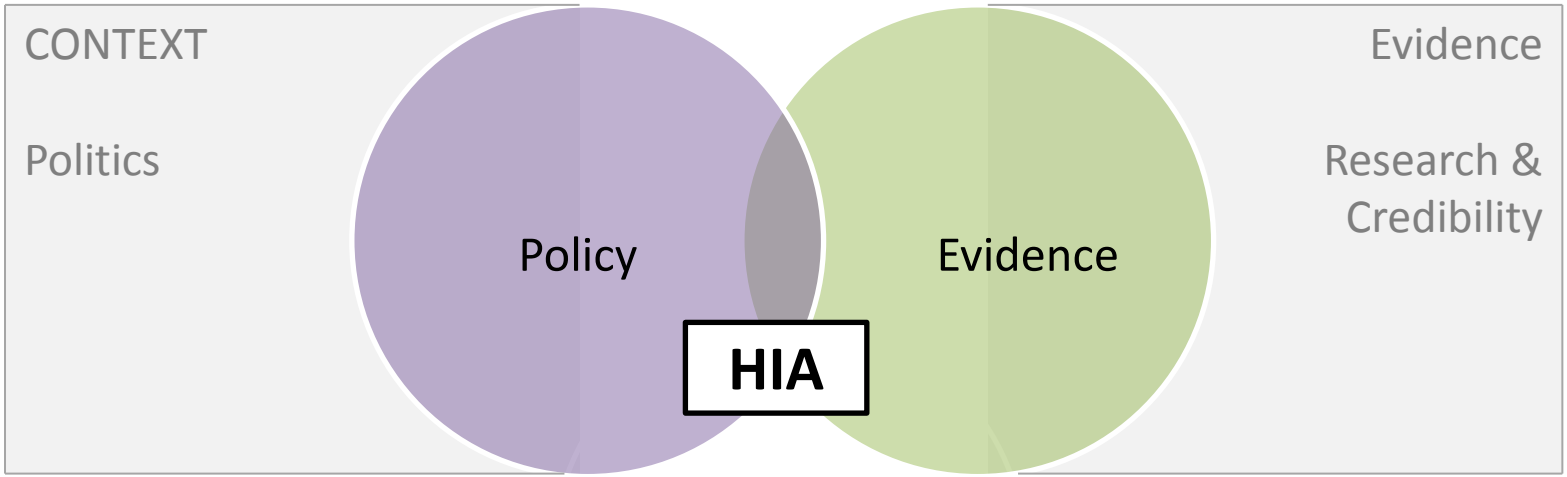


HEALTH IMPACT ASSESSMENT

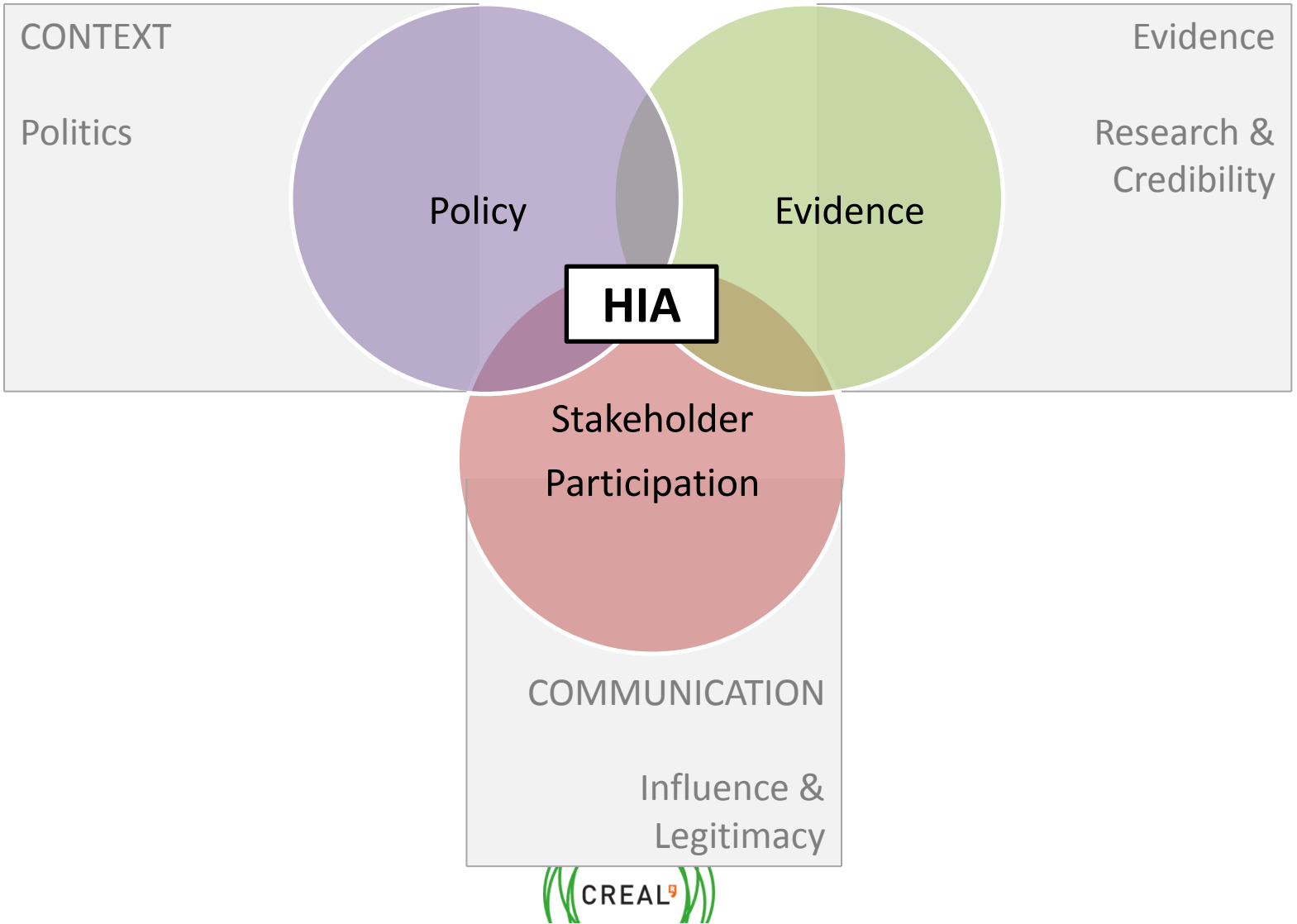
HIA

Health Impact Assessment

Health Impact Assessment



Health Impact Assessment




tapas
ACTIVE TRANSPORTATION
HEALTH IMPACT ASSESSMENT

Table 2| **Main results from health impact assessment of Bicing initiative in Barcelona**

Variables	Relative risk*	AF_{exp}†	Deaths/year
Road traffic injury	1.0007	0.0007	0.03
Air pollution (particulate matter <2.5 μm)	1.002	0.002	0.13
Physical activity	0.80	−0.23	−12.46
Carbon dioxide emissions saved (kg/year)‡	—	—	9 062 344

Rojas-Rueda D, 2011

WALK, BIKE & PUBLIC TRANSPORT

tapas ACTIVE TRANSPORTATION HEALTH IMPACT ASSESSMENT

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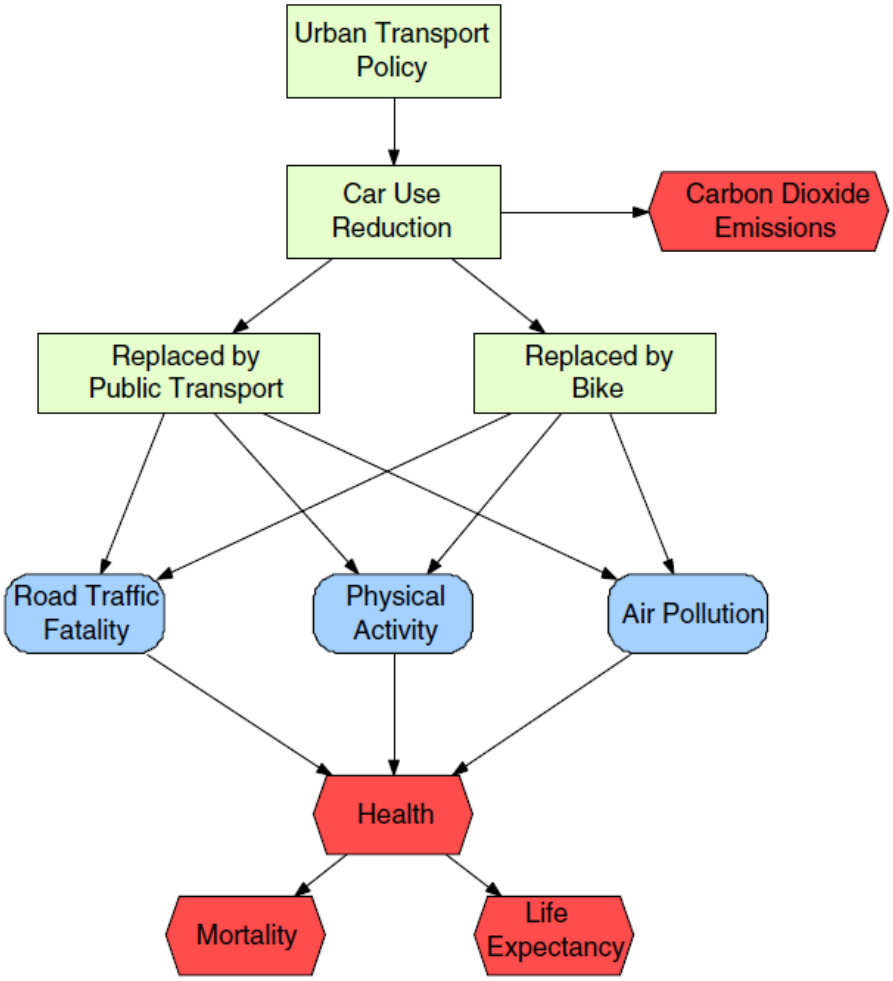
Contents lists available at SciVerse ScienceDirect

Environment International

journal homepage: www.elsevier.com/locate/envint

Replacing car trips by increasing bike and public transport in the greater Barcelona metropolitan area: A health impact assessment study

D. Rojas-Rueda [a,b,c,d,*], A. de Nazelle [a,b,c,d], O. Teixidó [e], M.I. Nieuwenhuisen [a,b,c,d]



Rojas-Rueda D, 2012

Scenarios and results (in travellers) of replacing car trips by bike and/or public transport.

	Inside Barcelona scenarios [a]			
	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Car trips reduction	20%	40%	20%[c]	40%[c]
Trips/day replaced by Bike (%)	94,460 (100)	188,920 (100)	47,230 (50)	94,460 (50)
Trips/day replaced by Public Transport (%) [f]	0	0	47,230 (50)	94,460 (50)
Health determinants (deaths/year)				
Air pollution (PM2.5)	0.57	1.15	0.33	0.67
Road traffic fatality	0.08	0.17	−0.01	−0.02
Physical activity	−33.73	−67.46	−22.2	−44.4
Total				
Deaths/year [g]	−33.06	−66.12	−21.88	−43.76
Months gained [h]	6.5	6.5	4.7	4.7

Rojas-Rueda D, 2012

6 European cities

Barcelona

Basel

Copenhagen

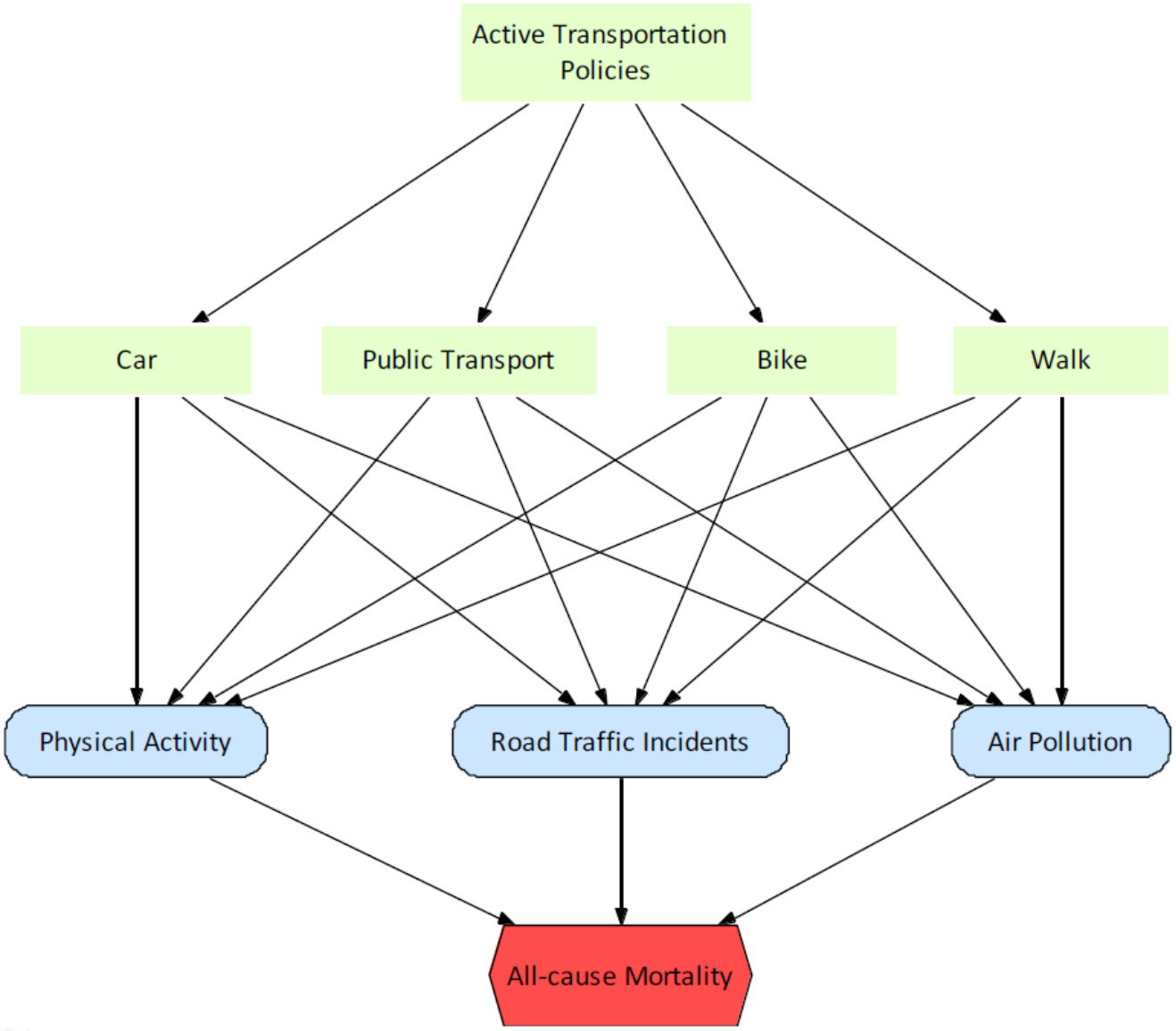
Paris

Prague

Warsaw

Rojas-Rueda D, 2016

CONCEPTUAL FRAMEWORK



Rojas-Rueda D, 2016

SCENARIOS

Scenarios	Description
A	Attaining the levels of cycling of the city of *Copenhagen* (35% of all trips made by bicycle)
B	Attaining the levels of walking of the city of *Paris* (50% of all trips made by walking)

Rojas-Rueda D, 2016

ANNUAL ESTIMATED DEATHS

Scenario		Barcelona	Basel	Copenhagen	Paris	Prague	Warsaw
A	35% of all trips by bicycles	-37·8 (-24, -56)	-5·7 (-3, -9)	-	-37·4 (-18, -64)	-61·0 (-29, -104)	-113·4 (-76, -163)
B	50% of all trips walking	-3·0 (-2, -4)	-6·2 (-4, -9)	-3·9 (-2, -6)	-	-11·3 (-3, -21)	-19·8 (-3, -42)
Results by each 100,000 travellers who shifted modes (new cyclists or pedestrians).							
A	Cyclist increment	-7·1 (-4, -10)	-5·5 (-3, -9)	-	-6·5 (-3, -11)	-13·8 (-6, -23)	-19·6 (-13, -28)
B	Pedestrian increment	-4·7 (-3, -7)	-7·7 (-5, -11)	-3·1 (-1, -5)	-	-3·4 (-1, -6)	-3·8 (-1, -8)

Rojas-Rueda D, 2016

PHYSICAL ACTIVITY THROUGH SUSTAINABLE TRANSPORT APPROACHES

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14 partners

Vienna

Zurich

Antwerp

Barcelona

Örebro

Rome

London

7 Case Study Cities

Workshops & Interviews

Key stakeholders from cities: transport & health

Policies, strategies, challenges, barriers, factors of success

Longitudinal survey

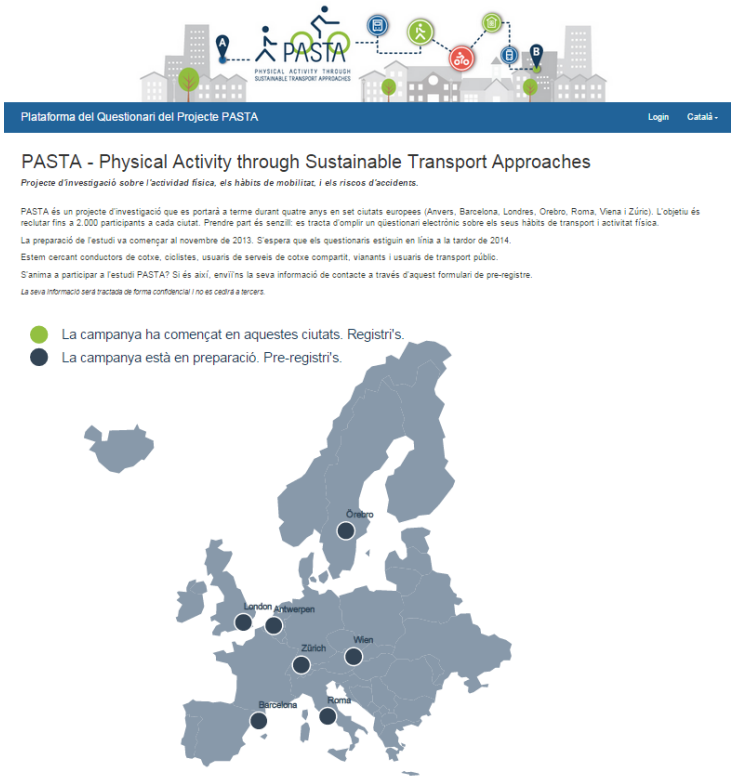
General public (2,000 each city)

Mobility diary, physical activity, accidents, air pollution.

Good practice examples & Improved HEAT

Outcome for the cities (politicians, planners, stakeholders)

SURVEY



14,000 volunteers
(2,000 per city)
1 year follow-up

PASTA

http://survey.pastaproject.eu

SEVENTH FRAMEWORK PROGRAMME

120 volunteers

All week

µ-Aethalometer

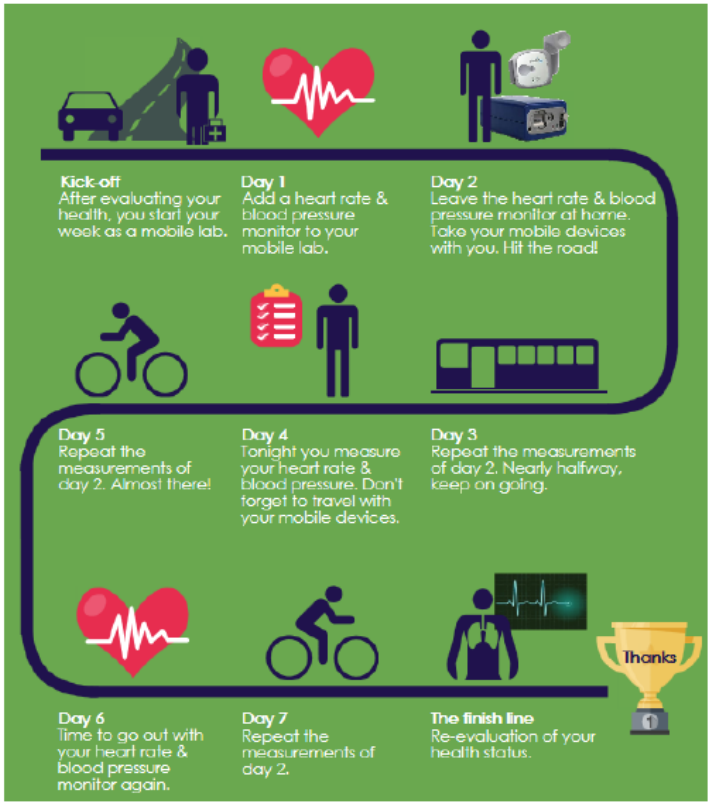
GPS

Smartphone (ExpoApp)

Sensewear

Zephyr BioHarness

The measurement week



Before and after

Retinal pictures

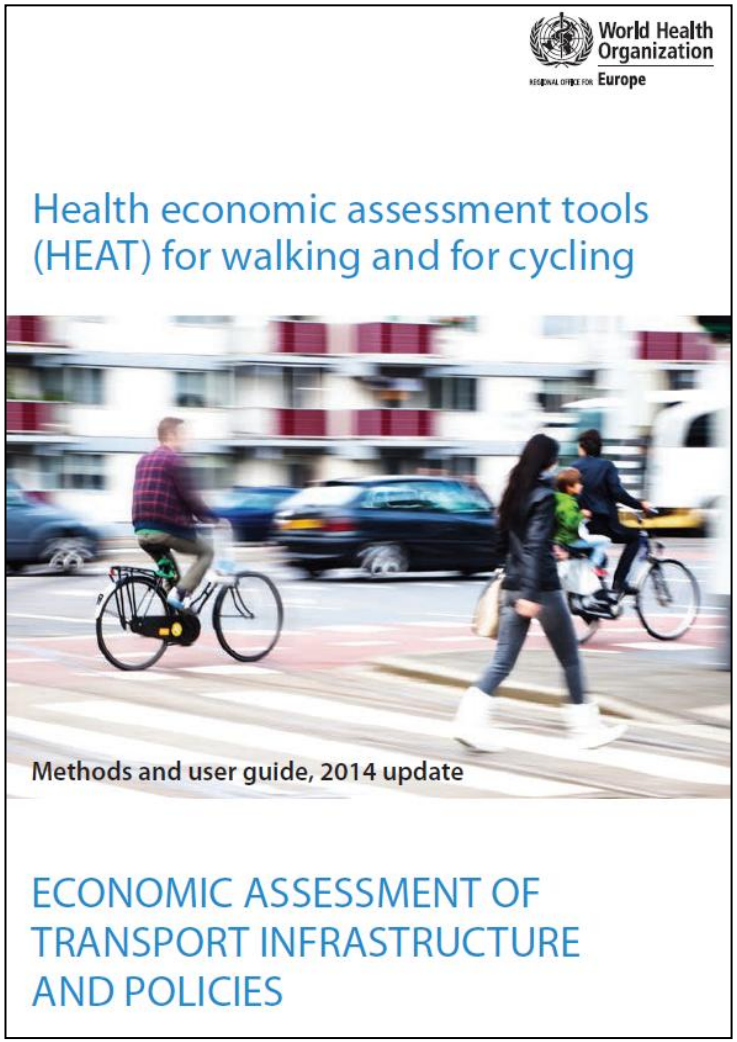
Blood pressure

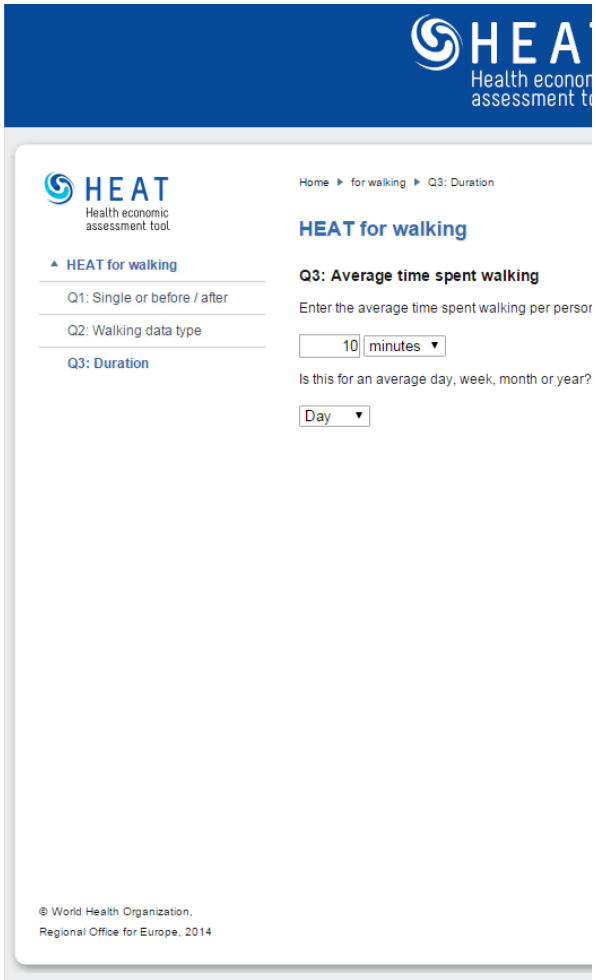
Spirometry: lung function

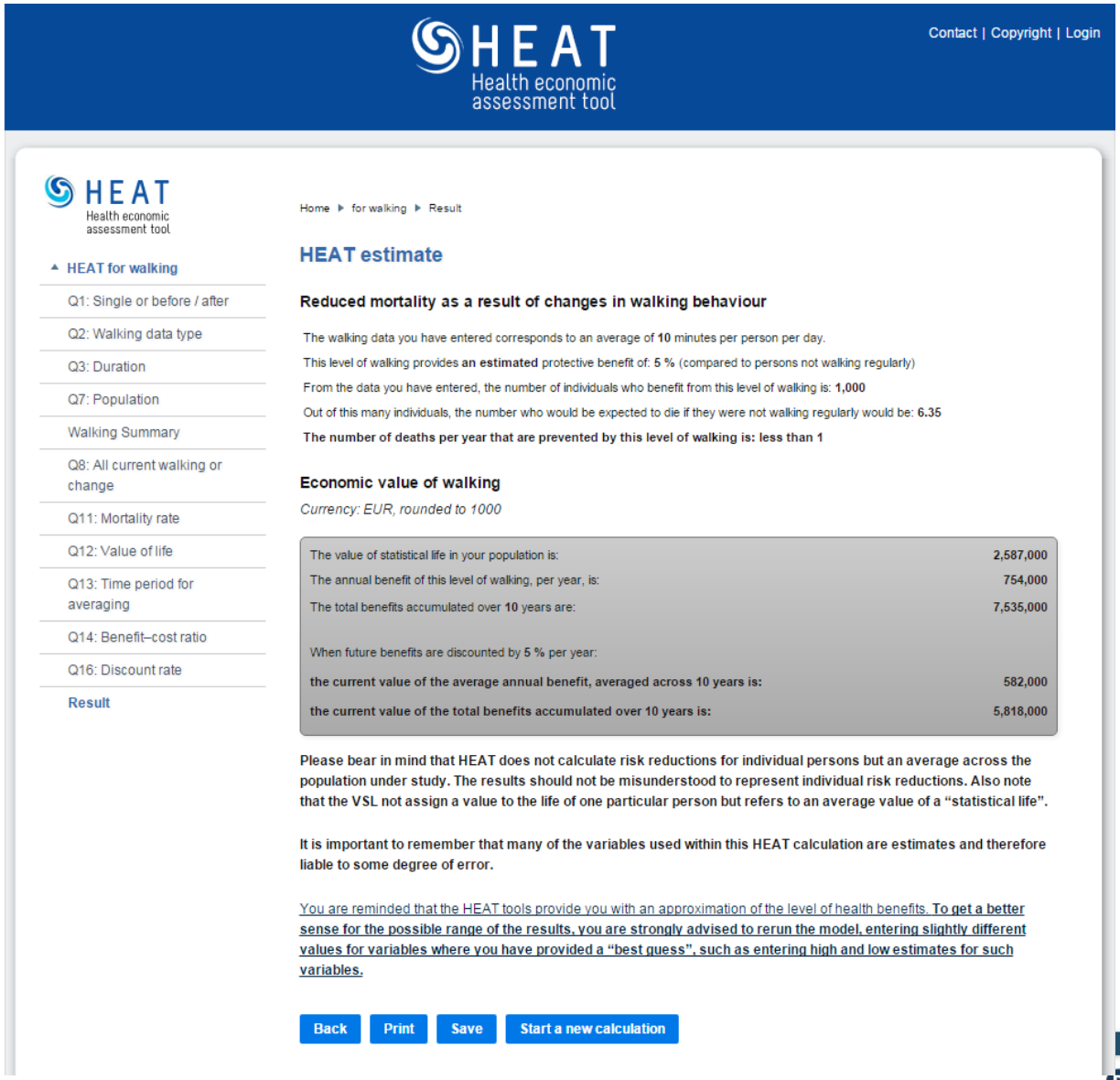
Concentration eNO: lung inflammation

Case studies

Top measure	Description
Barcelona	Super-blocks
Antwerp	Construction of cycling bridge
London	Redevelopment of 2012 Olympic Park
Örebro	Workplace mobility management
Rome	Deployment of 3,000 bicycle racks
Vienna	Personalized mobility consultancy
Zurich	E-bikes, car-sharing

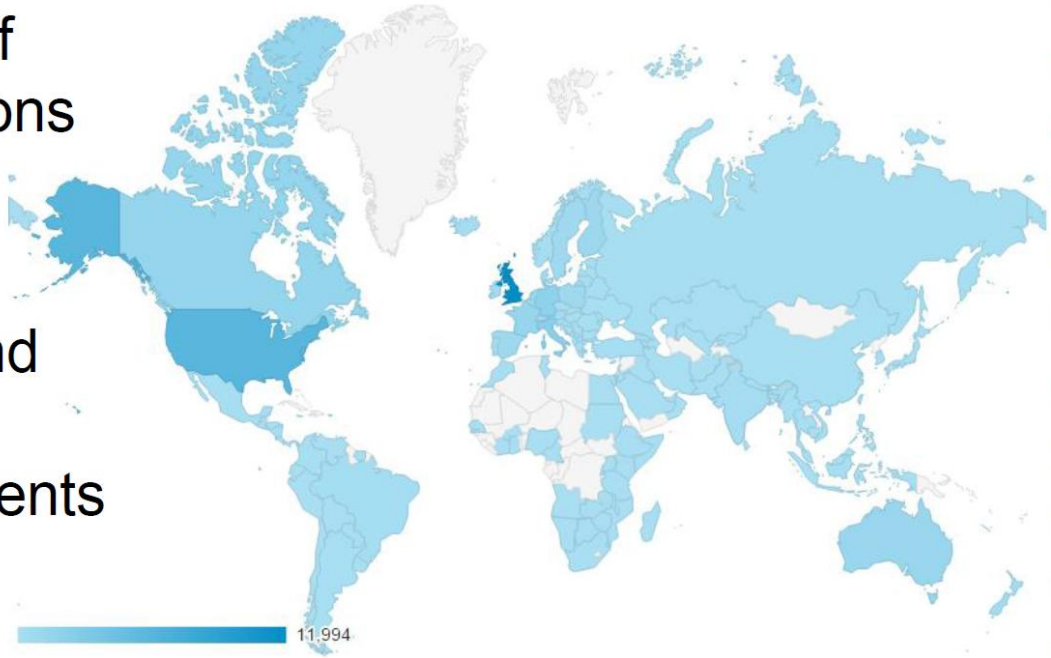

World Health Organization
Europe
Health economic assessment tools (HEAT) for walking and for cycling
Methods and user guide, 2014 update
ECONOMIC ASSESSMENT OF TRANSPORT INFRASTRUCTURE AND POLICIES


HEAT
Health economic assessment tool
HEAT
Health economic assessment tool
HEAT for walking
Q1: Single or before / after
Q2: Walking data type
Q3: Duration
Home ▸ for walking ▸ Q3: Duration
HEAT for walking
Q3: Average time spent walking
Enter the average time spent walking per perso
10 minutes
Is this for an average day, week, month or year?
Day
© World Health Organization,
Regional Office for Europe, 2014


HEAT
Health economic assessment tool
Contact | Copyright | Login
HEAT
Health economic assessment tool
HEAT for walking
Q1: Single or before / after
Q2: Walking data type
Q3: Duration
Q7: Population
Walking Summary
Q8: All current walking or change
Q11: Mortality rate
Q12: Value of life
Q13: Time period for averaging
Q14: Benefit–cost ratio
Q16: Discount rate
Result
Home ▸ for walking ▸ Result
HEAT estimate
Reduced mortality as a result of changes in walking behaviour
The walking data you have entered corresponds to an average of 10 minutes per person per day.
This level of walking provides an estimated protective benefit of: 5 % (compared to persons not walking regularly)
From the data you have entered, the number of individuals who benefit from this level of walking is: 1,000
Out of this many individuals, the number who would be expected to die if they were not walking regularly would be: 6.35
The number of deaths per year that are prevented by this level of walking is: less than 1
Economic value of walking
Currency: EUR, rounded to 1000
The value of statistical life in your population is: 2,587,000
The annual benefit of this level of walking, per year, is: 754,000
The total benefits accumulated over 10 years are: 7,535,000
When future benefits are discounted by 5 % per year:
the current value of the average annual benefit, averaged across 10 years is: 582,000
the current value of the total benefits accumulated over 10 years is: 5,818,000
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 VSL 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 this HEAT calculation are estimates and therefore liable to some degree of error.
You are reminded that the HEAT tools provide you with an approximation of the level of health benefits. To get a better sense for the possible range of the results, you are strongly advised to rerun the model, entering slightly different values for variables where you have provided a "best guess", such as entering high and low estimates for such variables.
Back
Print
Save
Start a new calculation

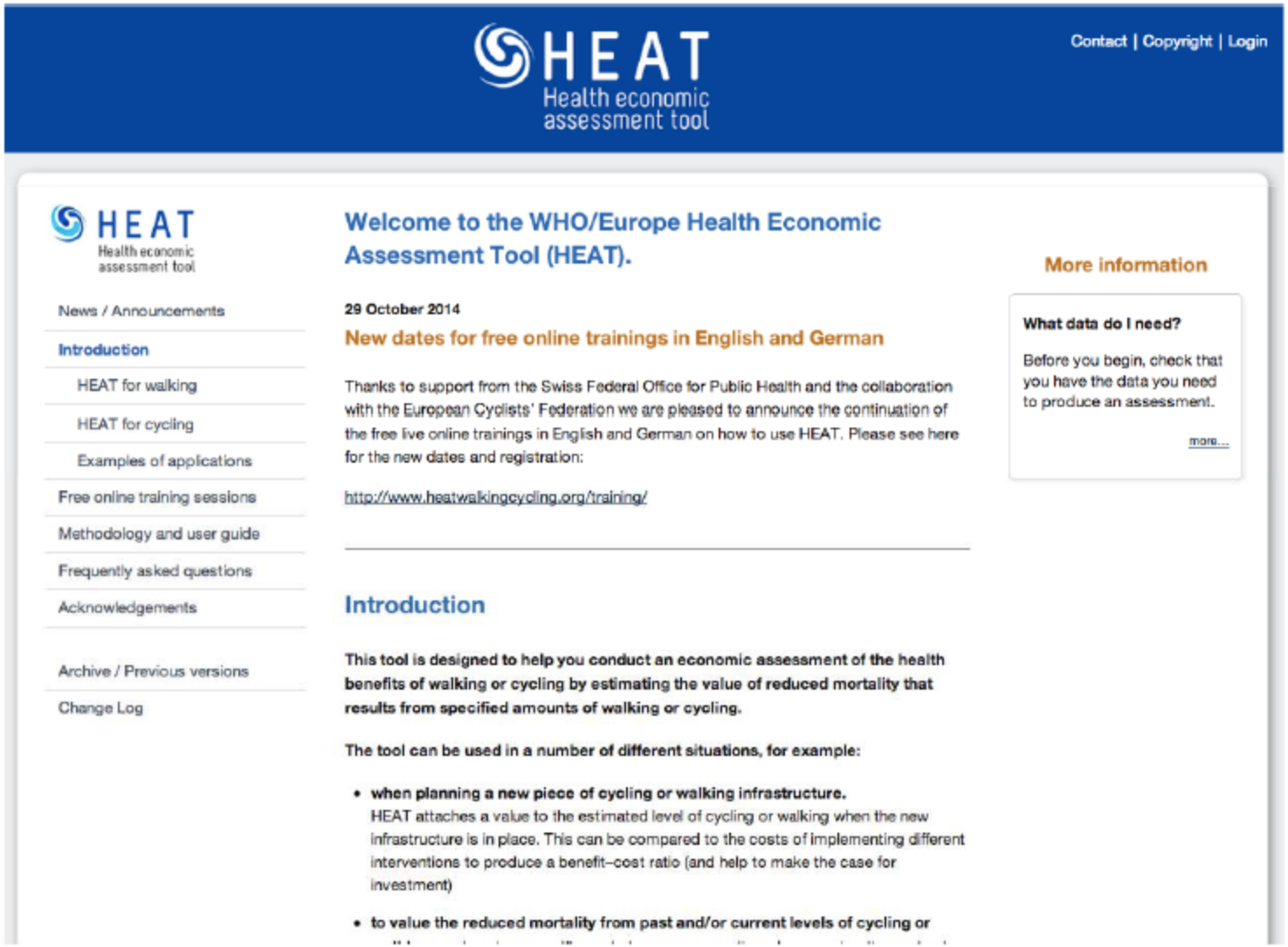
Success: worldwide use

- Project website visited over 38,000 times by over 25,000 visitors since 2011
- Variety of applications
- Method adopted by UK and Swedish governments

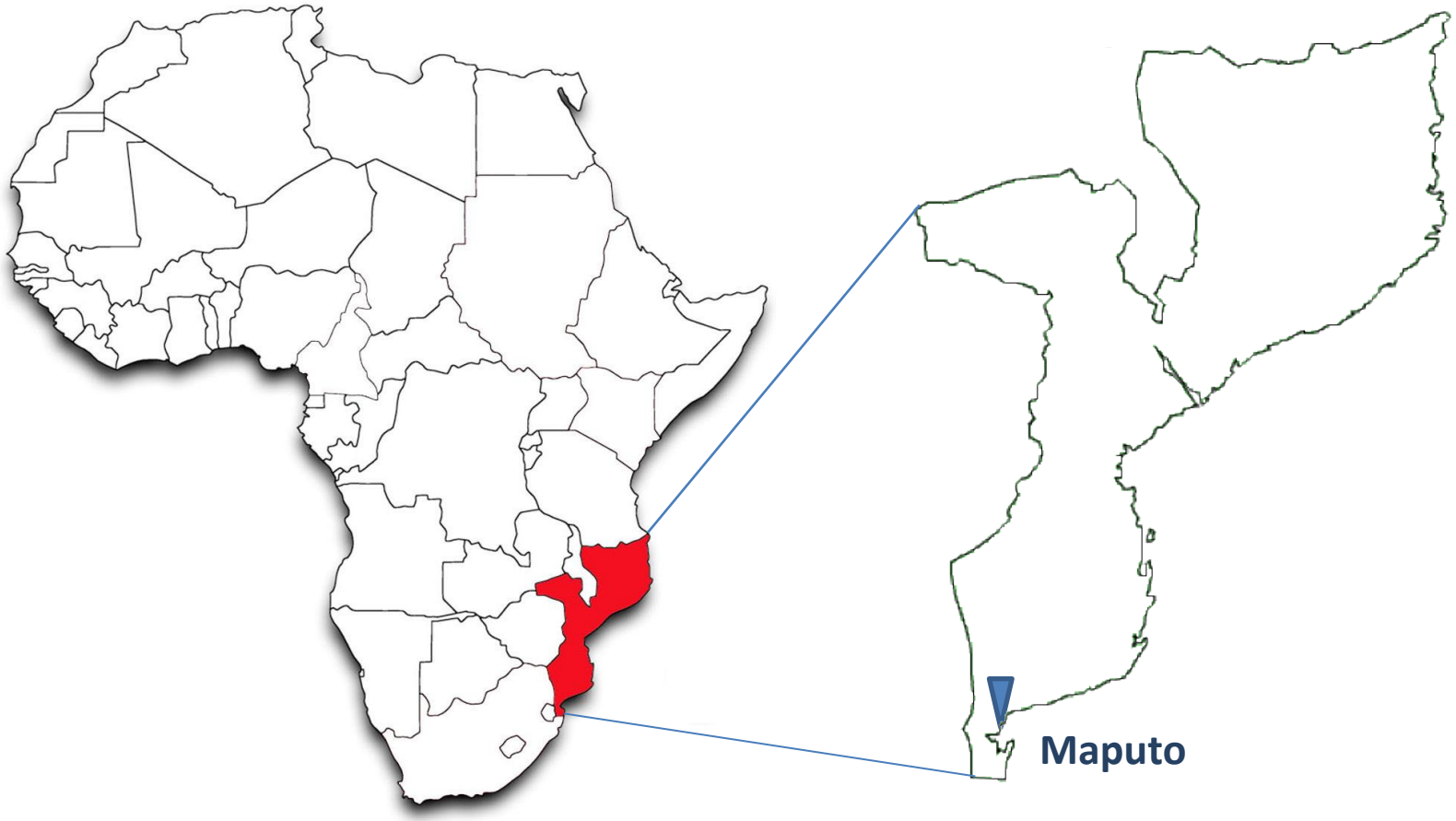


1.	United Kingdom
2.	United States
3.	Italy
4.	Germany
5.	Canada
6.	France
7.	Australia
8.	Finland
9.	Poland
0.	Spain
1.	Belgium
2.	Sweden
3.	Netherlands
4.	Switzerland
5.	Denmark

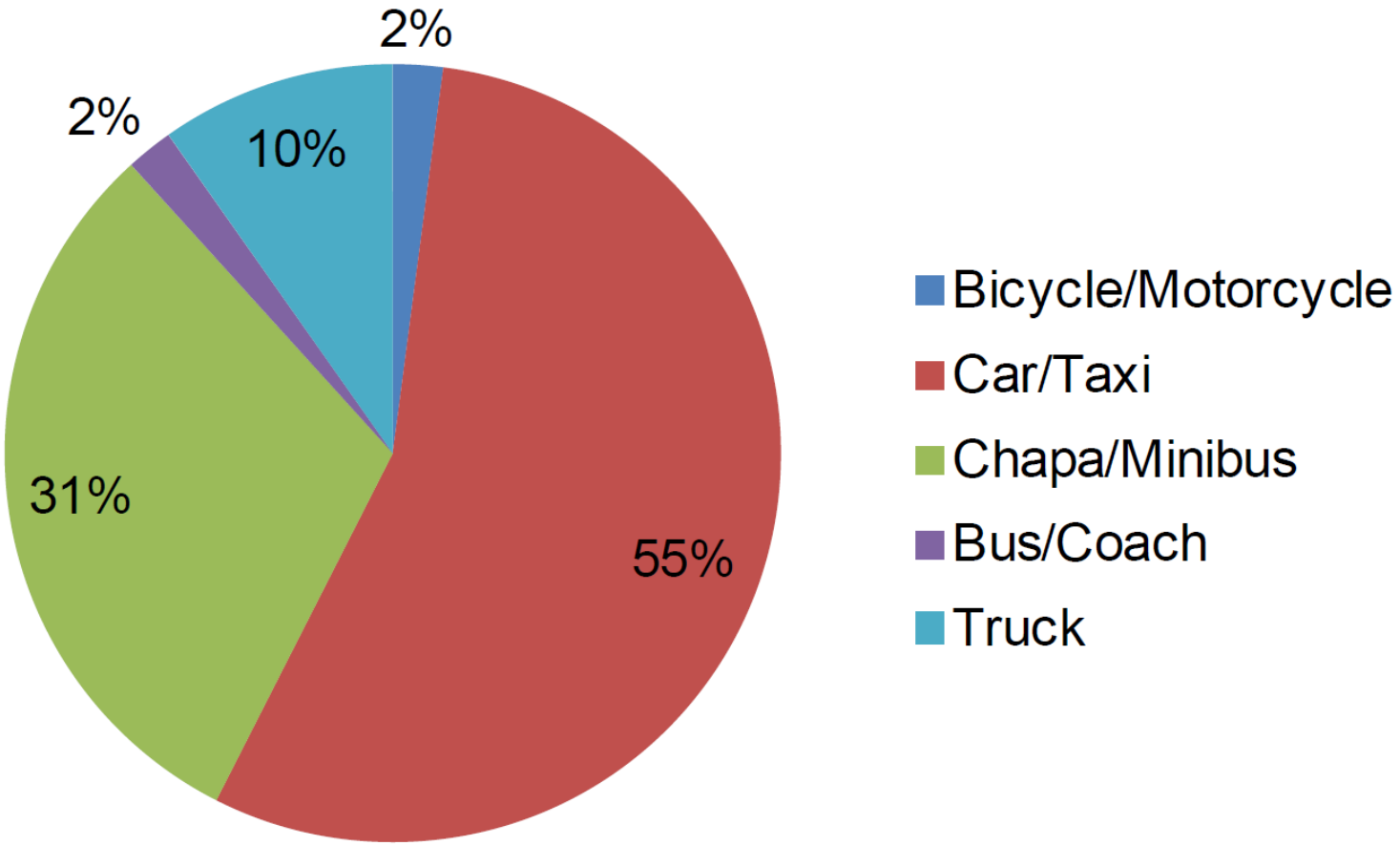
www.heatwalkingcycling.org



Maputo – Mozambique

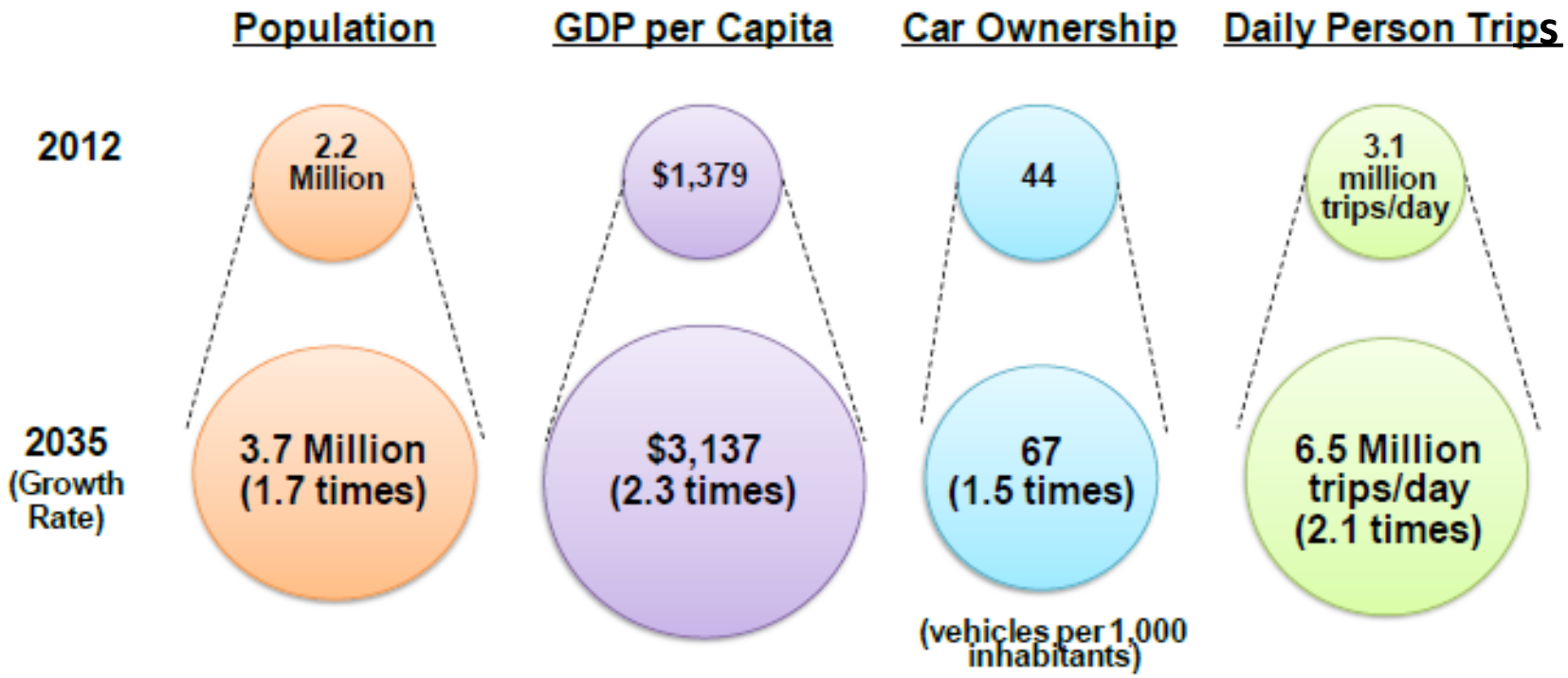


TRIPS IN MAPUTO



Source: JICA, 2014

GREATER MAPUTO



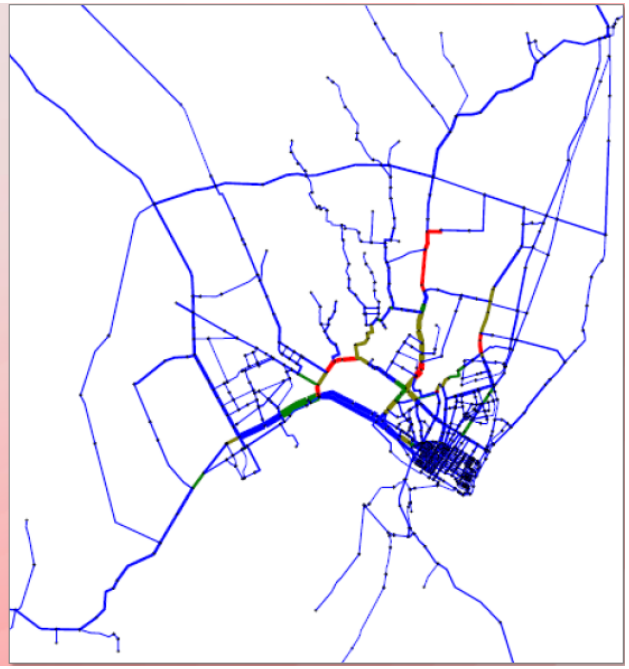
Source: JICA, 2014


12-b

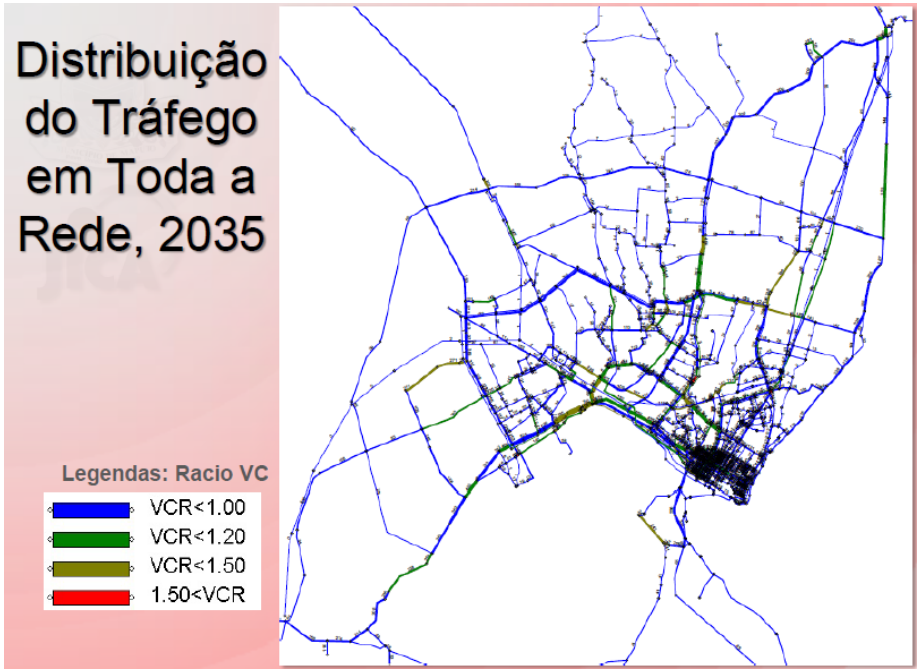
FUTURE OF MAPUTO

Tráfego Actual (2012) na Rede Base

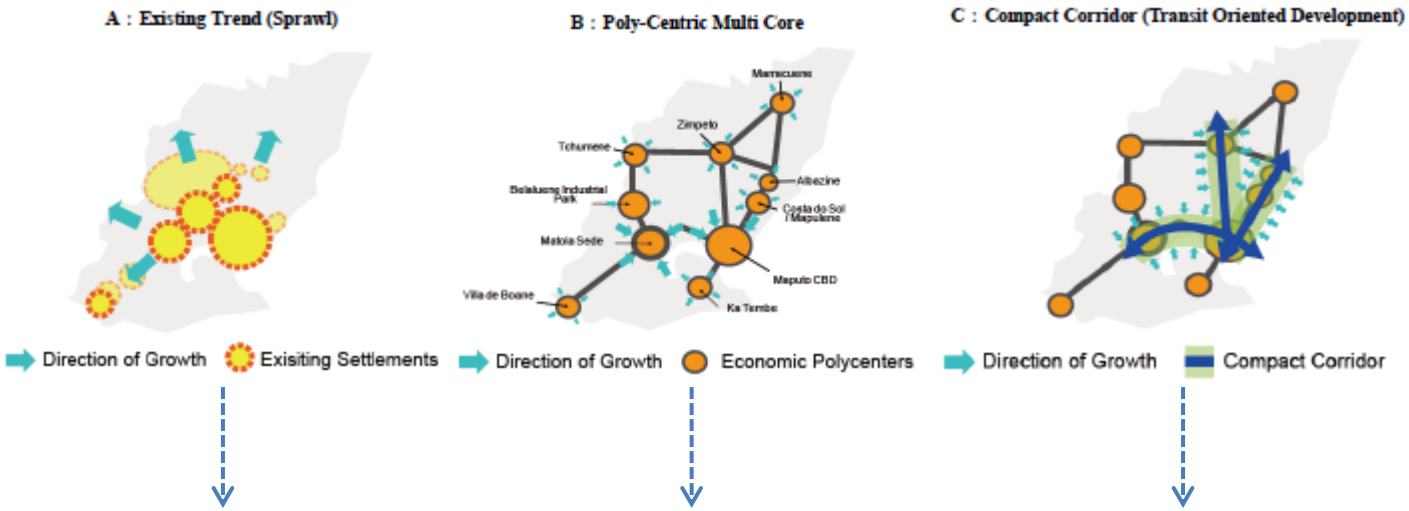
(Baseado nas tendências actuais da rede existente e nos Projectos em curso e em carteira)



Distribuição do Tráfego em Toda a Rede, 2035



URBAN MASTER PLAN



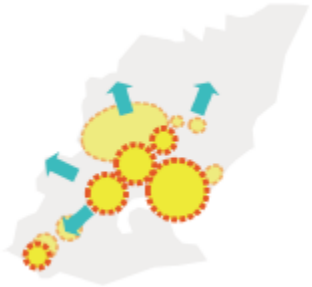
Car

Public Transport
Car

Public Transport

URBAN MASTER PLAN

A : Existing Trend (Sprawl)



Direction of Growth Exisiting Settlements

Car

B : Poly-Centric Multi Core

Direction of Growth Economic Polycenters

Public Transport
Car

C : Compact Corridor (Transit Oriented Development)

Direction of Growth Compact Corridor

Public Transport

Scenario D:

Scenario C
+
Biking & Walking

Public Transport
Walking
Cycling

URBAN PLANNING

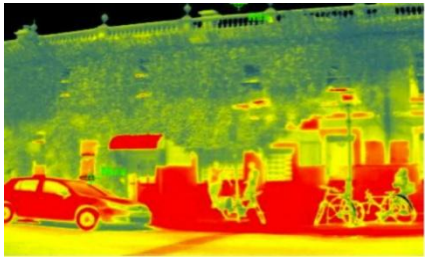
Air pollution

Noise

Urban Environment

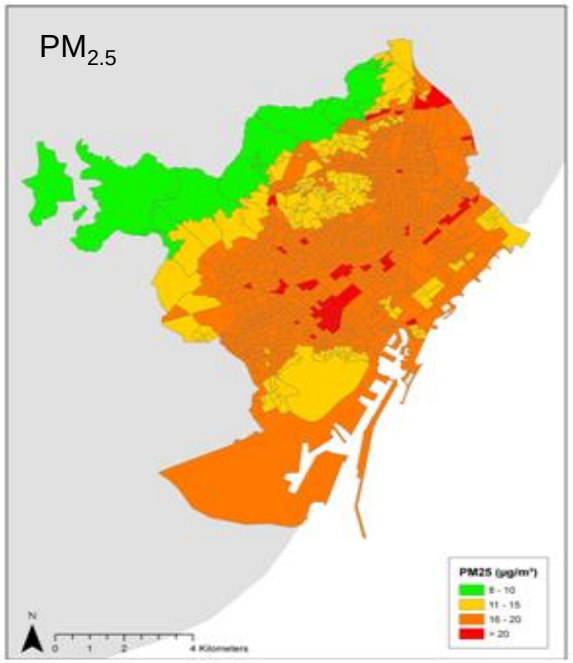
Physical inactivity

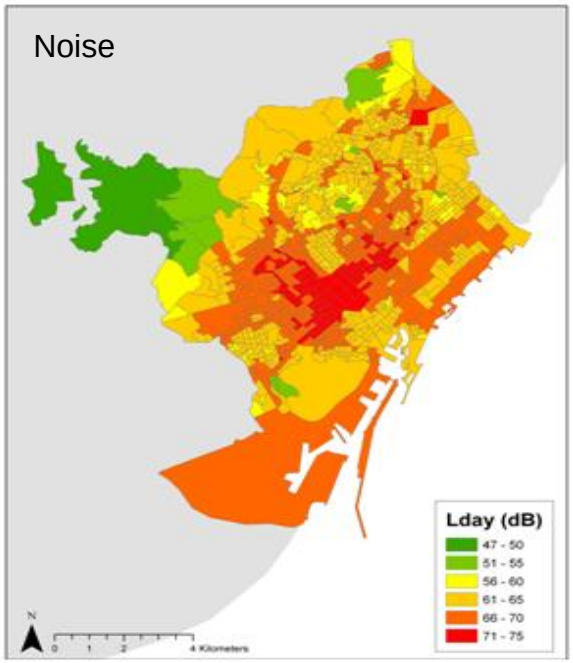
Heat

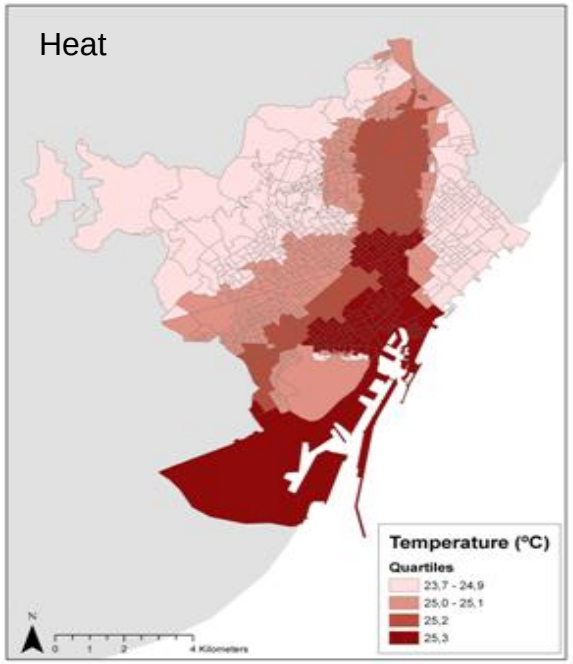


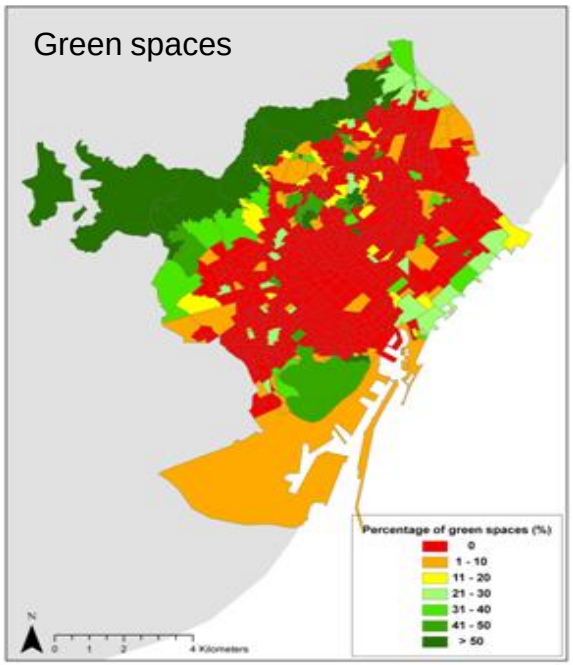
Lack of green space

CREAL

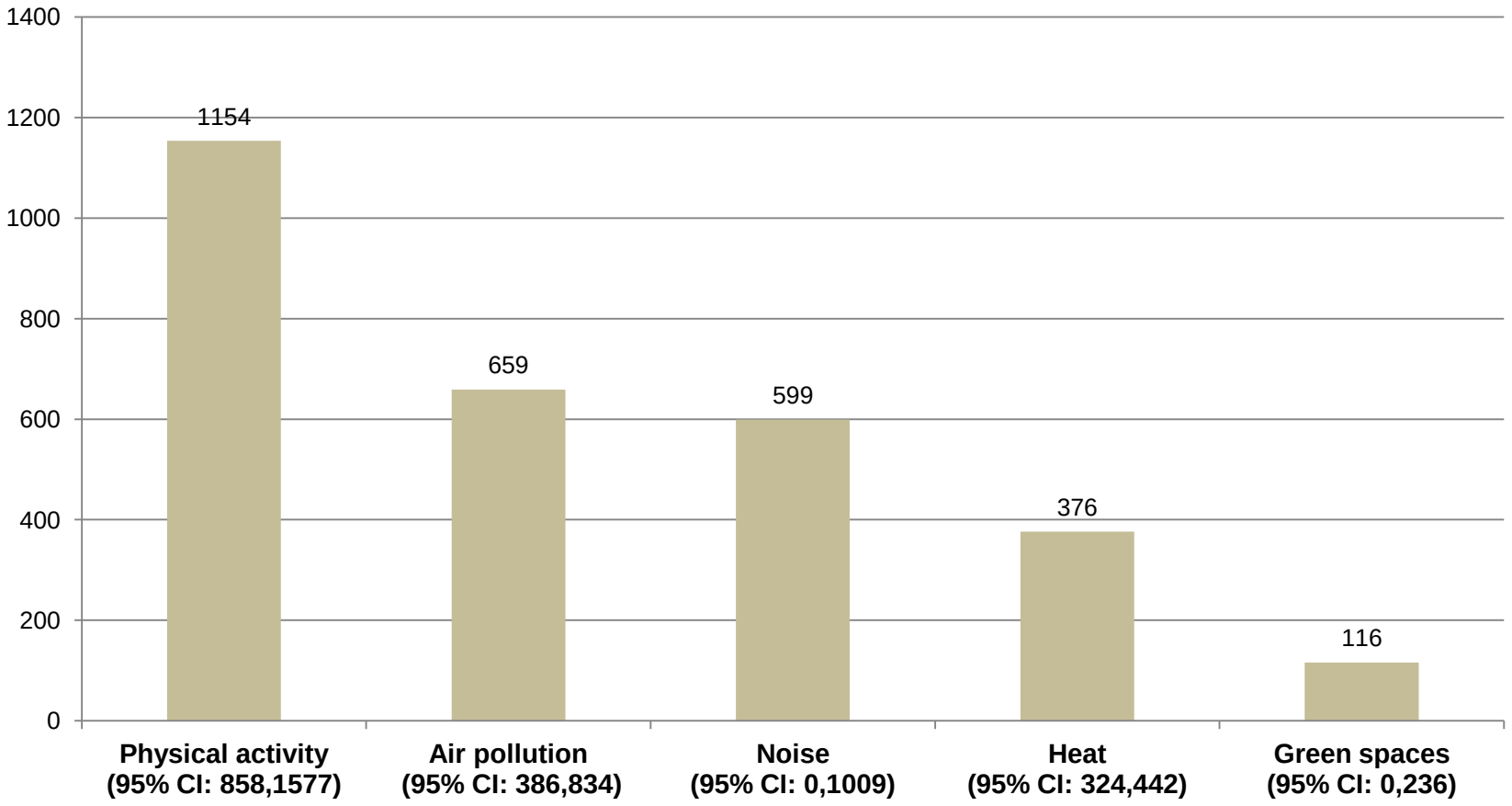

$PM_{2.5}$
PM25 (µg/m³)
8 - 10
11 - 15
16 - 20
> 20
N
0 1 2 4 Kilometers


Noise
Lday (dB)
47 - 50
51 - 55
56 - 60
61 - 65
66 - 70
71 - 75
N
0 1 2 4 Kilometers


Heat
Temperature (°C)
Quartiles
23,7 - 24,9
25,0 - 25,1
25,2
25,3
N
0 1 2 4 Kilometers


Green spaces
Percentage of green spaces (%)
0
1 - 10
11 - 20
21 - 30
31 - 40
41 - 50
> 50
N
0 1 2 4 Kilometers

RESULTS – ANNUAL MORTALITY



DISCUSSION

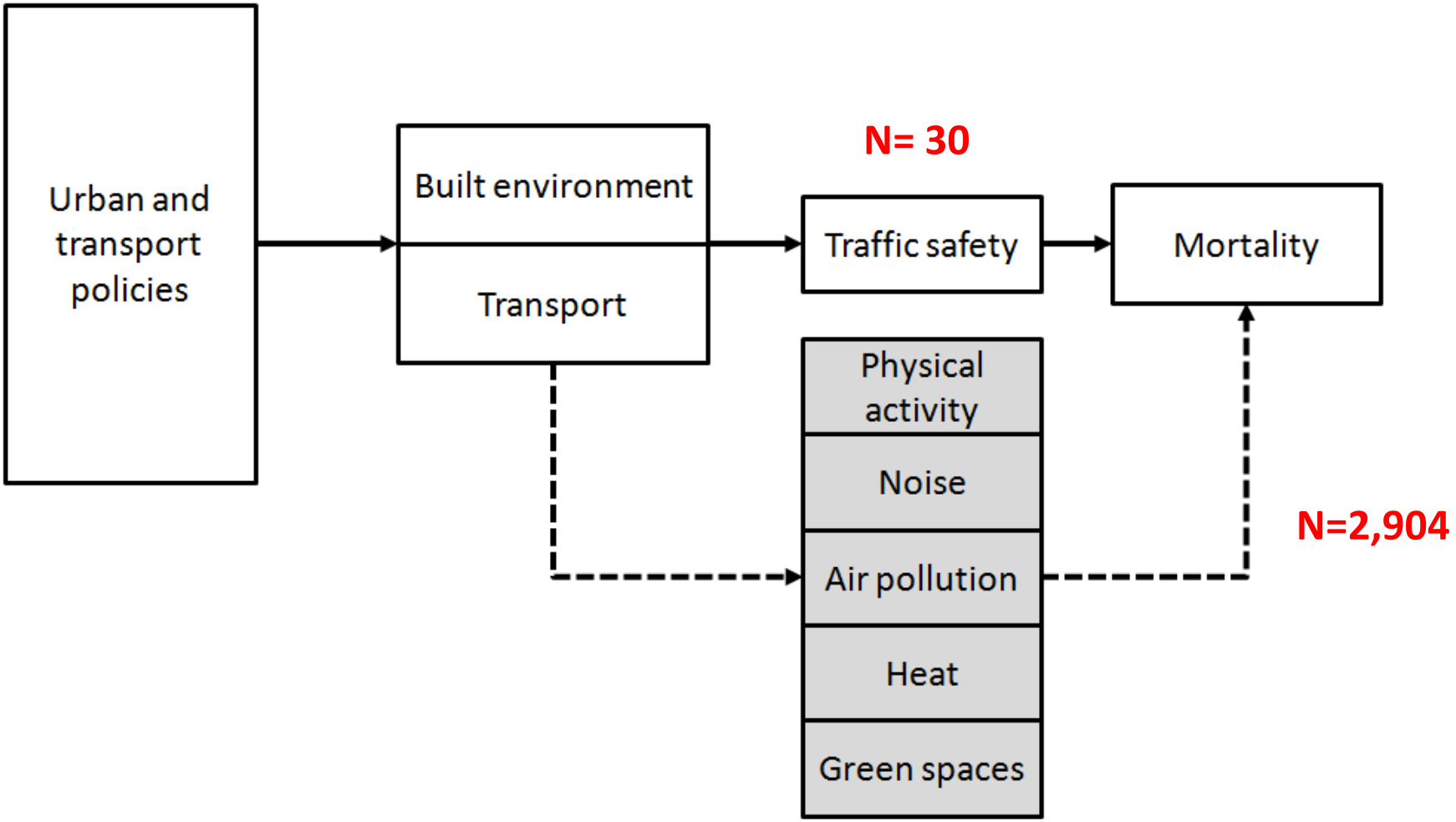
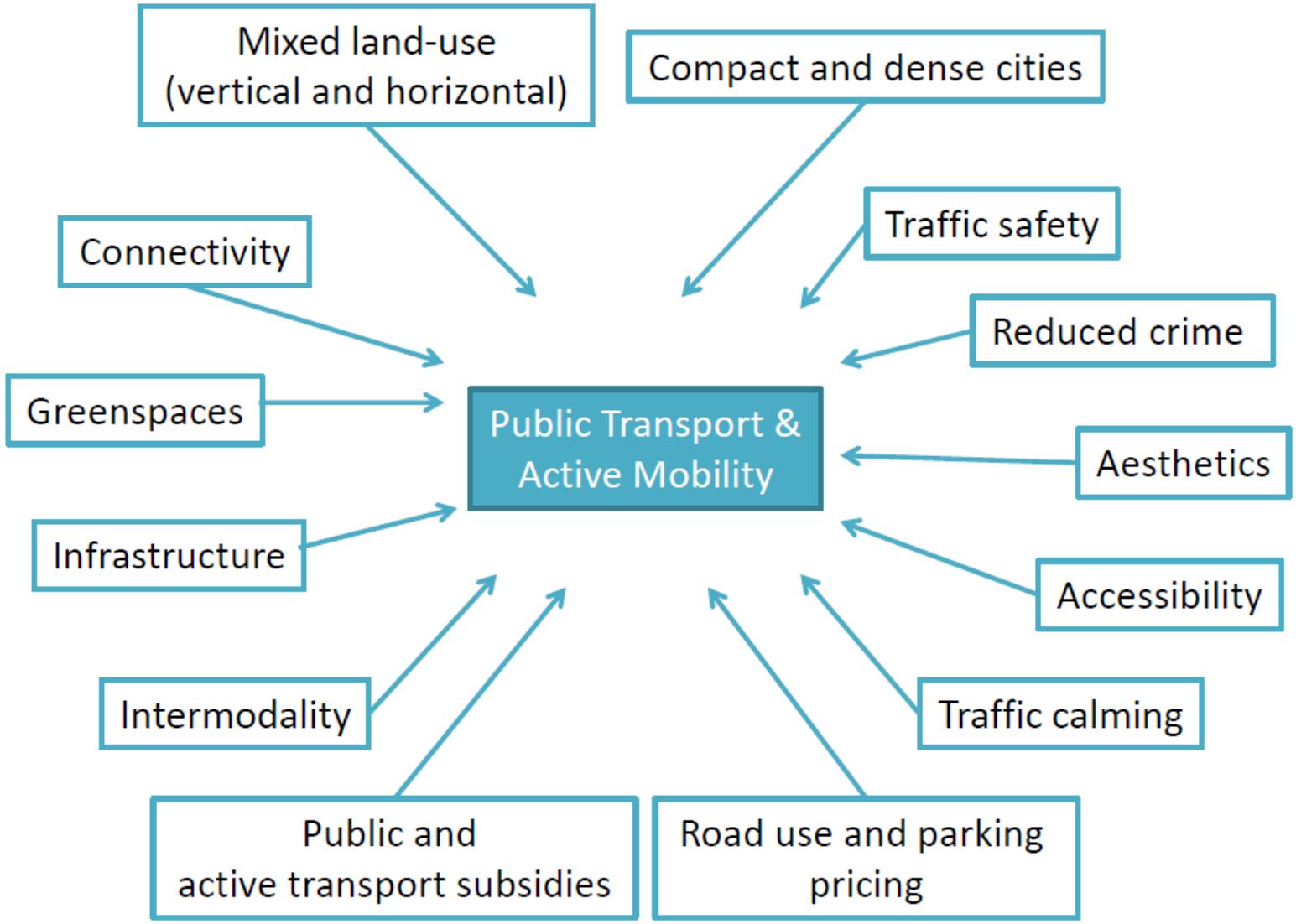

Urban and transport policies
Built environment
Transport
N= 30
Traffic safety
Mortality
Physical activity
Noise
Air pollution
Heat
Green spaces
N=2,904

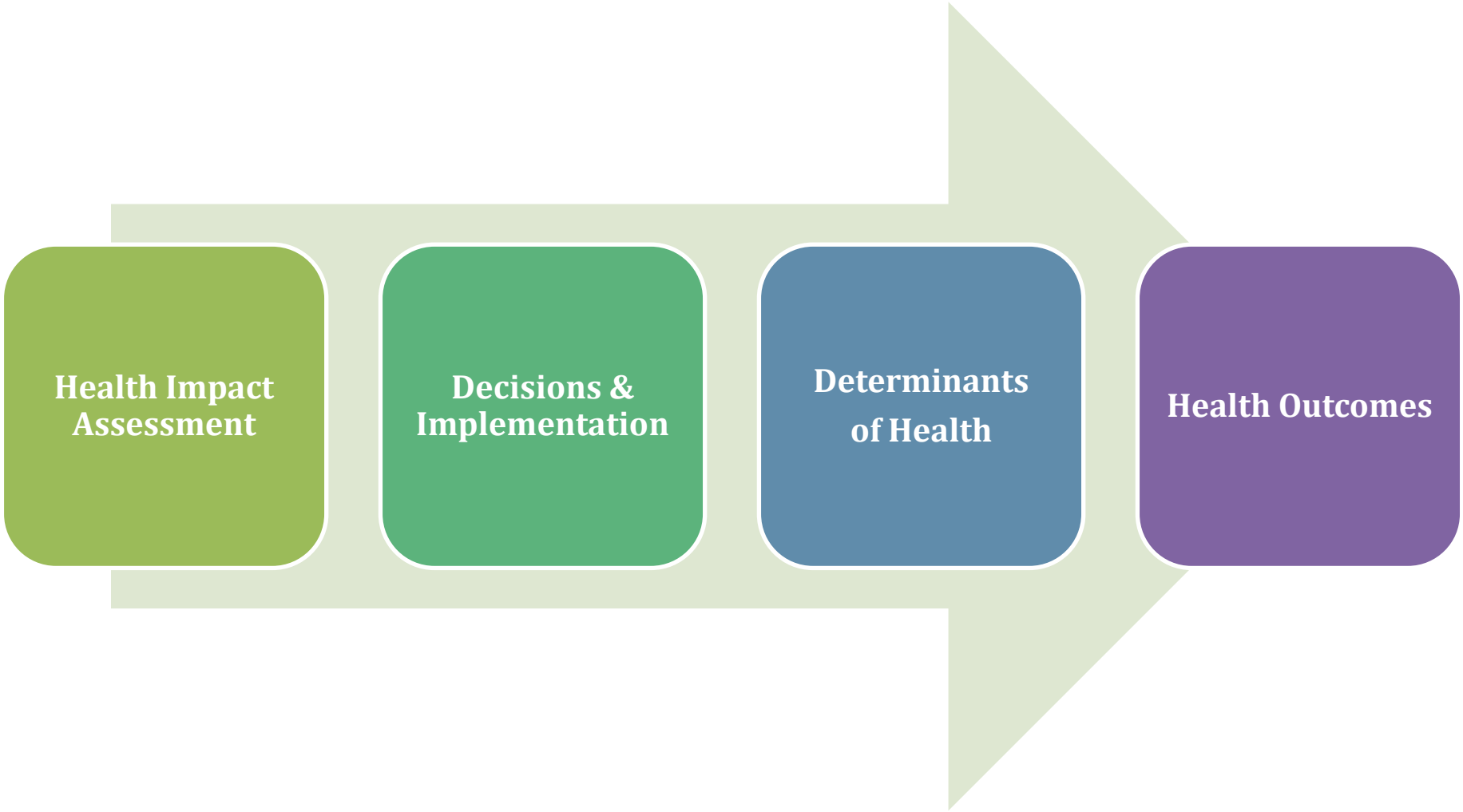
TABLE. Potential Impacts of Technological Transition Versus a City Model of Public Transport and Active Mobility

	Technological Transition (Natural Gas, Hydrogen, Hybrid, and Electric Cars)	City Model (Public Transport, Active Mobility)
Exhaust emissions (NO_x, PM, O_3, SO_2)	X	X
Greenhouse gases (CO_2)	X	X
Traffic noise	X	X
Nonexhaust emissions (PM [heavy metals, other chemicals])		X
Traffic incidents		X
Physical inactivity		X
Social inclusion and health inequalities		X

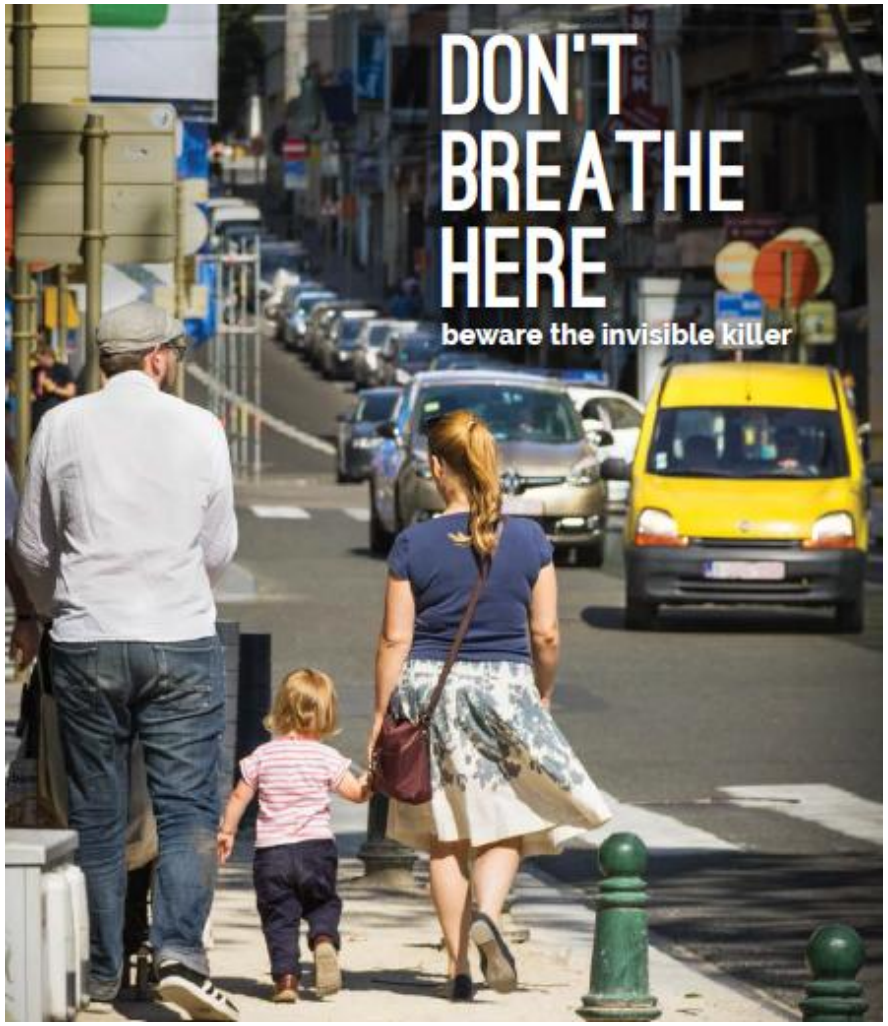
Rojas-Rueda & Turner, 2016



Rojas-Rueda & Turner, 2016


Health Impact Assessment
Decisions & Implementation
Determinants of Health
Health Outcomes

“Going together”



Public Health
Prevent. Promote. Protect.

CREAL

“Going together”

Public Health
Prevent. Promote. Protect.

CREAL

Merci beaucoup!

centre de recerca en epidemiologia ambiental

ISGlobal Barcelona Institute for Global Health

Generalitat de Catalunya

Parc de Salut MAR

upf. Universitat Pompeu Fabra Barcelona

drojas@creal.cat