Health – a measure of performance for Urban Transport

Dr. Carlos Dora

Coordinator, PHE, WHO HQ

World Health Organization

Main messages

- Urban transport and mobility solutions can bring major benefits for health and equity.
- Synergies and opportunities across urban transport, health and climate change.
- Tracking results – key for empowering citizens, for shaping aspirations and implementing a healthy urban future.
- How the health sector can contribute to this change

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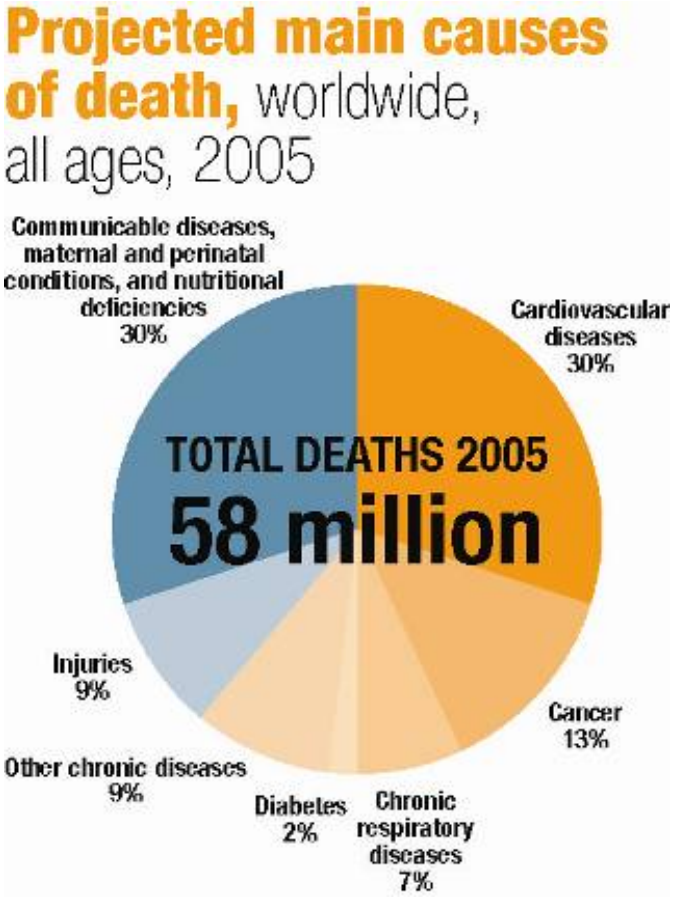
Main causes of death in the world today

Transport is key to prevent main global causes of death - Chronic diseases



- Cardiovascular disease, mainly heart disease, stroke
- Cancer
- Chronic respiratory diseases
- Diabetes

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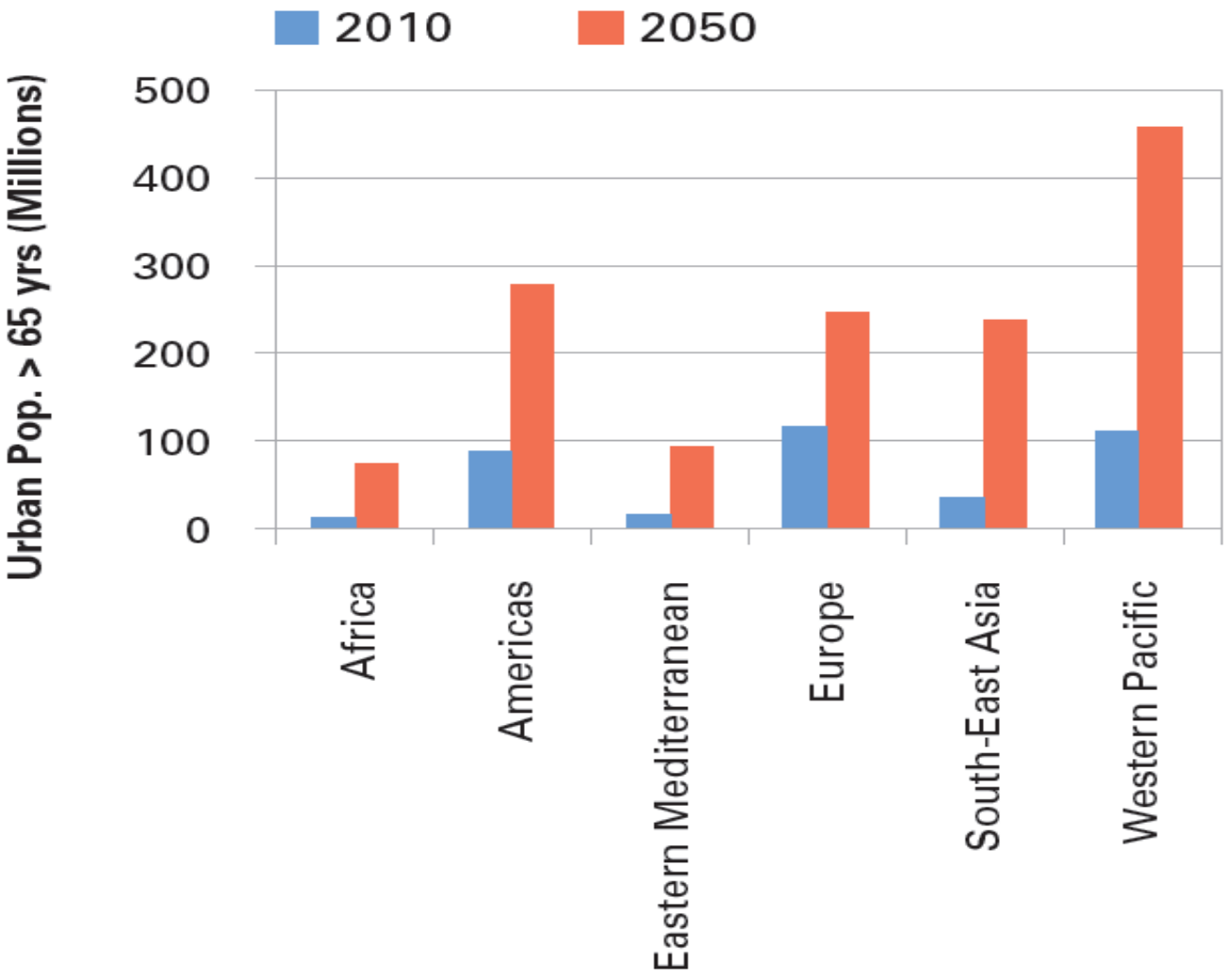
Older populations are growing rapidly



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1/2 the world's population lives in cities

Future population growth will be mostly in poor and middle income cities

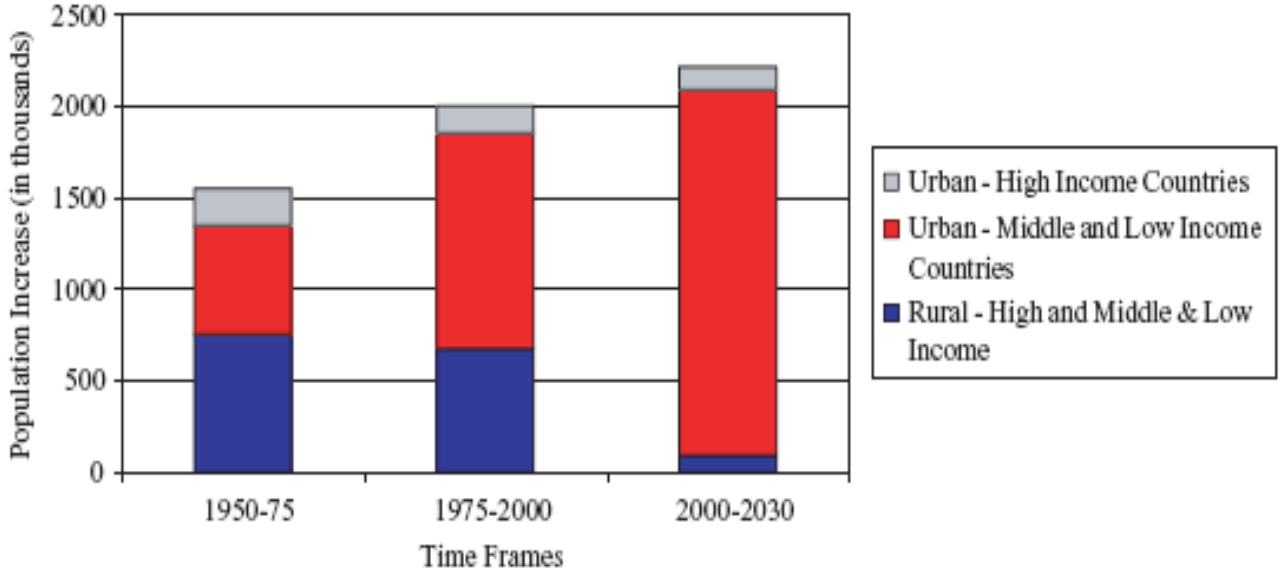

Figure 3. *Distribution of world population growth (1950–2030). Source: United Nations (2002), World Bank (2002).*

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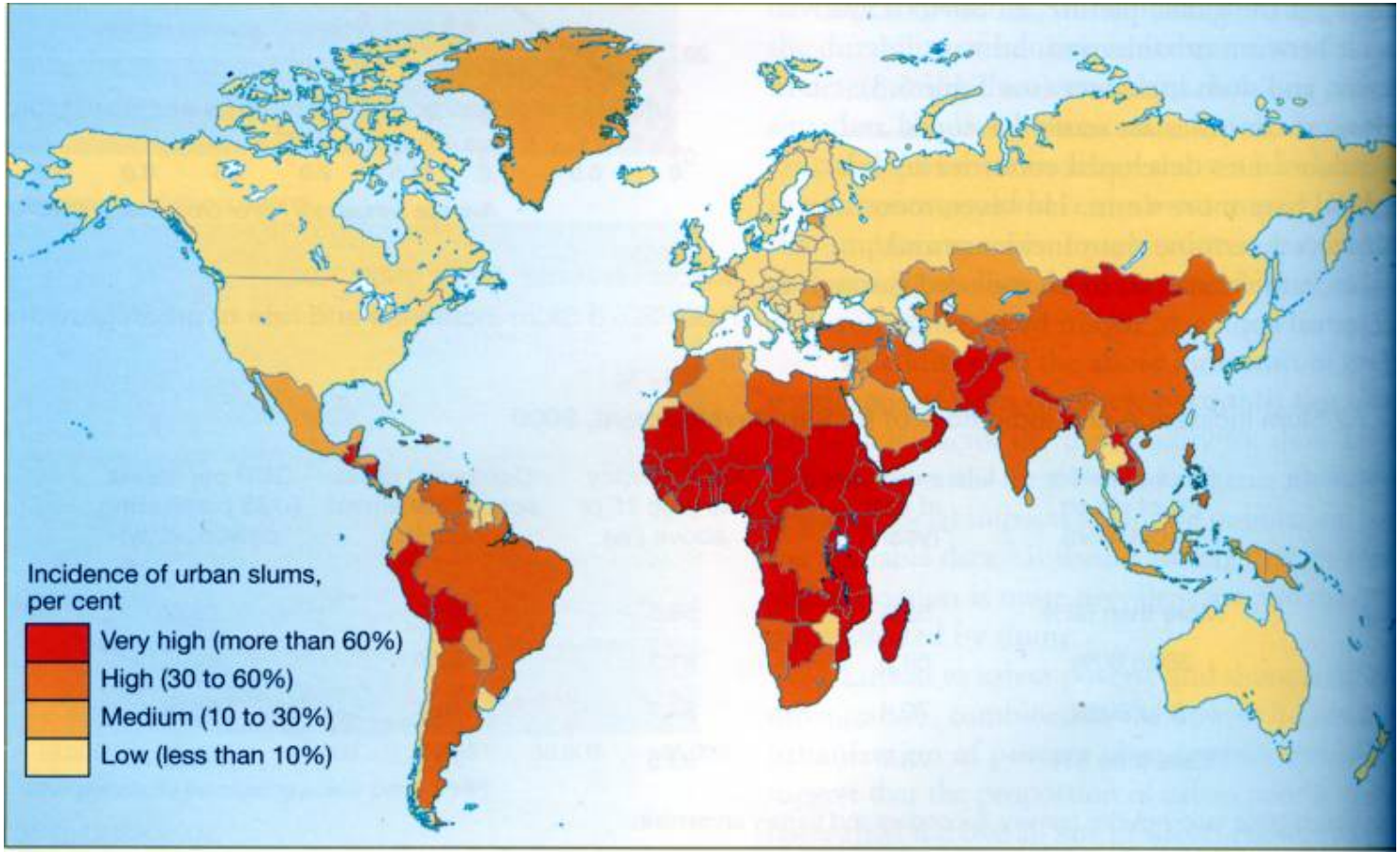
Slum expansion – with no infrastructure 'backbone'



Source: UN-Habitat, 2003b.

MAP 5.1 **Urban slum incidence, 2001**

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Transport & Health Linkages

urban land use & energy demand, air pollution, physical activity & injury risks

Global transport health burden (annual)

- Outdoor urban air pollution → 3.7 million deaths
- Physical inactivity → 3.2 million deaths; 19 million healthy life years lost
- Traffic injuries → 1.3 million deaths
- Traffic noise → stress, memory loss and analytical impairment
- Climate change → over 150 000 deaths
- Access to vital goods and services, social networks/equity/cohesion → under reported

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Sedentarism: 3,2 million deaths a year

30 minutes daily of active travel (cycling & walking) is enough to make a difference for health

- Reduce risk of coronary heart disease – by 50%
- Reduce risk of non-insulin-dependent diabetes and obesity – by 50%
- Reduce hypertension risk – by 30%.
- Reduce colon and breast cancer (50% reduction in colon cancer in long-term Shanghai study)
- Help maintain bone mass and protect against osteoporosis
- Improve balance, coordination, mobility, strength and endurance
- Increase self-esteem, reducing levels of mild to moderate hypertension and promote overall psychological well-being.

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Traffic Noise is a major cause of annoyance; Interferes With Memory, Attention and Ability to Deal With Analytical Problems

Emerging and consistent evidence for impact on hypertension and cardiovascular disease

Children chronically exposed to loud noise show:

- **impaired acquisition of reading skills,**
- **attention and problem-solving ability.**

Road traffic is the major source of exposure to noise.

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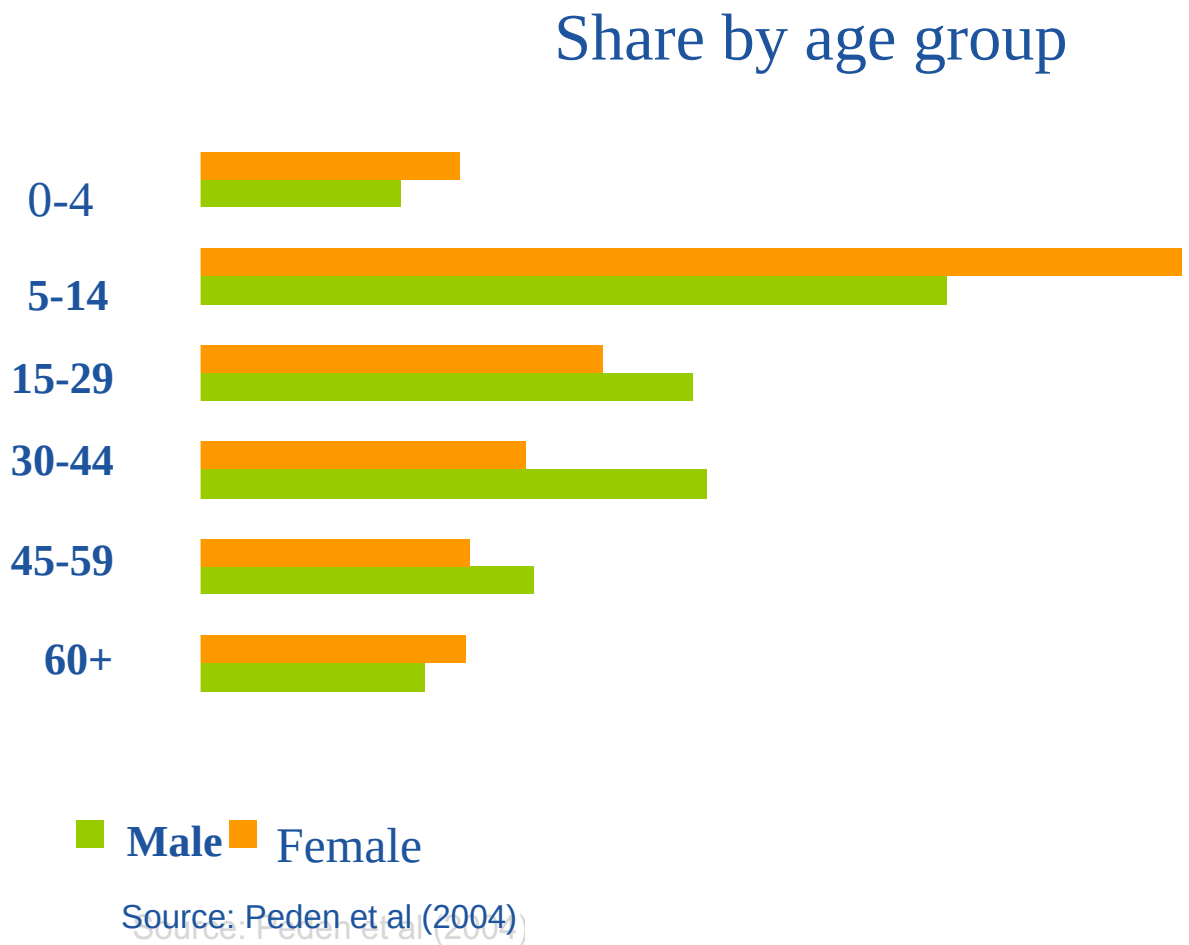
Traffic Deaths: 1,3 million/year
Traffic Injuries over 40 million/year



Source: Peden et al (2004)

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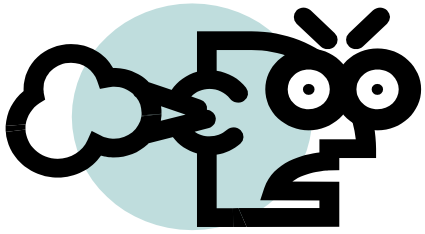
Community Severance

Psychological Barriers - How people feel about moving through an area:

- **Traffic noise**



- **Traffic pollution**

Can combine to produce:

- **Trip Suppression**

- **Perceived danger**

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Children pay a High Price

- They are at higher risk of being involved ***traffic injuries***.
- Play unhindered by street traffic = double ***social contacts***
- Restrictions to walk and cycle hinder the development of their ***independence***.
- Lack of physical activity leads to ***obesity***.

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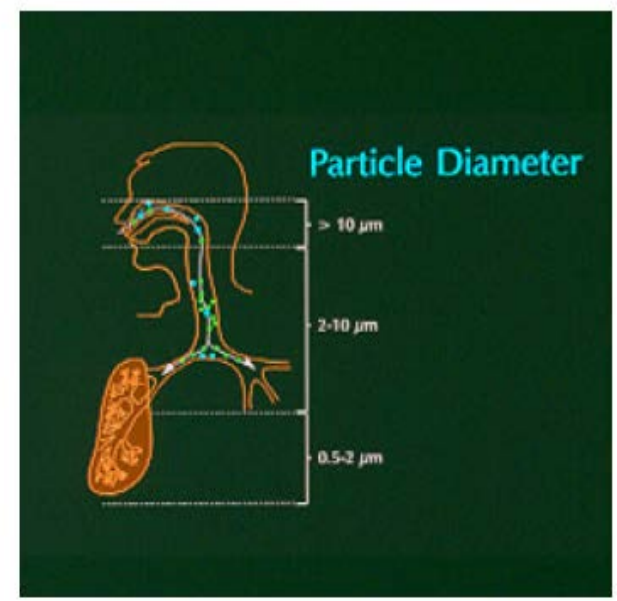
Air Pollutants a major health risk – small particles

Particles smaller than 2.5µm penetrate deep into the lungs and effect the body more systematically leading to diseases like *stroke, heart disease, cancers* and *pneumonia.*



PM<10µm – Coars

PM<2.5µm – Fine

PM<1µm – Ultrafin

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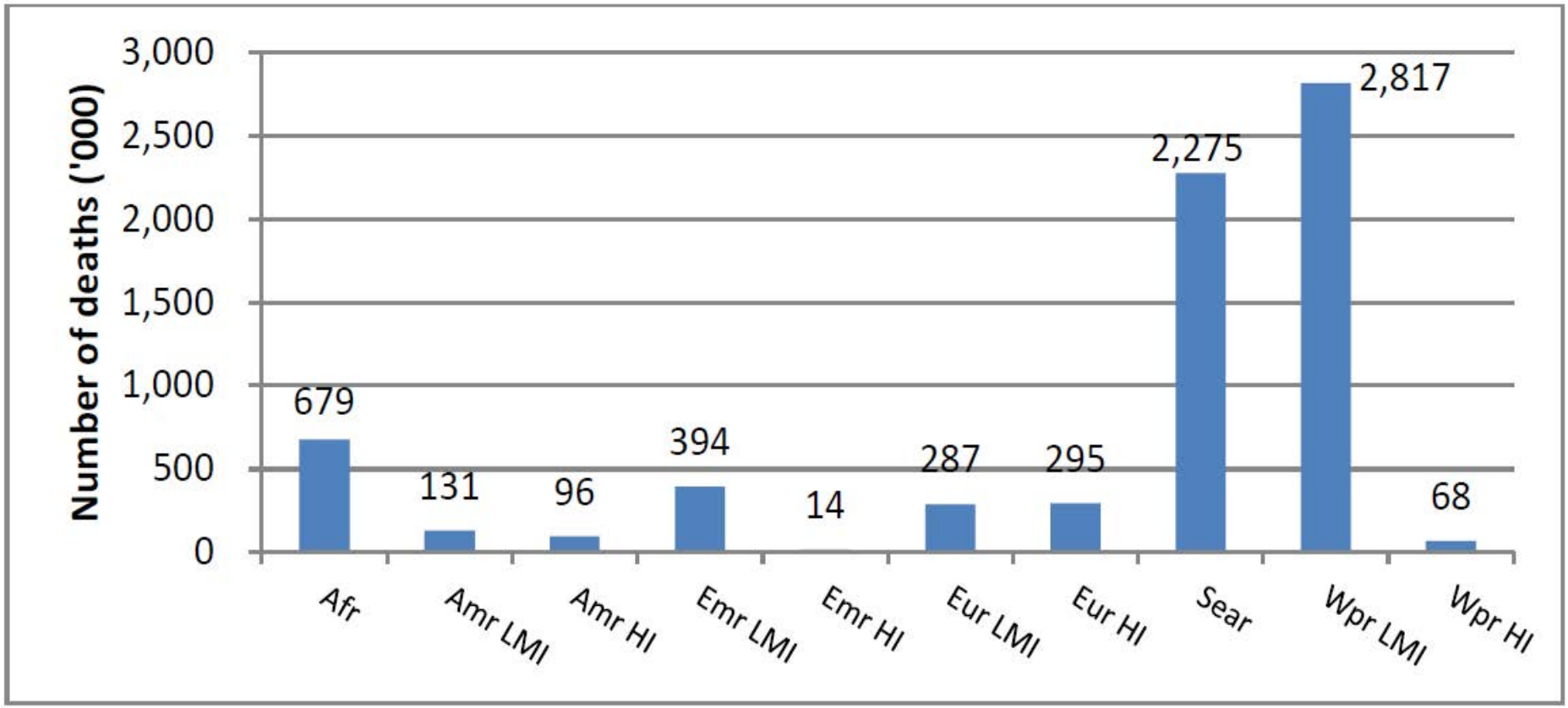
Globally 1 in eight deaths are estimated to be due to air pollution

7 million deaths globally every year

WHO, 2014



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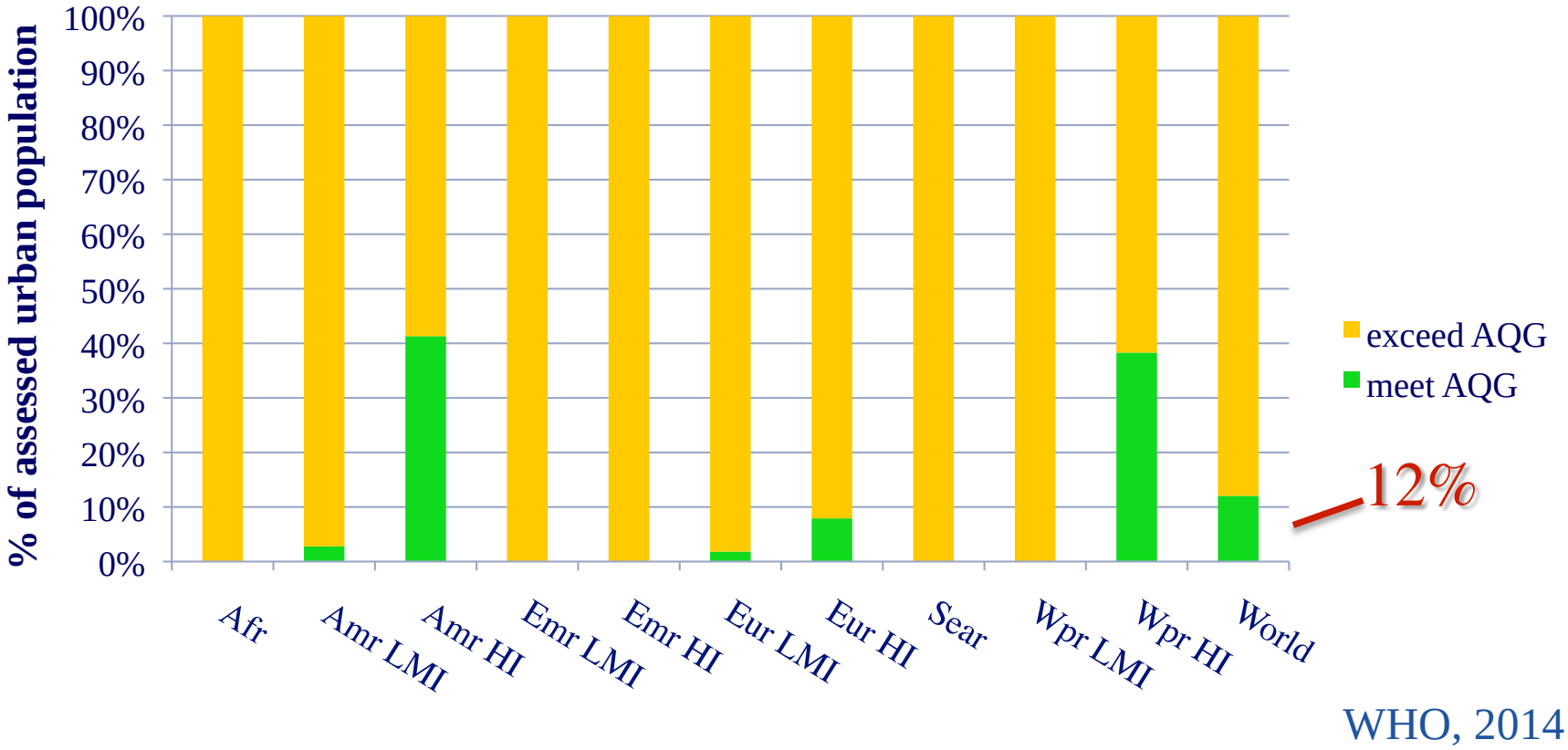
OECD Health Impacts of Road Transport, 2014

- 50% of AP costs in OECD countries comes from road transport
- OECD countries are decreasing
- China - AP costs increasing by 5%
- India – AP costs increasing by 12%
- Importance of the increasing use of diesel vehicles
- Challenge of vehicle emissions standards adoption to catch up with increase in vehicle use – e.g. doubling number of vehicles in China between 2008 and 2011

Most human exposure to OAP happens in cities.
Most cities (88%) have annual mean PM concentrations above WHO Air Quality Guidelines levels (10 µ g/m3)



WHO, 2014

Afr: Africa; Amr: America; Emr: Eastern Mediterranean; Eur: Europe; Sear: South-East Asia; Wpr: Western Pacific; LMI: Low- and middle-income; HI: high-income; AQG: WHO Air Quality Guidelines : Annual mean PM10: 20 µg/m3; Annual mean PM2.5: 10 µ g/m3.

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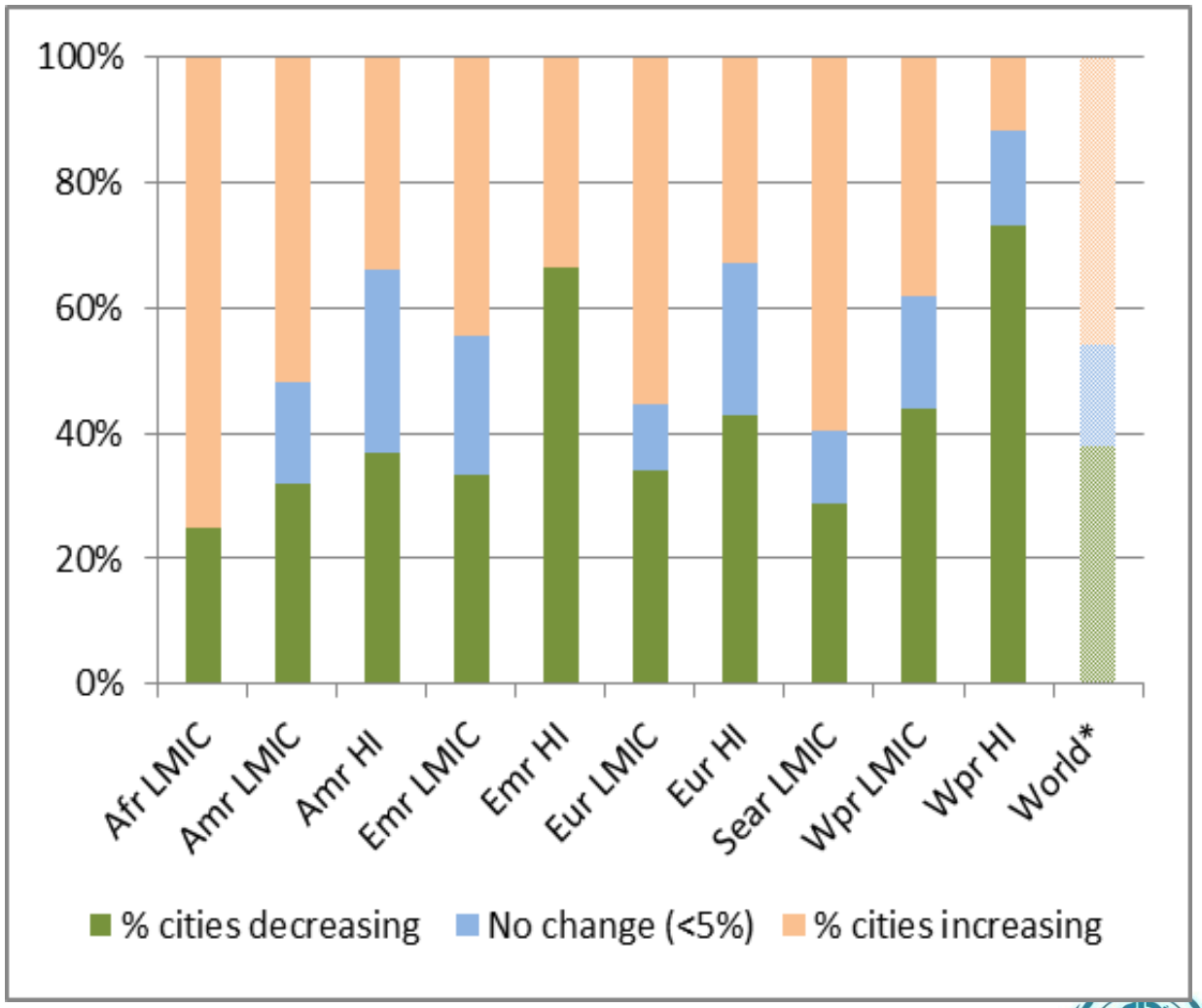
Air pollution is increasing in cities in emerging economies and decreasing in developed countries

Number of cities with increasing or decreasing levels of PM10 in 3 years



WHO, 2014

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Diesel, Coal, Air Pollution mixture and Small Particle all cause cancer

WORLD HEALTH ORGANIZATION
INTERNATIONAL AGENCY FOR RESEARCH ON CANCER

IARC Monographs on the Evaluation of Carcinogenic Risks to Humans

VOLUME 95
Household Use of Solid Fuels and High-temperature Frying

International Agency for Research on Cancer

World Health Organization

PRESS RELEASE
N° 213

12 June 2012

IARC: DIESEL ENGINE EXHAUST CARCINOGENIC

Lyon, France, June 12, 2012 -- After a week-long meeting of international experts, the International Agency for Research on Cancer (IARC), which is part of the World Health Organization (WHO), today classified diesel engine exhaust as **carcinogenic to humans (Group 1)**, based on sufficient evidence that exposure is associated with an increased risk for lung cancer.

INDOOR EMISSIONS FROM HOUSEHOLD COMBUSTION OF COAL

previous IARC Working Group in 2006
ne available, these have been incorpo-
tion in the present evaluation.

Constituents of coal emissions

hen using small and simple combustion
es such as household cooking and heating
, coals are difficult to burn without substan-
mission of pollutants principally due to the
lty of completely pre-mixing the fuel and
ring burning. Consequently, a substantial
on of the fuel carbon is converted to prod-
of incomplete combustion. For example

World Health Organization

International Agency for Research on Cancer

World Health Organization

PRESS RELEASE
N° 221

17 October 2013

IARC: Outdoor air pollution a leading environmental cause of cancer deaths

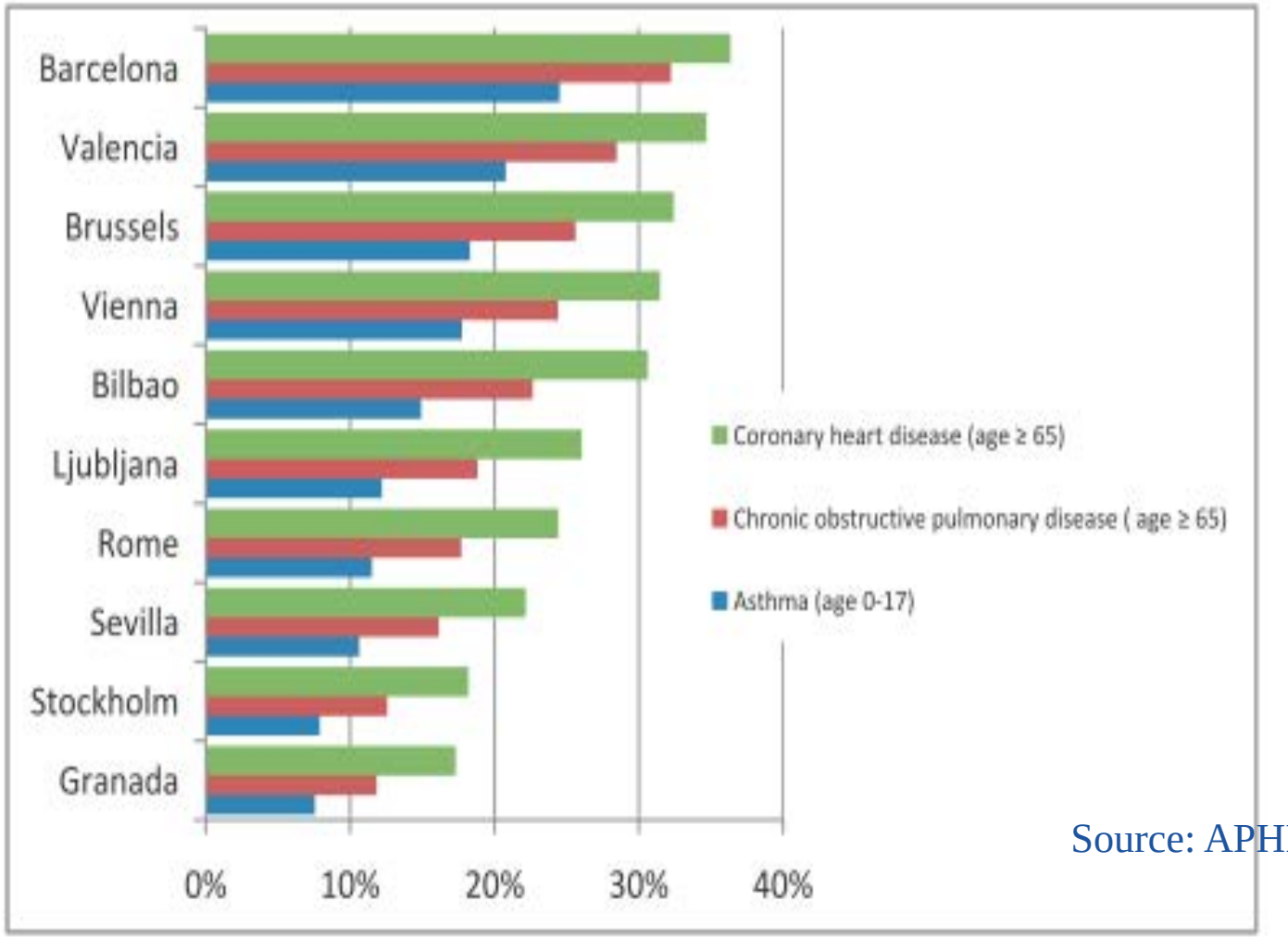
Lyon/Geneva, 17 October 2013 – The specialized cancer agency of the World Health Organization, the International Agency for Research on Cancer (IARC), announced today that it has classified outdoor air pollution as *carcinogenic to humans* (Group 1).[1]

After thoroughly reviewing the latest available scientific literature, the world's leading experts convened by the IARC Monographs Programme concluded that there is *sufficient evidence* that exposure to outdoor air pollution causes lung cancer (Group 1). They also noted a positive association with an increased risk of bladder cancer.

Particulate matter, a major component of outdoor air pollution, was evaluated separately and was also classified as *carcinogenic to humans* (Group 1).

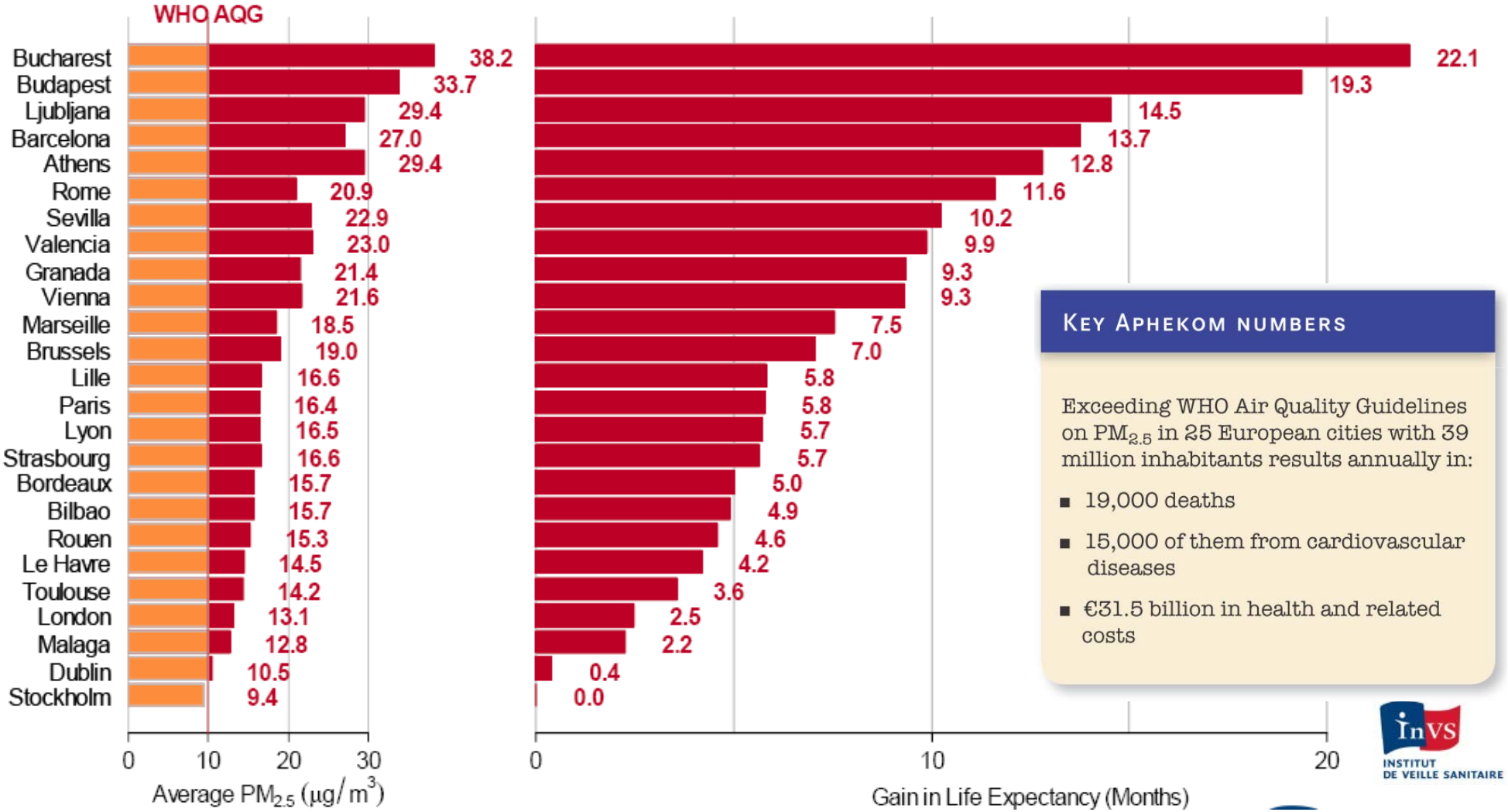
A significant fraction of NCDs is attributable to exposure to traffic-related air pollution

Percentage of population with chronic diseases whose disease could be attributed to living near busy streets and roads in 10 Aphekom cities



Source: APHEKOM

Gain in life expectancy (months) in 25 Aphekom cities for a decrease in $PM_{2.5}$ to WHO AQG (10 µg/m^3) (age 30+)



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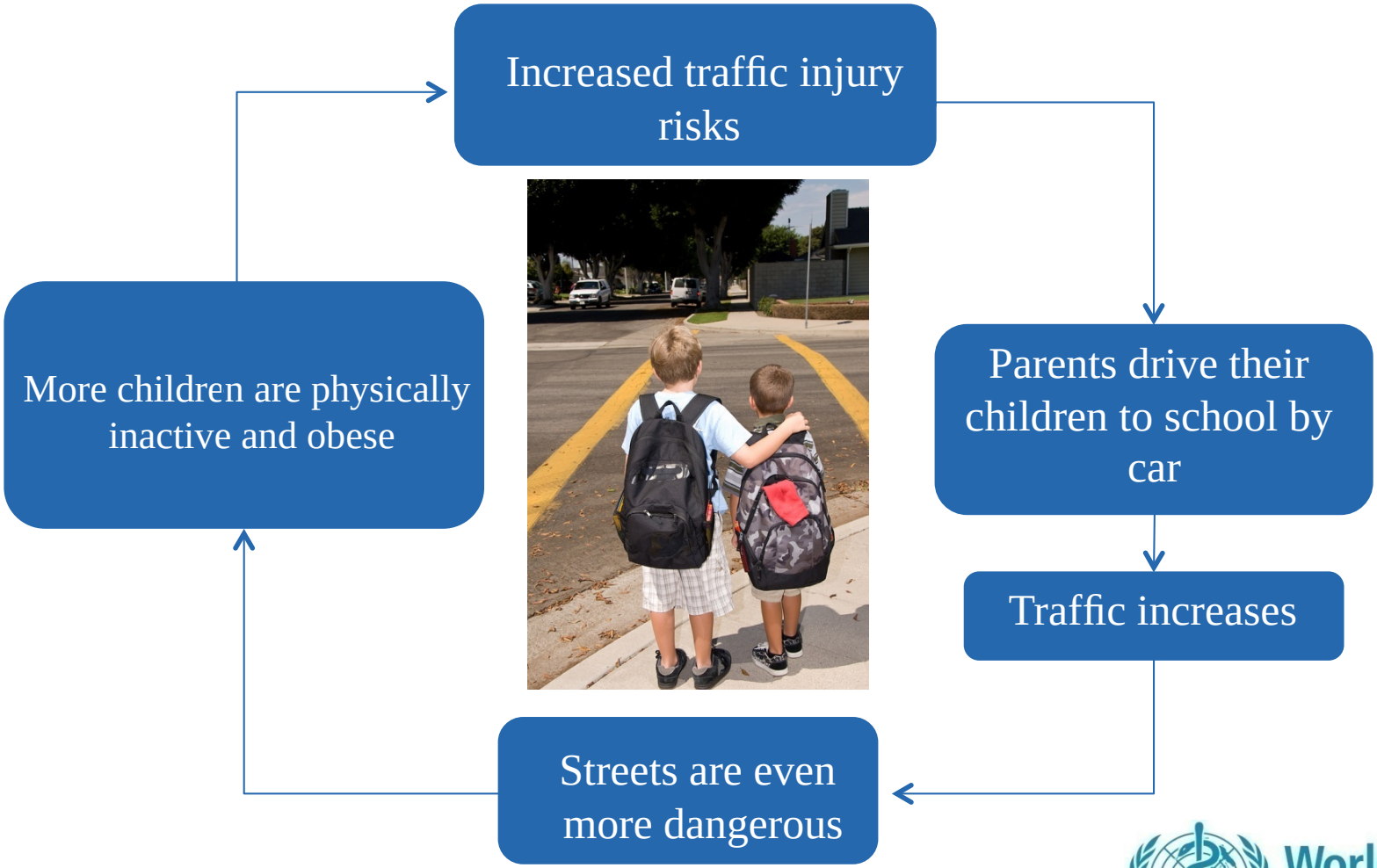
Need for integrated solutions that result in greatest health co-benefits.



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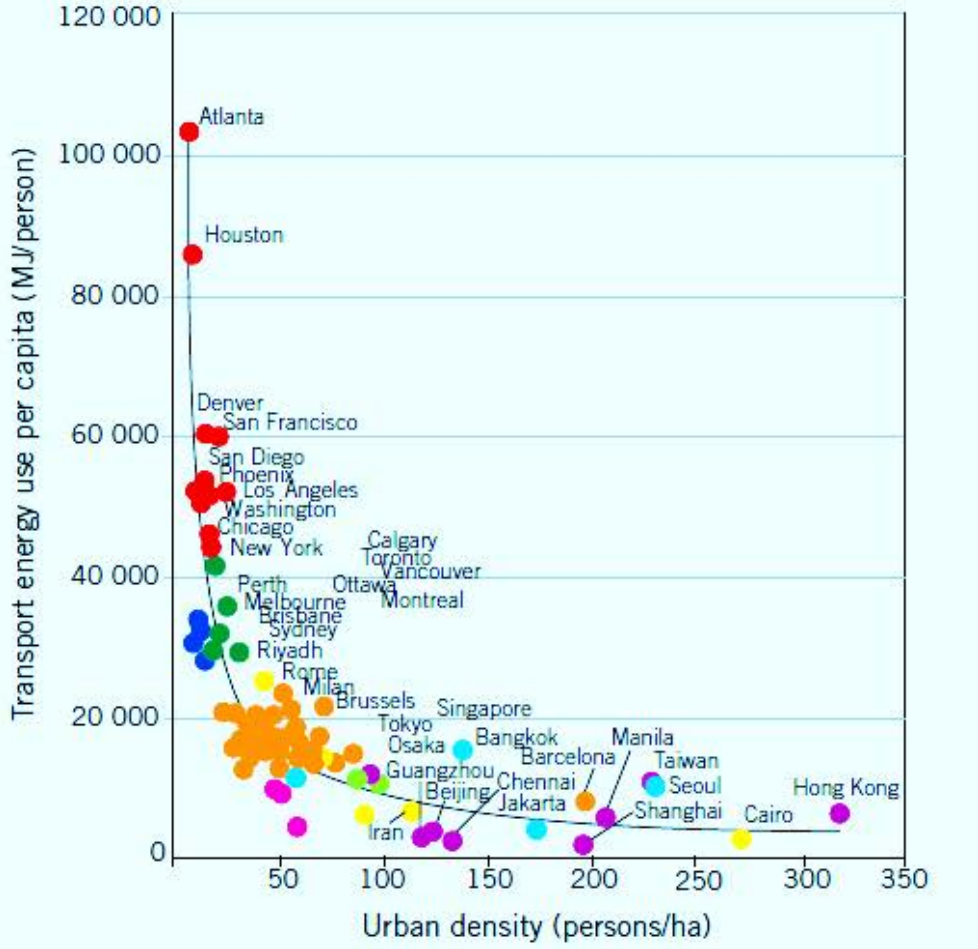
Urban sprawl & air pollution exposures, injury risks etc.

Fig. 4. Urban density and transport-related energy consumption



Source: International Association of Public Transport Providers, 2005[11]

Sprawl leads to more energy consumption /per capita and thus more air pollution/ GHGs.

More need for travels = greater risk of accidents, noise, severance,

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Busy road environment puts pedestrians and cyclists at risk

	Holland	Germany	US
Walking share of urban trips	18%	22%	6%
Biking share of urban trips	28%	12%	1%
Pedestrian fatality rate (deaths/100M km)	2.5	4.4	14.0
Bicyclist fatality rate (deaths/100M km)	2.0	3.2	7.2

Source: Pucher and Dijkstra, Promoting safe walking and cycling to improve public health: Lessons from the Netherlands and Germany, Am J Public Health, 2003: 93:1509-16.

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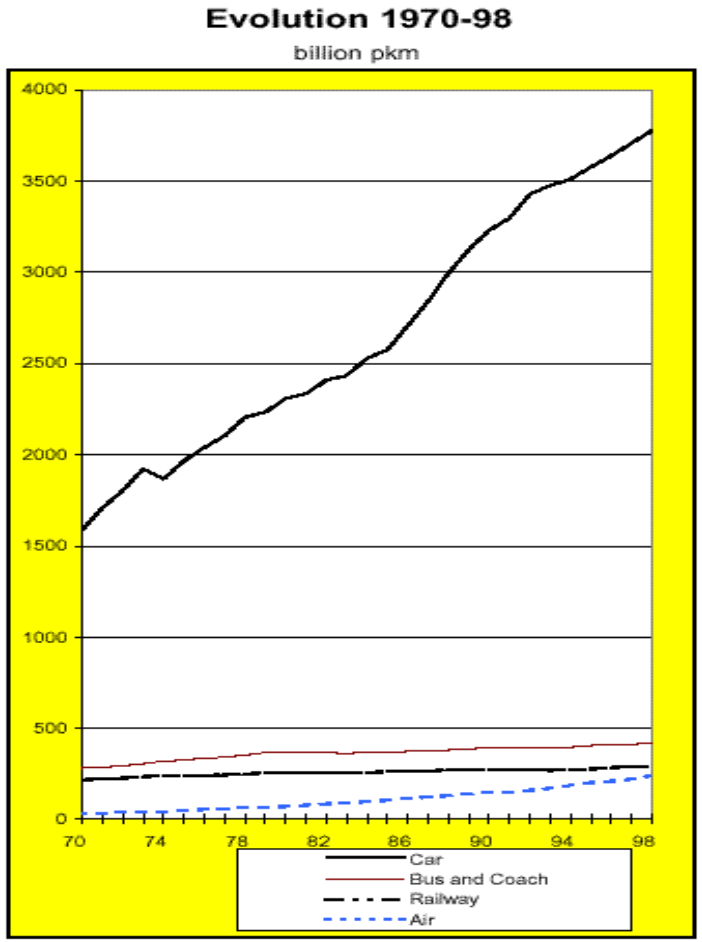
Continuing Traffic Growth Has Cancelled Out Pollution Savings from Cleaner and More Efficient Vehicles



- Cars are becoming heavier and more powerful.
- Trips are becoming increasingly long.
- Total kilometers traveled by road continues to grow

EC: Transport in Figures, 2000

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Transport drives injury risks: But safety aspects of rail/bus transport largely ignored

- Rail and bus are the safest modes of travel (ETSC, 2003), even so :
- Priority is given to individual injury protection over “systems” approaches.
- Few health-oriented studies on injury impact of transit interventions
- Transport planning gives little priority to the comparative advantages of transit in terms of injury risks

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The search for best transport and health models

More car-dependent and sprawling (USA model)
Or, more energy-efficient & walkable (European)

% by travel mode	Asian cities (high/low)	European cities	USA cities
Active travel	19%	18%	5%
Transit	43%	23%	3%

Source: Peterson R. Sustainable Transport, a Sourcebook for Policymakers, BMZ, 2002

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What are the transport policies with excellent health performance?

Walking, Cycling, Public Transport/ Rapid Transit

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Use of travel modes: transit use positively associated with more physical activity, less air pollution, and fewer injuries

Table 12. Health-related outcomes associated with active transport, public transport and car use, and their infrastructure

Factor	Studies finding improved outcomes	Studies finding worse outcomes
Use of different travel modes		
More active transport (walking, cycling)	More physical activity/fitness[199,205–218]	More road traffic injury[50,200,219]
	Lower BMI/less obesity[177,190,207,218,220–226]	Higher personal exposure to air pollution[205]
	Lower air pollution exposure/effects[50,227]	
	More favourable social factors[228]	
	Higher quality of life or reported health status[181,196,229]	
	Lower risk of specific health problems[207,229]	
	Lower mortality/higher life expectancy[230–233]	
More use of public transport	More walking, cycling or active transport[121,234]	Higher risk of tuberculosis[235]
	More physical activity[205,236–238]	Higher personal exposure to air pollution[205]
	Lower BMI/less obesity[220,223,234,239]	
	Lower air pollution exposure/effects[48]	
	Lower noise levels[240]	
	Higher reported health status[189]	
	Lower road traffic injury risk for public transport users[219,240]	
Lower car use, car ownership and traffic volumes	More walking, cycling or active transport[88,94,142,144,147–149,152,160,162,165,166,186,191,241–243]	Less walking[155,244]
	More physical activity[84,193,211,245]	Fewer social trips[246]
	Lower BMI/less obesity[176,177,189,245,247–250]	Higher BMI/more obesity[59]
	Lower air pollution exposure[251]	
	Less road traffic injury[137]	
	Higher reported health status or functioning[252]	
	Lower risk of specific health problems[253]	

Review of studies on health outcomes in association with use of different urban travel modes –

WHO/Health in Green Economy (2011)

World Health Organization

Availability of transport infrastructure: Transit investments also positively associated with physical activity, less injuries & air pollution

Infrastructure for different travel modes (including presence and proximity of infrastructure)		
More infrastructure facilitating walking (including general assessments of walkability of neighbourhoods as well as presence of specific features, e.g. pavements)	More walking, cycling or active transport[83,88,94–96,123,148,157,160,166,169,182,198,226,254–260]	
	More physical activity[91,93,169,174,198,226,254,256,261–268]	
	Lower BMI/less obesity[126,178,250,257,262,267]	
	Lower air pollution exposure/effects[262,268]	
	Lower risk of specific health problems[126,253]	
	Lower mortality/higher life expectancy[197]	
More infrastructure facilitating cycling	More walking, cycling or active transport[83,95,96,152,154,157,183,186,256,269–271]	
	More physical activity[92,93,123,171,172,256,272]	
	Lower BMI/less obesity[250]	
More infrastructure facilitating public transport use	More walking, cycling or active transport[66,122,148,153]	Less walking, cycling or active transport [88,94,112,243,273]
	More physical activity[84,124,153,171,172,194,256]	Lower reported quality of life[181]
	Lower BMI/less obesity[134,179]	
	Lower air pollution exposure/effects[49,274]	
Less infrastructure facilitating car travel (including parking, motorways)	More walking, cycling or active transport[66,273]	
	Lower BMI/less obesity[59]	

Review of studies on health in association with different modes of transport investments

WHO/Health in Green Economy (2011)

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Indicators of Healthy Transport:

We need to track impacts in four domains

- Access/equity of access
- Physical activity
- Pollution (air, noise and water)
- Traffic injury

Measuring **access/physical activity –** can inform us about key health *benefits* of sustainable transport.

Measuring **pollution and injury –** can inform us about key health *risks* of transport systems.

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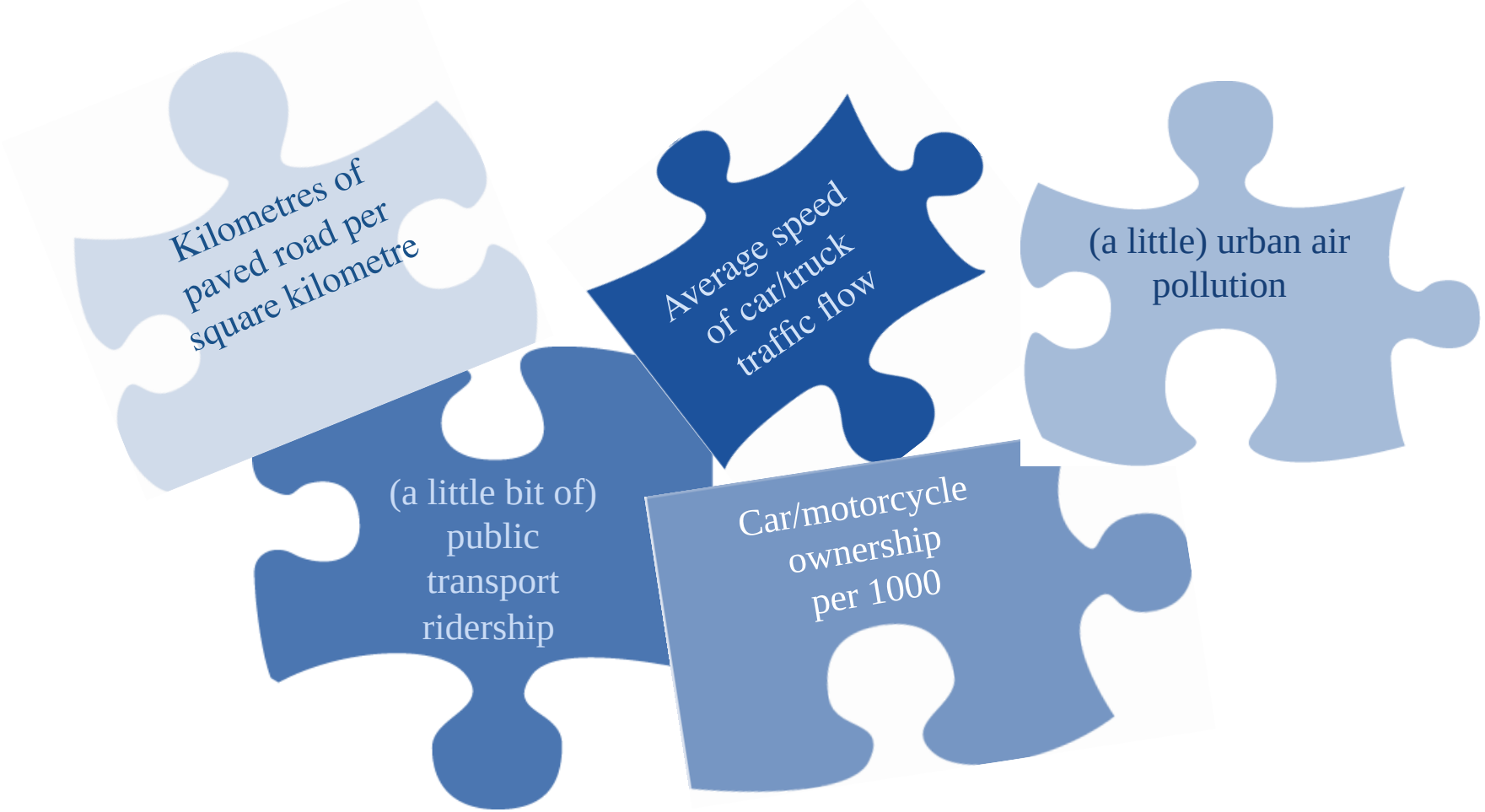
But --- Transport indicators continue to measure focus on road vehicles – not people



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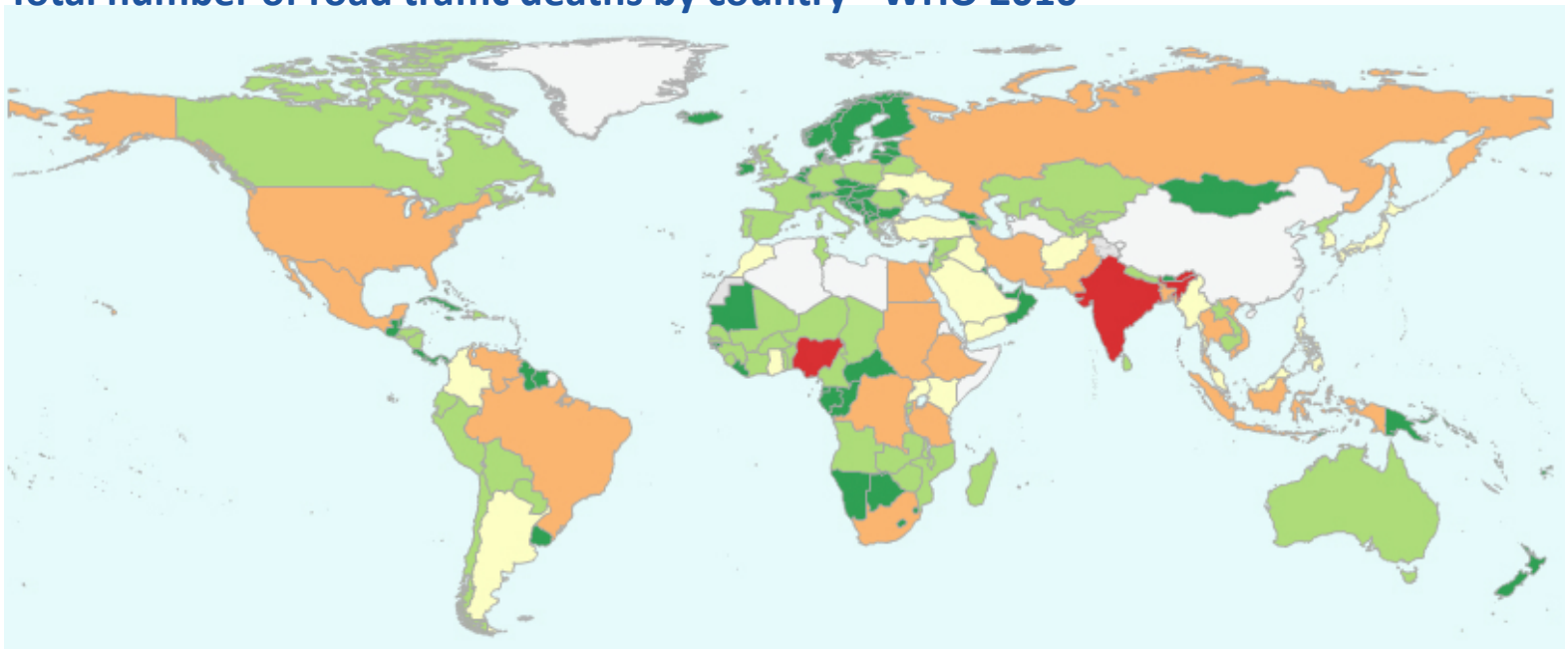
Example 1: Global data on injuries not systematically collected for bus/rail travel mode

Total number of road traffic deaths by country - WHO 2010



Number of Deaths by Country	
Dark Green	<1000
Light Green	1001-5000
Yellow	5001- 10 000
Tan	10 001-50 000
Red	>50 000
White	– No data

Data Collection for Modes of Travel Includes:

Cyclists;
Drivers/passengers of 4-wheeled vehicles
Drivers/passengers of motorized 2- or 3- wheelers
Other unspecified road users
Pedestrians

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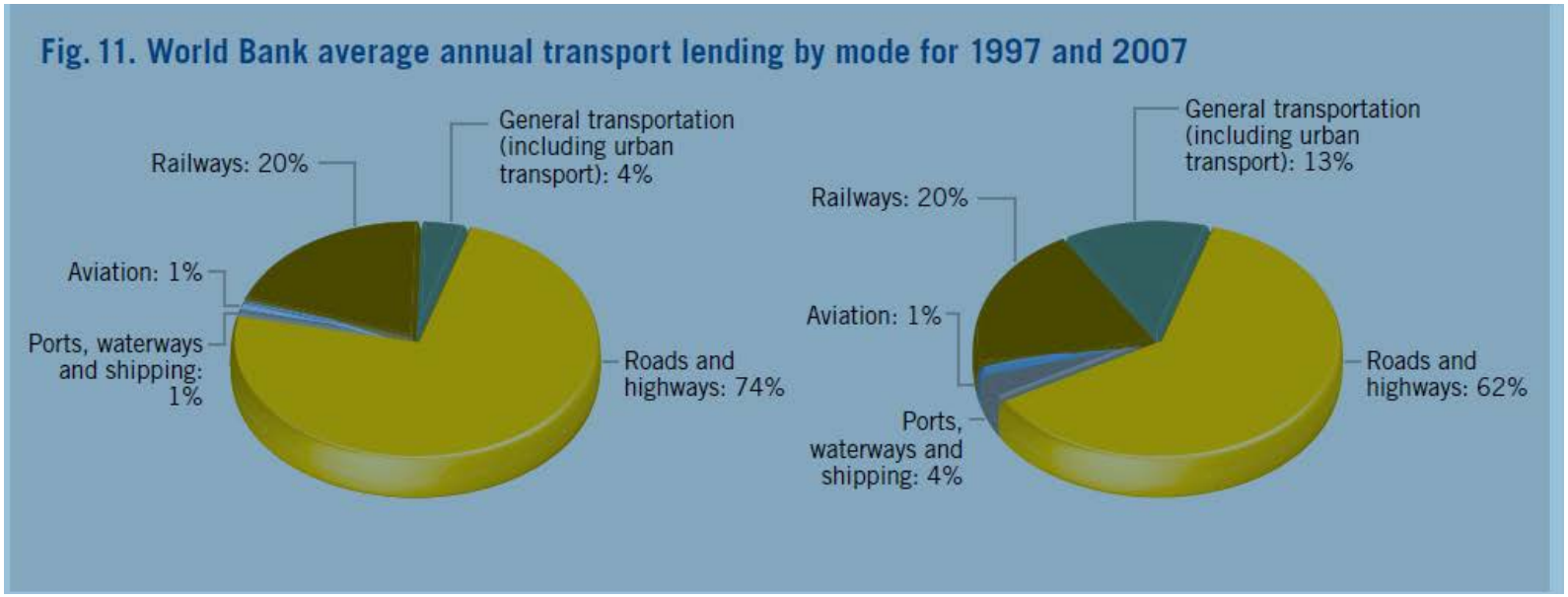
Example 2: Key transit/public transport indicators also are missing from global transport data bases:



World Bank tracking of urban transit, cycling and pedestrian investments is folded into “general transportation”

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Example 3: Standard CBA models for roads & fail to consider transit alternatives

World Bank's highway development and management CBA model (HDM-4) considers a limited set of health and environmental risks but not the benefits of alternative, transit-oriented investments

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Example 4: Jobs & poverty reduction benefits from transit also largely ignored: Our report found:

'Investment in public transport and rapid transit may be a more effective means of generating stable local jobs and more economic value-added' than road-building because:

- Transit projects are labour intensive
- Transit creates long-term jobs
- Transit increases access of disadvantaged groups to employment centres and can lower their travel costs

In addition, a greater share of transit's total economic investment is typically allocated to salaries and ongoing system operations, as compared to the transport investment for private vehicle fuel consumption & maintenance. **Further research is needed to better describe this and other equity impacts.**

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Lack of research and indicator data contributes to a 'vicious cycle' of bad decisions & health impacts

More vehicles = more road space/construction for vehicles = greater air pollution, noise and physical activity risks

Hanoi, 1993

Hanoi, 2001

Hanoi, 2002

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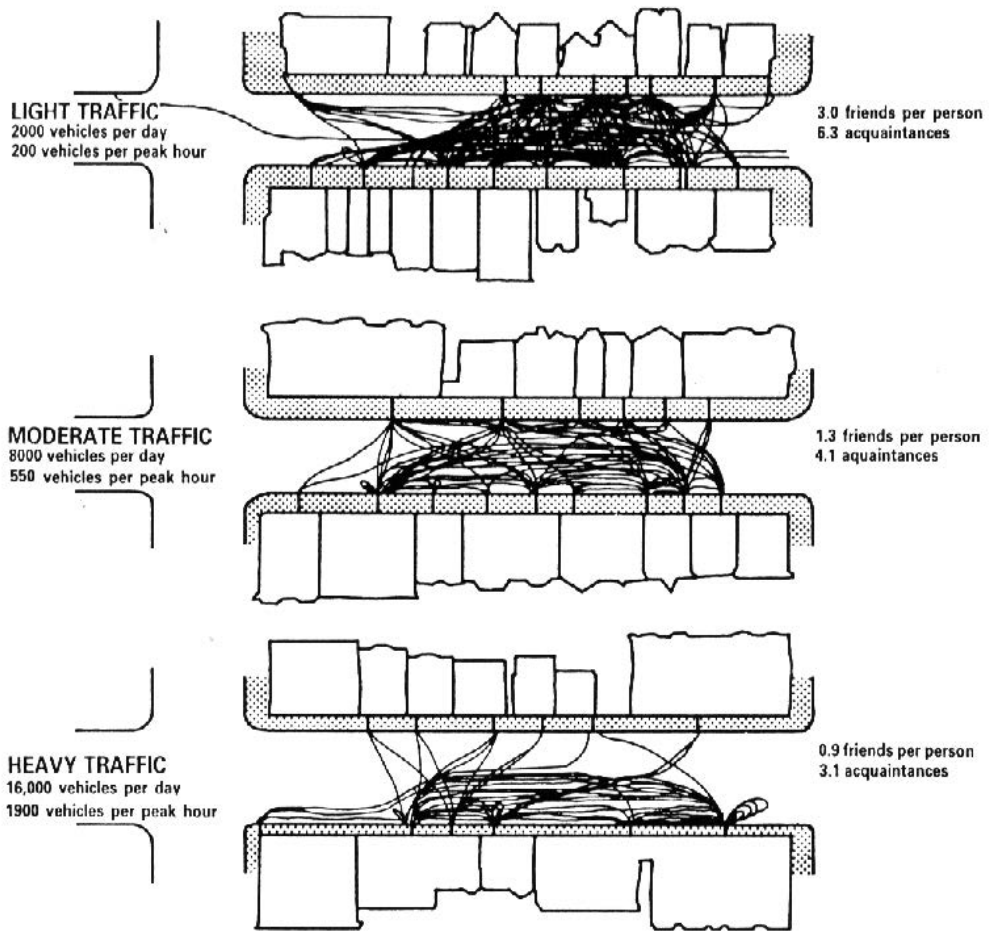
Simple targeted surveys can yield rich insights into health



People on heavily-trafficked streets reported fewer neighbourhood friendships - Appleyard, 1981

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Broader, systematic evaluation of BRT is needed to drive policies and investments

- Measurement of BRT's impacts on health through better collection of indicators on:
  - Shifts in modal split including transit/walking/cycling in and beyond the BRT corridor.
  - Change in average PM10 levels in the neighbourhoods near the corridor, and city-wide.
  - Ridership by vulnerable groups – children, women, poor elderly, disabled
  - Poverty reduction & health equity benefits, direct and indirect -- terms of job creation, job access and lower transport costs

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SDGs draft (19 July 2014) transport benefits /risk reduction

- **Goal 11.** Make **cities** and human settlements inclusive, safe, resilient and sustainable
- by 2030, provide access to safe, affordable, accessible and **sustainable transport systems for all**, improving road safety, notably **by expanding public transport**, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons

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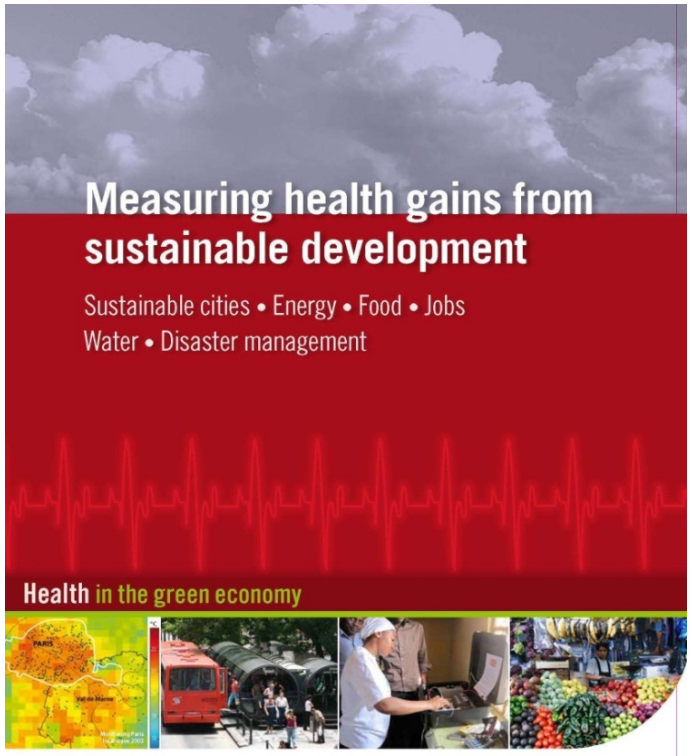
SDGs draft (19 July 2014) transport benefits /risk reduction

- **Goal 3.** Ensure **healthy** lives and promote well-being for all at all ages

- by 2030 substantially reduce the number of deaths and illnesses from hazardous chemicals and **air**, water, and soil **pollution** and contamination
- by 2030 reduce by one-third pre-mature mortality from **non-communicable diseases (NCDs)** through prevention and treatment,
- by 2020 halve global deaths and **injuries from road traffic accidents**



RIO+20 United Nations Conference on Sustainable Development

World Health Organization

World Health Organization

The Lancet, 10 June 2014

Indicators linking health and sustainability in the post-2015 development agenda

Dr Carlos Dora PhD a , Prof Andy Haines F Med Sci c, John Balbus MD d, Elaine Fletcher BA a, Heather Adair-Rohani MPH a, Graham Alabaster PhD e, Rifat Hossain MA a, Mercedes de Onis MD b, Francesco Branca PhD b, Maria Neira MD a

Targets for cities

- Efficient, healthy, and safe urban transport by the **increased use of public transport and active travel modes** together with policies to increase road safety.

Indicator

- Percentage of **trips or passenger kilometers travelled by public transport, cycling, and walking.**
- Number of **traffic injury deaths**, including among vulnerable road users

- Reduce exposure to **urban air pollution and related deaths** and disease by x%.

Indicators

- Percentage of the **urban population exposed** to small or fine urban particulates (PM10 or PM2,5) in concentrations exceeding WHO Air Quality Guidelines.
- Estimated **burden of disease** from urban ambient air pollution.

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How can a cooperation between transport health and environment help harness development opportunities

- Long term vision of healthy development
- Norms /guidelines
- Planning/Health, Social Environment Impact Assessments
- Metrics - health performance /tracking
- Access to information- public participation,
- Access to justice (evidence for litigation), conflict resolution access to non-judicial remedies

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Shared long term vision – e.g. partnerships between transport, health and local development

Transport policies that reduce air pollution, injuries, noise and enable physical activity

Gains from cycling/walking/transit & compact urban land use.

Move beyond improved fuels and engines

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Visualize health benefits from alternative policy options

Woodcock et al.

urban modelling group

Vision 1

Vision 2

Vision 3


visions
2030
urban modelling group

Research into health impacts of transit interventions

- Transit is usually cleaner – not well documented
- Transit induces physical activity – not well measured
- Transit is generally safer – but no global data collection

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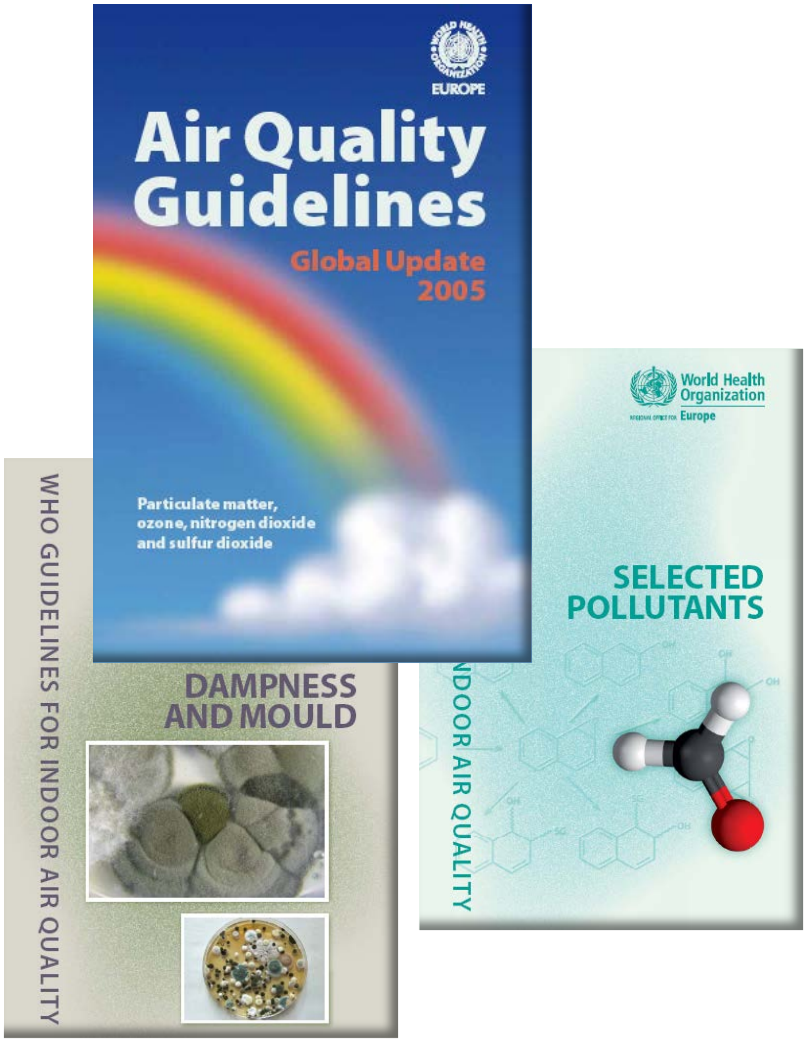
Research/synthesize the evidence of links with health

- **Document the size of the burden of disease – make the case**
- **Normative work**
  - **WHO Air Quality Guidelines:** provide the scientific evidence on the health impacts of air pollution as well as recommendations on pollutant levels safe for health
  - **WHO Indoor air quality guidelines for household fuel combustion**: provide guidance on policies and the impact of different fuels/ technologies (for cooking, heating & lighting) on health
  - **WHO Housing and Health guidelines**: including guidance on indoor air and on household energy use and energy efficiency with relevance to AP



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Assess Expected Health Impacts from Proposed Policies
(e.g as part of EIAs, SIAs)

State:

- Plan development that benefits populations
- Respond to consumer demand for more sustainable practices
- Avoid and manage risks

Corporations:

- Avoid risks, costs and liabilities
- Secure and maintain a social license to operate
- Corporate social resposibility

Communities/individuals:

- Access to information, public participation, access to justice

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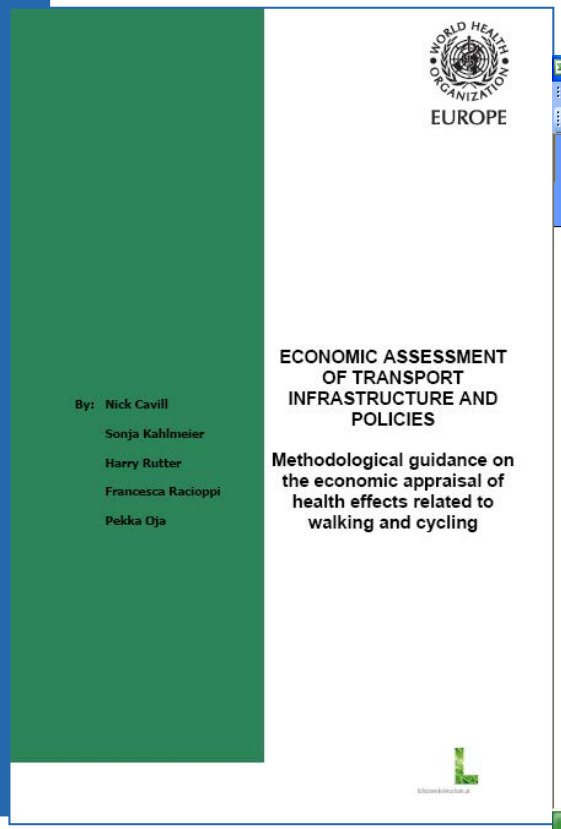
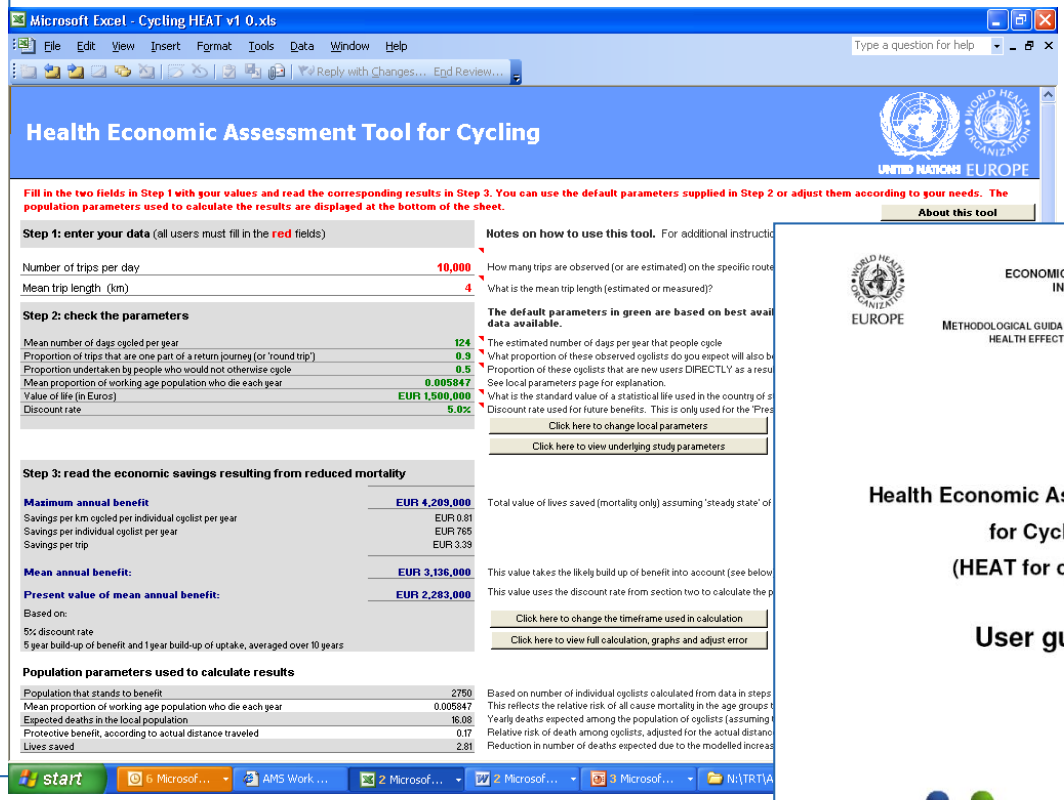
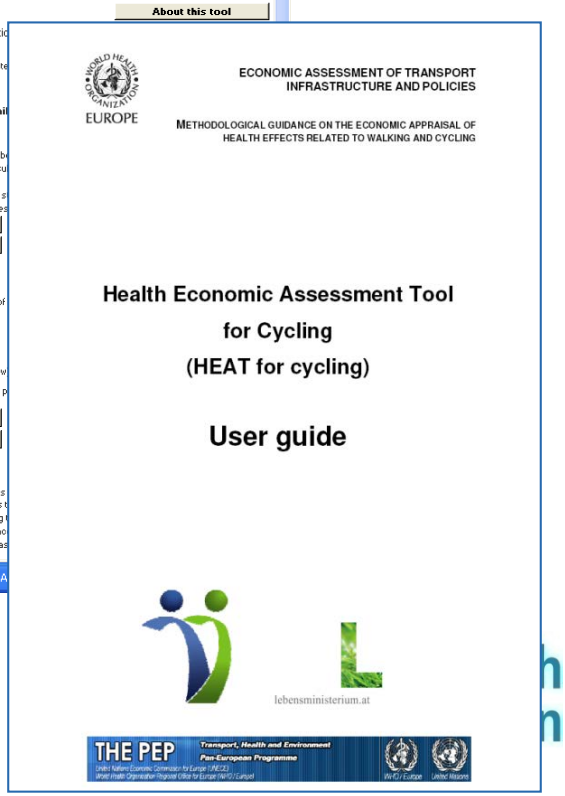
Cost benefit analysis including all relevant health information/indicators

e.g. WHO HEAT – quantifying health gains from cycling infrastructure investment in terms of avoided traffic injuries and health care costs







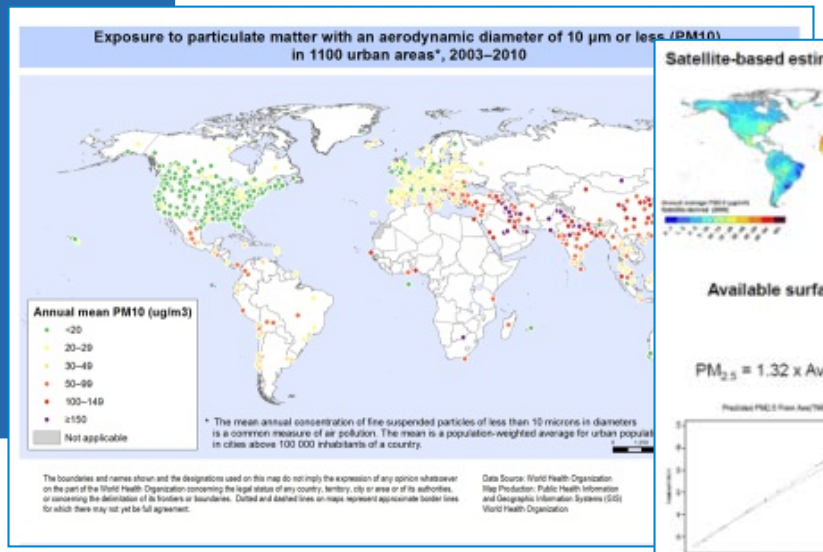
www.euro.who.int/transport/policy/20070503_1

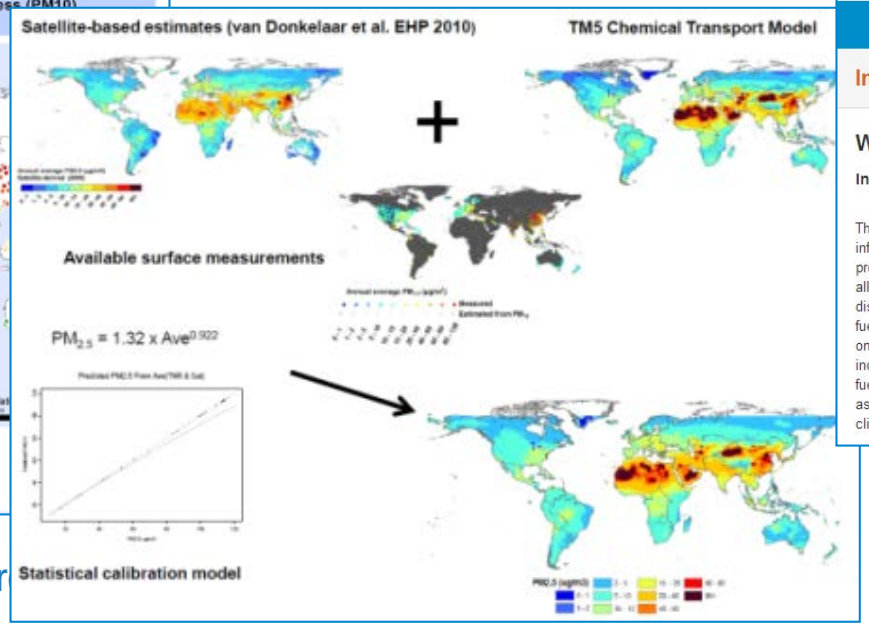
Harmonized 'healthy transport' indicators

World Health Organization

Monitoring trends transport and related risks and benefits, building on what we have: e.g. in air pollution

- Global databases on Household Energy Use & Household Air Pollution
- Global database on Outdoor Air Pollution in cities
- **WHO Global platform for Air Quality & Health →** combining satellite imagery, chemical transport models & ground-level monitoring in development





World Health Organization

Communicating synergies:

↑Physical activity

↓ Obesity

↓ Cardiovascular diseases/depression

↓ **Air pollution**

↓ Traffic injuries

↑ Social capital

World Health Organization

Where should we go next?

1. **Include health in planning scenarios for sector policy options:** ex-ante, through HIA, CBA, health gains expected from transport strategies/interventions in cities and regions
2. **Evidence on the effectiveness of interventions:** Research on health impacts of policy packages / transport interventions adoption and follow-up
3. **Improve global tracking of transport policies, risks to health and health impacts:** for monitoring and evaluation of trends and consequences of transport interventions on health and wellbeing.

World Health Organization

World Health Organization