Transport, environment and health
from addressing problems to ripening the benefits of green and healthy transport policies

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In this presentation.....

• *Transport as a “problem” for health and the environment;*

• *Transport as an “opportunity” for health and the environment;*

• *Health dividends from Green Growth Strategies*

• *Tools to support action: HEAT (Health Economic Assessment Tool)*
The “classic” approach:

transport as a “problem” for health and the environment
Transport-related health and environmental effects: An overview

- Tens of thousands of premature adult deaths are estimated to occur each year.
- Physical inactivity is associated to about 1 million deaths/year.
- At least 1 million healthy life years are lost every year from traffic-related noise in the western part of Europe.
- The overall land-use of one km of motorway is up to 20 ha.

120,000 deaths and 2.5 million injuries/year

- Physical inactivity
- Air pollution
- Climate change
- Noise
- Psychosocial effects
- Nature and landscape effects

Mobilitat fur alle 2011

Vienna, 5 October 2011
Health effects represent the largest part of the external costs of transport

- The external costs of transport are estimated at ca 8% of GDP in the EU(*).
- Savings from improved health could be re-invested in other societal priorities.

Air pollution and health:
Premature mortality attributable to PM2.5 (2005)

Total:
492,000 premature deaths per year;
4892,000 YLL

No PM10 or PM2.5 monitoring available in EECCA countries

Source: F. De Leeuw, J. Horalek, ETC/ACC, 2009
In the WHO European Region there are approximately 120,000 deaths and 2.4 million injuries per year due to road traffic.

The average mortality rate for RTI is 13.4 per 100,000 population, with a range from 3 to 31, with higher death rates in the eastern European countries.

**Deaths per 100,000 population**

- ≤ 5
- 6–9
- 10–14
- 15–19
- ≥ 20

Source: European status report on road safety

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In Austria car crashes decreased in the last decade

- 532 cars for 1000 population
- -42.4% deaths in 2010 vs 2001 (based on crude rates received from Austria focal persons in 2011)
- 34% of deaths among pedestrians, cyclists and motorcyclists
- Young people are most affected

Source: European status report on road safety
At least 1 million healthy life years are lost every year from traffic-related noise in the western part of Europe.

Reported noise exposure of more than 55 dB Lden in European agglomerations with more than 250,000 inhabitants.

Exposure to transport-related noise is associated with:
- Annoyance,
- Sleep disturbance,
- Heart attacks,
- Learning disabilities,
- Tinnitus.

The transport sector is the only one whose GHG emissions continue to increase

Changes 1990–2008

- Total GHG
- International shipping
- International aviation
- Waste
- Agriculture
- Industrial processes
- Fugitive emissions
- Households/services
- Transport
- Manufacturing/construction
- Energy production

Source: EEA, 2010
Change in total GHG emissions from transport by country (1990-2008)

(source EEA, TERM report 2010)
Physical inactivity is one of the leading risk factors for health in Europe, associated to nearly 1 million deaths/year.

Transport policies can create conditions supportive for physical activity.

Disability adjusted life years lost due to risk factors in EURO, 2004

Inactivity status in the European Region

- WHO estimates that in adults:
  - 63% are not reaching the minimum recommended level of physical activity
  - 20% of those are rated as “inactive”
  - 38% are sufficiently/highly active

- 40% of EU citizens say that they play sport at least once a week

- Citizens of Mediterranean and central European countries tend to exercise less

- 22% of 11-year old girls and 30% of boys report at least one hour of daily moderate to vigorous PA (MVPA)

Eurobarometer 72.3. Special Eurobarometer 334: Sport and PA
Health Behaviour in School Aged Children 2005/06 Survey
Physical inactivity estimated to cause:
21–25% of breast and colon cancer burden
27% of diabetes burden
30% of ischaemic heart disease burden

Magnitude of benefits from reaching minimum recommendations for physical activity
• Risk reductions for:
  – 20-30% for CHD and CVD morbidity and mortality
  – Cancer risks:
    • 30% for colon cancer
    • 20% - 40% for breast cancer
    • 20% for lung cancer
    • 30% for endometrial cancer
    • 20% for ovarian cancer
  – 30% for developing functional limitations
  – 30% for premature all-cause mortality

Reframing the issue:

*transport as an “opportunity” for health and the environment*
Focus on walking cycling and public transport: *Great potential of multiple benefits*

- Air pollution, noise, GHG emissions
- Energy consumption
- Congestion
- Land consumption
- Quality of the urban environment
- Social equity
- Physical activity
Walking, cycling and public transport: options that help different sectors achieving *their own goals*

<table>
<thead>
<tr>
<th>Goals</th>
<th>Interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce emissions of:</td>
<td></td>
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<tr>
<td>– air pollutants;</td>
<td>Environment</td>
</tr>
<tr>
<td>– greenhouse gases;</td>
<td></td>
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<tr>
<td>– noise</td>
<td>Health</td>
</tr>
<tr>
<td>Reduce congestion</td>
<td>Transport</td>
</tr>
<tr>
<td>Reduce road traffic injuries</td>
<td>Transport, Health</td>
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<tr>
<td>Reduce investments in infrastructure for more cars</td>
<td>Transport</td>
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<tr>
<td>Improve accessibility and quality of urban life</td>
<td>Transport, Health</td>
</tr>
<tr>
<td>Complement improvements to vehicles and fuels</td>
<td>Transport</td>
</tr>
<tr>
<td>Increase physical activity</td>
<td>Health</td>
</tr>
<tr>
<td>Promote tourism</td>
<td>Tourism and leisure industry</td>
</tr>
<tr>
<td>Creation of new jobs</td>
<td>Economy, welfare, labour</td>
</tr>
</tbody>
</table>

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Cycling and walking: a great way to meet the recommendations for healthier life!

- Do not require making a time slot available for that
  
  “I have no time for physical activity”

- Equitable and accessible options

- Feasible
  
  - 10% of trips made in car in Europe cover distances of less than 1 km
  
  - more than 30% less than 3 km and 50% of less than 5 km

- Most people can do it

- Is enjoyable!!!!

Photo courtesy of BASPO
The benefits of physical activity come as a “package” and are reflected on overall reduction in total mortality - 1/2

**Cycling and effects on total mortality**

<table>
<thead>
<tr>
<th>FINDINGS</th>
<th>Reduction in risk for all cause mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andersen et al (2000) Copenhagen Hearth Study</td>
<td>Danish adults reporting cycling to and from work: RR = 0.72 (95 % CI: 0.6, 0.9) for all cause mortality</td>
</tr>
<tr>
<td>Matthews et al (2007) Shangay Women’s Health Study</td>
<td>Chinese women reporting regular cycling for transportation: RR=0.79 (0.61-1.01) (0.1-3:4METs) and 0.66 (0.40-1.07) (&gt;3.5METs) for all-cause mortality.</td>
</tr>
</tbody>
</table>
The benefits of physical activity come as a “package” and are reflected on overall reduction in total mortality - 2/2

Meta-analysis results show nearly 30 % reduced all-cause mortality for regular walkers

Source: Hamer and Chida, 2008
What about the balance of benefits vs. risks?

City cyclists are at increased risk of lung injury from inhaled soot

Sunday 25 September 2011

People who cycle through London and other major cities have higher levels of black carbon in their airway cells, according to research from Queen Mary, University of London.

The research, which will be presented at the European Respiratory Society's Annual Congress in Amsterdam, suggests that cyclists inhale more black carbon than pedestrians, which may cause damage to the lungs.

The combustion of fossil fuels results in the generation of large numbers of inhalable particles of soot. There is increasing evidence that inhalation of these black particles is associated with a wide range of health effects - including heart attacks and reduced lung function.
What about the balance of benefits vs. risks?
Recent new evidence (1):

• Modeled impact both on society and for individuals when 500,000 people would make a transition from car to bicycle for short trips on a daily basis in the Netherlands
  • increased inhaled air pollution doses: 0.8-40 days lost
  • traffic accidents: 5-9 days lost
  • increased physical activity: 3-14 months of life gained
  • societal benefits even larger

→ **positive effects of active transport far greater than risks**

• For maximum positive effects: promote physical activity, road safety and clean air together!

What about the balance of benefits vs. risks?

Recent new evidence (2):

• The health benefits of physical activity from cycling using the bicycle sharing scheme (Bicing) in Barcelona, Spain, were large compared with the risks from inhalation of air pollutants and road traffic incidents.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Relative risk</th>
<th>AF&lt;sub&gt;exp&lt;/sub&gt;†</th>
<th>Deaths/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road traffic injury</td>
<td>1.0007</td>
<td>0.0007</td>
<td>0.03</td>
</tr>
<tr>
<td>Air pollution (particulate matter &lt;2.5 μm)</td>
<td>1.002</td>
<td>0.002</td>
<td>0.13</td>
</tr>
<tr>
<td>Physical activity</td>
<td>0.80</td>
<td>-0.23</td>
<td>-12.46</td>
</tr>
<tr>
<td>Carbon dioxide emissions saved (kg/year)‡</td>
<td>—</td>
<td>—</td>
<td>9,062,344</td>
</tr>
</tbody>
</table>

*Relative risk of death during cycling compared with travel by car.
†Attributable fraction of mortality among exposed (Bicing users).
‡Calculated for Barcelona vehicle fleet, reported in 2008 by Spanish traffic department.

Health dividends from Green Growth Strategies
Active transport as part of policies to reduce greenhouse gases emissions provides important health benefits

Scenarios for urban transport in London

* Health effects attributable to physical activity, air pollution, injuries per million population in 1 year, compared to “business as usual”. Negative numbers indicate a reduction in the disease burden.

<table>
<thead>
<tr>
<th>Health effects*</th>
<th>Low emissions vehicles</th>
<th>Increase in active mobility</th>
<th>Combining low emissions vehicles and active mobility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Premature mortality</td>
<td>-17</td>
<td>-530</td>
<td>-541</td>
</tr>
<tr>
<td>Years of Life Lost (YLL)</td>
<td>-160</td>
<td>-5188</td>
<td>-5295</td>
</tr>
<tr>
<td>Years of Life lived with Disability (YLD)</td>
<td>0</td>
<td>-2144</td>
<td>-2144</td>
</tr>
<tr>
<td>Disability Adjusted Life Years (DALYs)</td>
<td>-160</td>
<td>-7332</td>
<td>-7439</td>
</tr>
</tbody>
</table>

Health Dividends from Green Growth

- Much greater health gains from shifting to rapid transit/public transport and walking and cycling
- than from improving fuel and vehicle efficiency
- Consider all costs and benefits of Green Growth strategies!
Tools to support action

HEAT

Health Economic Assessment Tool
The question

• If \( x \) people walk/cycle a distance of \( y \) kilometers on most days, what is the economic value of the health benefits that occur as a result of the reduction in mortality due to their physical activity?
The answer

http://www.euro.who.int/HEAT
The Health Economic Assessment Tool for walking and cycling (HEAT)

- Easy tool to calculate the economic value of the health benefits of regular walking and cycling
- Recognises importance of economic analysis in transport: benefit-cost ratio is king
- New and updated version just launched end of May 2011 at the International Transport Forum in Leipzig
The Health Economic Assessment Tool for walking and cycling (HEAT)

- Effective public health:
  - action outside as well as within the health sector
  - identify levers
  - working upstream
  - Helps efficient use of public resources

- Evidence-based, transparent and adaptable

- Conservative
Number of trips per day x Distance per trip

Days cycled per year x Average speed

Distance cycled per year in study area

Relative risk of death among cyclists =
\[
1 - \left( \frac{\text{Distance cycled in study area}}{\text{Distance cycled in Copenhagen}} \times (1 - RR^*) \right)
\]

Estimate of economic savings based on reduced mortality among cyclists in the study area
HEAT estimate

Reduced mortality as a result of changes in cycling behaviour

The cycling data you have entered corresponds to an average of 450 km per person per year.

This level of cycling provides an estimated protective benefit of 9.31% (compared to persons not cycling regularly).

From the data you have entered, the number of individuals who benefit from this level of cycling is 60,000.

Out of this many individuals, the number who would be expected to die if they were not cycling regularly would be 436.27.

The number of deaths per year that are prevented by this level of cycling is 40.64.

Financial savings as a result of cycling

Currency: EUR

The value of statistical life applied is: 1,000,000 EUR

The annual benefit of this level of cycling, per year, is: 40,635,000 EUR

The total benefits accumulated over 10 years are: 406,353,000 EUR

When future benefits are discounted by 5% per year:

The current value of the average annual benefit, averaged across 10 years is: 31,377,000 EUR

The current value of the total benefits accumulated over 10 years is: 313,775,000 EUR

It is important to remember that many of the variables used within this HEAT calculation are liable to be estimates, and therefore liable to some degree of error.

In order to be sure of the validity of the figures outlined above, you are advised to rerun the model entering slightly different values for variables where you have provided a best guess, for example.
HEAT estimate

Reduced mortality as a result of changes in cycling behaviour

The walking data you have entered corresponds to an average of 3 km per person per day.
This level of walking provides an estimated protective benefit of 25.54% (compared to persons not walking regularly).

From the data you have entered, the number of individuals who benefit from this level of walking is: 60,000.
Out of this many individuals, the number who would be expected to die if they were not walking regularly would be: 436.27.

The number of deaths per year that are prevented by this level of walking is: 115.79.

Financial savings as a result of walking

Currency: EUR

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>The value of statistical life in your population is</td>
<td>1,000,000 EUR</td>
</tr>
<tr>
<td>The annual benefit of this level of walking, per year, is</td>
<td>115,789,000 EUR</td>
</tr>
<tr>
<td>The total benefits accumulated over 10 years are</td>
<td>1,157,888,000 EUR</td>
</tr>
<tr>
<td>When future benefits are discounted by 5% per year;</td>
<td></td>
</tr>
<tr>
<td>The current value of the average annual benefit, averaged across 10 years is</td>
<td>89,409,000 EUR</td>
</tr>
<tr>
<td>The current value of the total benefits accumulated over 10 years is</td>
<td>894,090,000 EUR</td>
</tr>
</tbody>
</table>

It is important to remember that many of the variables used within this HEAT calculation are liable to be estimates, and therefore liable to some degree of error.

In order to be sure of the validity of the figures outlined above, you are advised to recap the model.

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Vienna, 5 October 2011
HEAT for cycling: selected applications
Applying HEAT for Cycling
Austrian results

- 811 Mio. Euro mean annual benefit
- 824 'saved lifes' per year
- 1253 Euro annual savings per cyclists
- Strong arguments for the promotion of cycling in particular for investments in cycling infrastructure
Tools to support action

Evidence and policy platforms – THE PEP
Documenting the evidence of the effects of transport
Working with ministries of transport, health and environment: THE PEP
Transport, Health and Environment Pan-European Programme

• Integration of E&H aspects in transport policies
• Transport management towards sustainable mobility
• Urban transport
• Transition countries and sensitive areas
What is THE PEP?

- Tri-partite policy framework for a larger Europe
  - integration of environment and health concerns into transport policy
  - Transport, Health, Environment on equal footing
- Integrated and holistic approach
  - Air pollution, climate change, noise, injuries, nature and landscape effects, physical inactivity, psychosocial effects
The Amsterdam Declaration (2009)
Goals for 2009-2014

- **Sustainable** *economic development*
- **Sustainable and efficient** *transport systems*
- **Reducing transport related** *emissions*
- **Safe and healthy** *modes of transport*
Working in partnership: THANKS! www.euro.who.int/transport
“I thought of that while riding my bicycle.”

Albert Einstein
on the theory of relativity