FFHS
Fernfachhochschule Schweiz
Mitglied der SUPSI

New e-biking functionality in the Health Economic Assessment Tool (HEAT) for walking and cycling

HEAT
Health economic assessment tool

Prof. Sonja Kahlmeier
Swiss Distance University of Applied Science FFHS, Department of Health
HEAT coordinating team

On behalf of the HEAT coordinating team:
Racioppi F, Goetschi T, Brand C, Cavill N, Castro A, de Nazelle A, Herick de Sa T, Johnson A, Kelly P, Lieb C, Rojas Rueda D, Rutter H, Sarmiento OL, Smith R, Thondoo M, Winters M, Woodcock J, Yunesian M

Active mobility and public transport have important climate mitigation and health co-benefits

Mitigation strategy	Potential to reduce emissions (illustrative	Likely reduction of health risk factors		Additional effects, limitations and comments
		Size and direction of effect	Strength of	
IPCCc Land use changes and alternatives to private motorized transport	Package of walkways, cycleways and bus rapid transit could reduce emissions by 25% at a cost of US$ 30/tCO_2.[20] Improved land use could reduce emissions by 21% over a 20-year period at a cost of US$ 91/tCO_2.[10]	Air pollution	++	Moderate
		Physical activity	++	Moderate
		Road traffic injury	++	Moderate
		Noise	++	Weak
		Social effects	++	Weak
		Land use	Not applicable	

changes and alternatives to private motorized transport

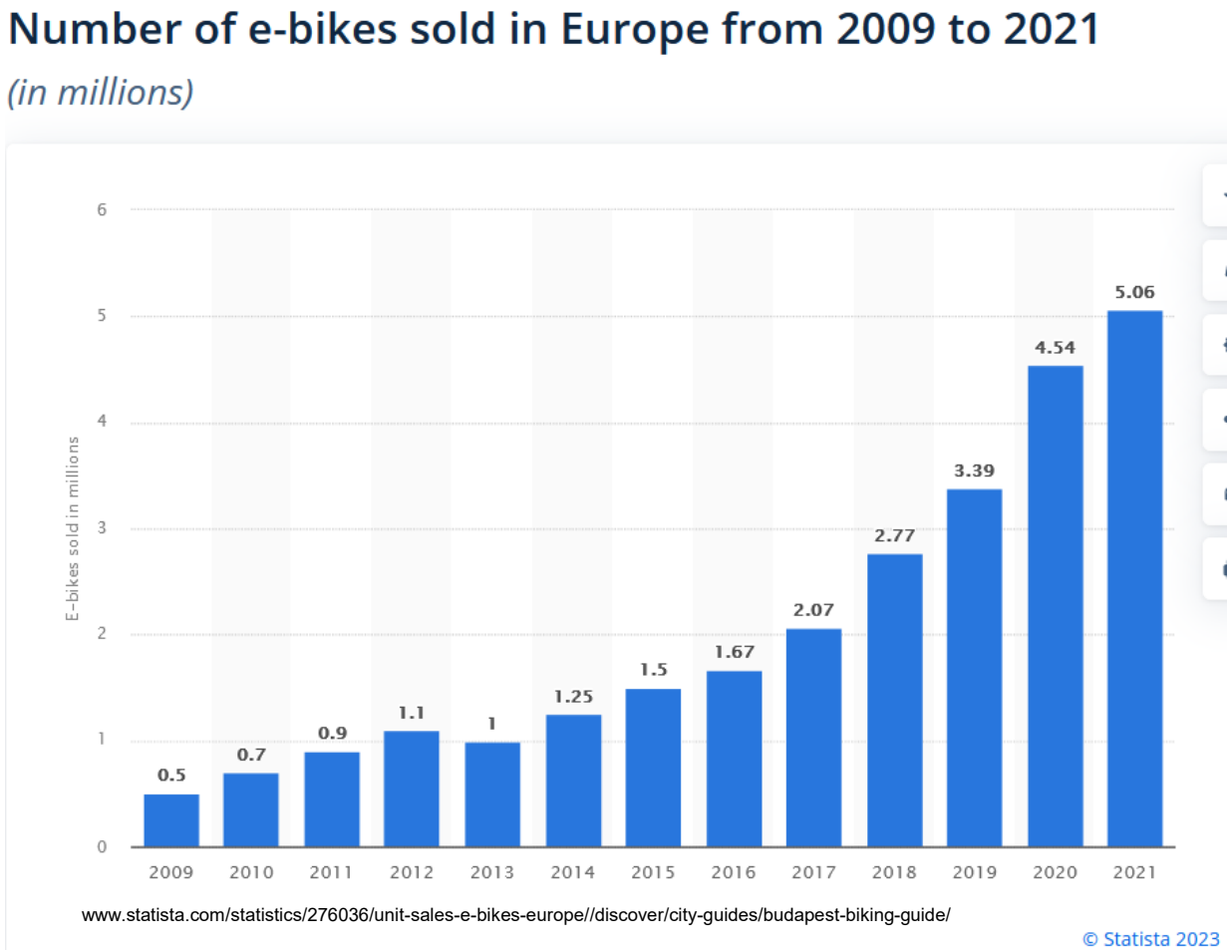
transit could reduce emissions by 25% at a cost of US$ 30/tCO_2.[20]
Improved land use could reduce emissions by 21% over a 20-year period at a cost of US$ 91/tCO_2.[10]

Road traffic injury ++ Moderate
Noise ++ Weak
Social effects ++ Weak
Land use Not applicable

Can make walking and cycling safer for vulnerable groups, e.g. children, older adults and people without cars.
Increases in walking and cycling need to be accompanied by improvements in the safety of the walking and cycling environment.

Source: World Health Organization, 2011. *Health co-benefits of climate change mitigation - Transport sector*,

E-bikes are on the rise



Evidence on e-biking, health & climate impacts

Transport Policy
Volume 116, February 2022, Pages 11-23

https://www.sciencedirect.com/science/article/pii/S0967070X21003401

E-bikes and their capability to reduce car CO_2 emissions

SYSTEMATIC REVIEW article

Front. Sports Act. Living, 19 October 2022
Sec. Physical Activity in the Prevention and Management of Disease
Volume 4 - 2022 | https://doi.org/10.3389/fspor.2022.1031004

This article is part of the Research Topic
Walking, Cycling and Active Travel As Part of Physical Activity and Public Health Systems
View all 12 Articles ›

E-cycling and health benefits: A systematic literature review with meta-analyses

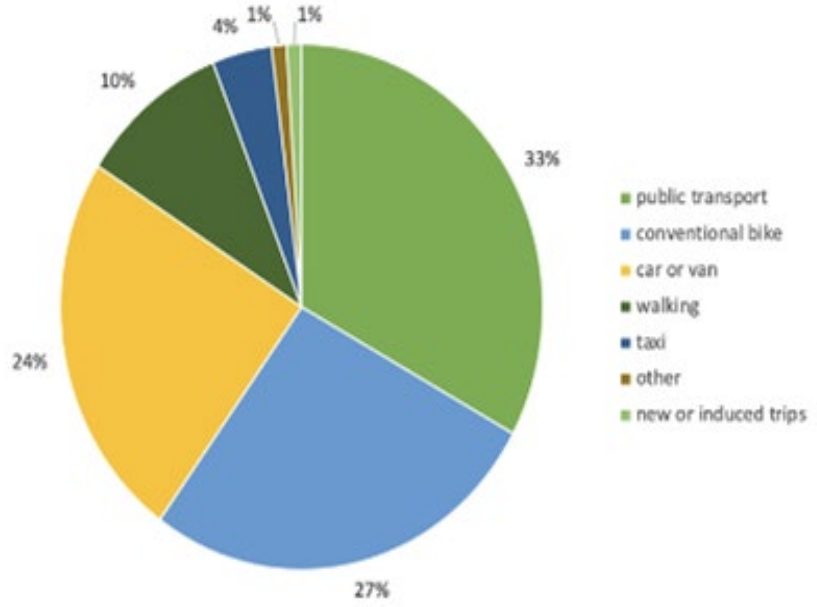
https://www.sciencedirect.com/science/article/pii/S259019821930017X

Which modes are being replaced by e-biking?

- **Public transport** **33%**
- **Motorized modes** **28%**
- Conventional bike 27%
- Walking 10%
- New / induced trips 1%
- Other 1%

→ needs to be considered for health / climate impact assessment

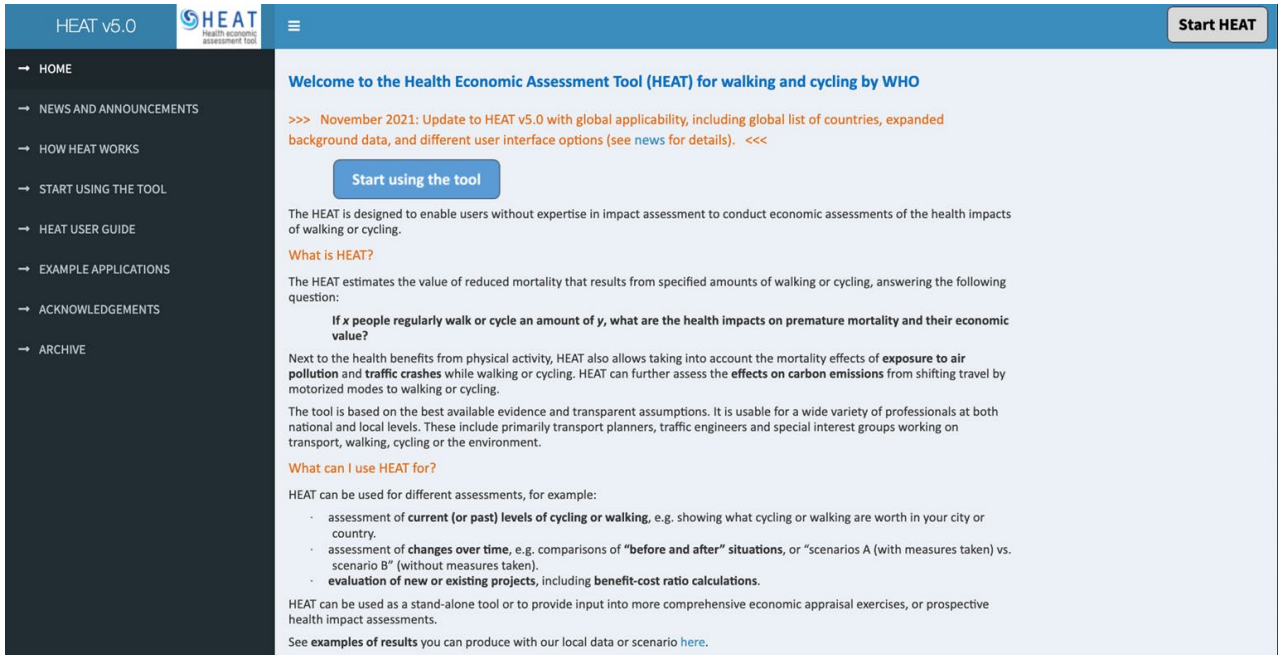
Figure 2: Median mode substitution to e-biking based on meta-analysis of 24 studies



Source: Bigazzi and Wong (2020)

What *is* the HEAT?

- Online tool www.heatwalkingcycling.org
- Designed for transport planners and non-health experts
  - no in-depth health or economic expertise required
- Economic assessment of health benefits of walking or cycling
- Effects on mortality ‘only’
- Evidence-based



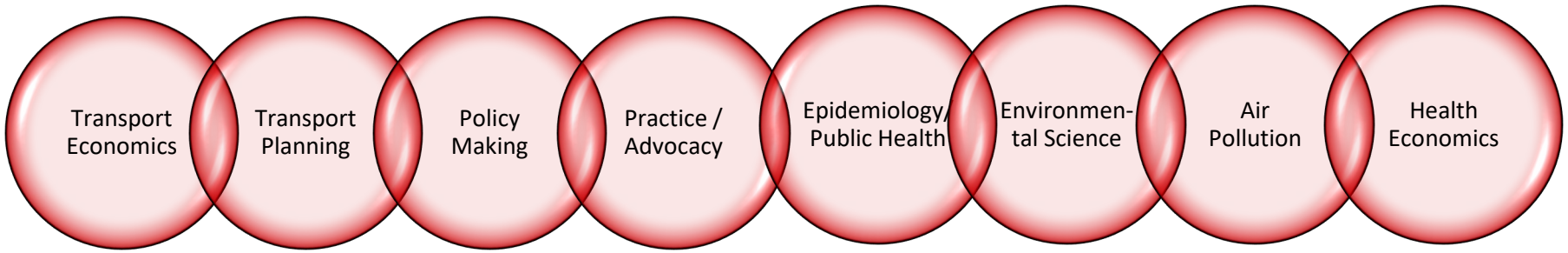
HEAT – A collaborative project

Project coordinating team:
Francesca Racioppi, WHO Regional Office for Europe, Sonja Kahlmeier, Swiss Distance University of Applied Science (FFHS), Switzerland,
Thomas Götschi, University of Oregon, USA, Abraham Mwaura, WHO Headquarters

Project advisory and expert groups:
Karim Abu-Omar, Heba Adel Moh'd Safi, Yousaf Ali, Lars Bo Andersen, Hugh Ross Anderson, Nelzair Araujo Vianna, Alex Bigazzi, Olivier Bode, Tegan Boehmer, Jessica Bourne, Nils-Axel Braathen, Christian Brand, Hana Bruhova-Foltynova, Fiona Bull, Daniel Buss, Juan Castillo, Nick Cavill, Dushy Clarke, Andy Cope, Baas de Geus, Audrey de Nazelle, Thiago Herick de Sa, Ardine de Wit, Hywell Dinsdale, Damien Dussaux, Rune Elvik, Santiago Enriquez, Mark Fenton, Jonas Finger, Francesco Forastiere, Richard Fordham, Charlie Foster, Virginia Fuse, Eszter Füzeki, Aslak Fyhri, Rogerio Gama, Frank George, George Georgiadis, Regine Gerike, Eva Gleissenberger, Rahul Goel, Shifalika Goenka, Anna Goodman, Thomas Götschi, Maria Hagströmer, Mark Hamer, Yahaya Hassan Said, Holger Haubold, Eva Heinen, Thiago Herick de Sa, Marie-Eve Heroux, Max Herry, Gerard Hoek, Stefanie Holzwarth, Luc Int Panis, Nicole Iroz-Elardo, Luis Jorge Hernandez, Sonja Kahlmeier, Paul Kelly, Meleckidhesi Khayesi, Caryl Koinange, Michal Krzyzanowski, SM. Labib, I-Min Lee, Christoph Lieb, Jose Lobo, Mazen Malkawi, Brian Martin, Marco Martuzzi, Markus Maybach, Adriannah Mbandi, Guy Mbayo, Gabriel Michel, Irina Mincheva Kovacheva, Hanns Mooshammer, Pierpaolo Mudu, Carlos Muñoz Piña, Marie Murphy, Nanette Mutrie, Bhash Naidoo, Keiko Nakamura, Daisy Narayanan, Maria Neira, Amanda Ngabirano, Mark Nieuwenhuijsen, Åse Nossum, Pekka Oja, Edith Patouillard, Uttam Paudel, Genandrialine Peralta, Laura Perez, Ian Philips, Julie Powel, Francesca Racioppi, Hussain Rasheed, Lisa Robinson, Patrick Rérat, Amund Riiser, David Rojas Rueda, Gabe Rousseau, Candace Rutt, Harry Rutter, Randy Rzewnicki, Kjartan Saelensminde, Elin Sandberg, Alexander Santacreu, Andreia Santos, Parth Sarathi Mahapatra, Lucinda Saunders, Daniel Sauter, Shari Schaftlein, Peter Schantz, Tom Schmid, Peter Schnohr, Christoph Schreyer, Christian Schweizer, Nino Sharashidze, Heini Sommer, Jan Sørensen, Joe Spadaro, Gregor Starc, Dave Stone, Marko Tainio, Robert Thaler, Vo Thi Hue Man, Meelan Thondoo, Miles Tight, Sylvia Titze, Lan Wang, Miriam Weber, Wanda Wendel Vos, Paul Wilkinson, James Woodcock, Tian Xiangyang, Hou Xiaohui, Mulugeta Yilma, Masud Yunesian.

Development team: Tomasz Szreniawski, Thomas Götschi, Alberto Castro Fernandez, Vicki Copley, Ali Abbas, Duy Dao, Hywell Dinsdale

Expertise involved:



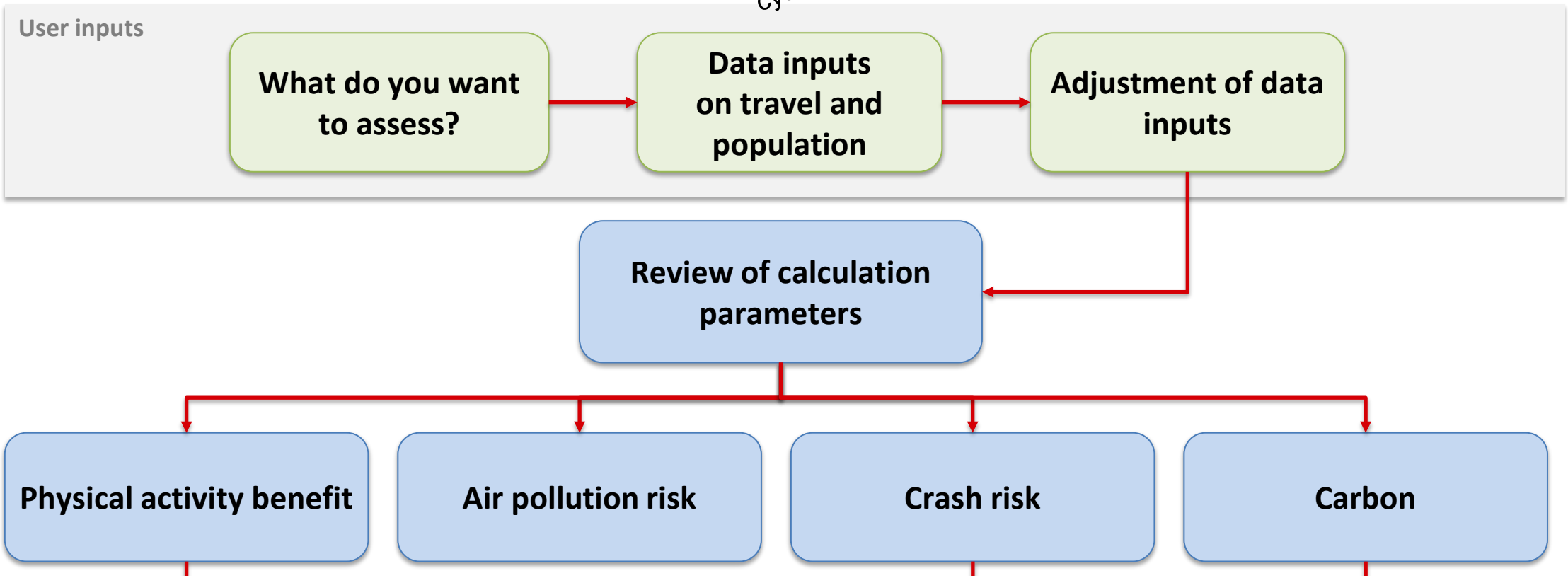
HEAT answers the question:

- If x people walk/cycle an amount of y 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?

- In addition:
  - How much do air pollution or crashes affect these results?
  - What are the effects on the emissions of carbon?

HEAT workflow

Now including e-biking functionality!
(as well as regular cycling & bike sharing)



VSL = Value of a Statistical Life, SCC = Social Cots of Carbon

How does it work?

- **An example: e-biking in Budapest**
  - Based on: situation in Switzerland
    - Average of 1 minute of e-biking across the adult population (Microcensus Transport & Mobility 2021)

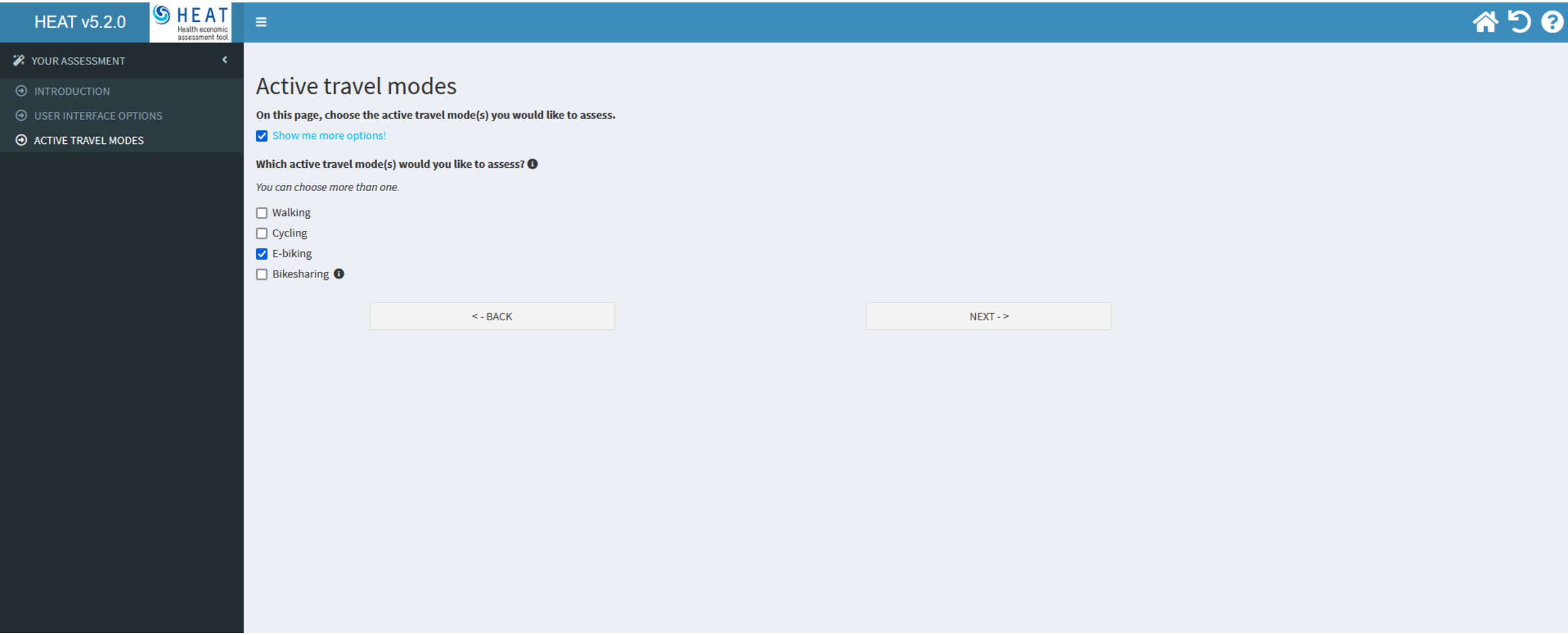

https://www.tripadvisor.com/Attraction_Review-g274887-d6487046-Reviews-I_Like_EBike-Budapest_Central_Hungary.html

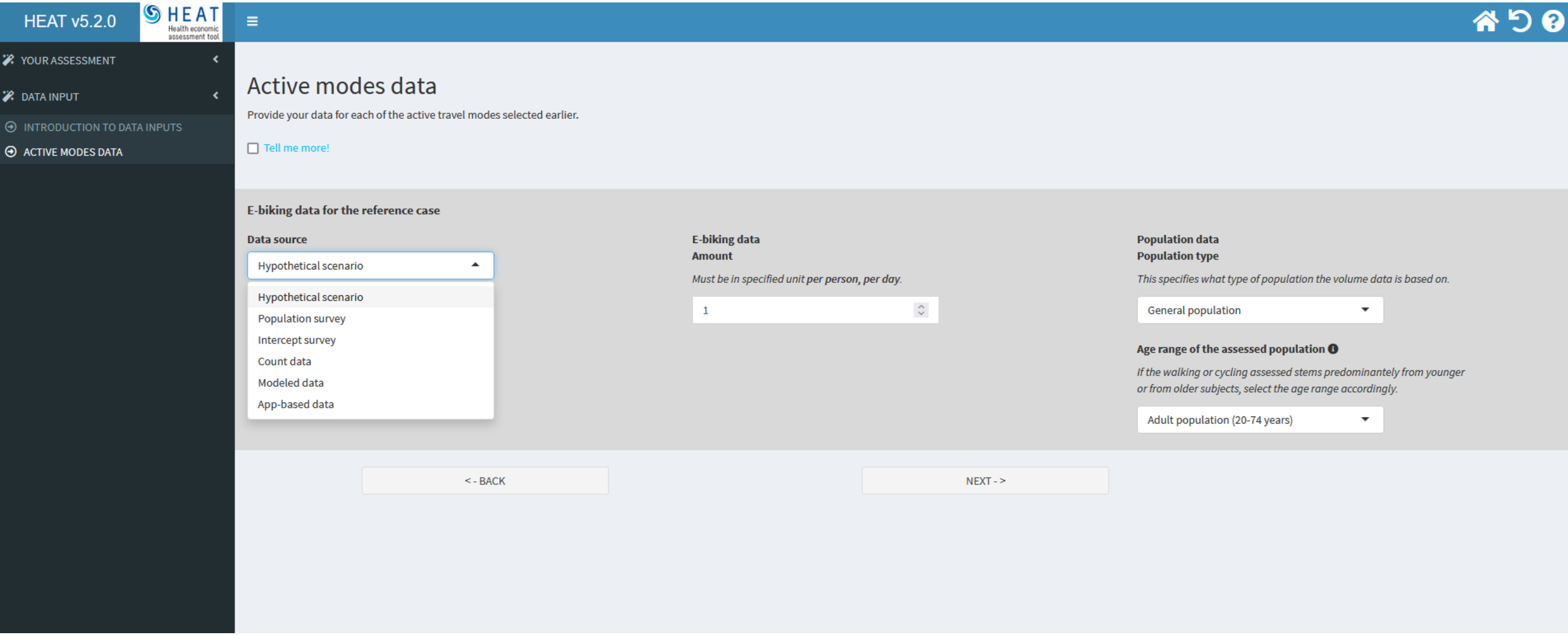
→ Scenario: reaching the level of Switzerland within the next 10 years

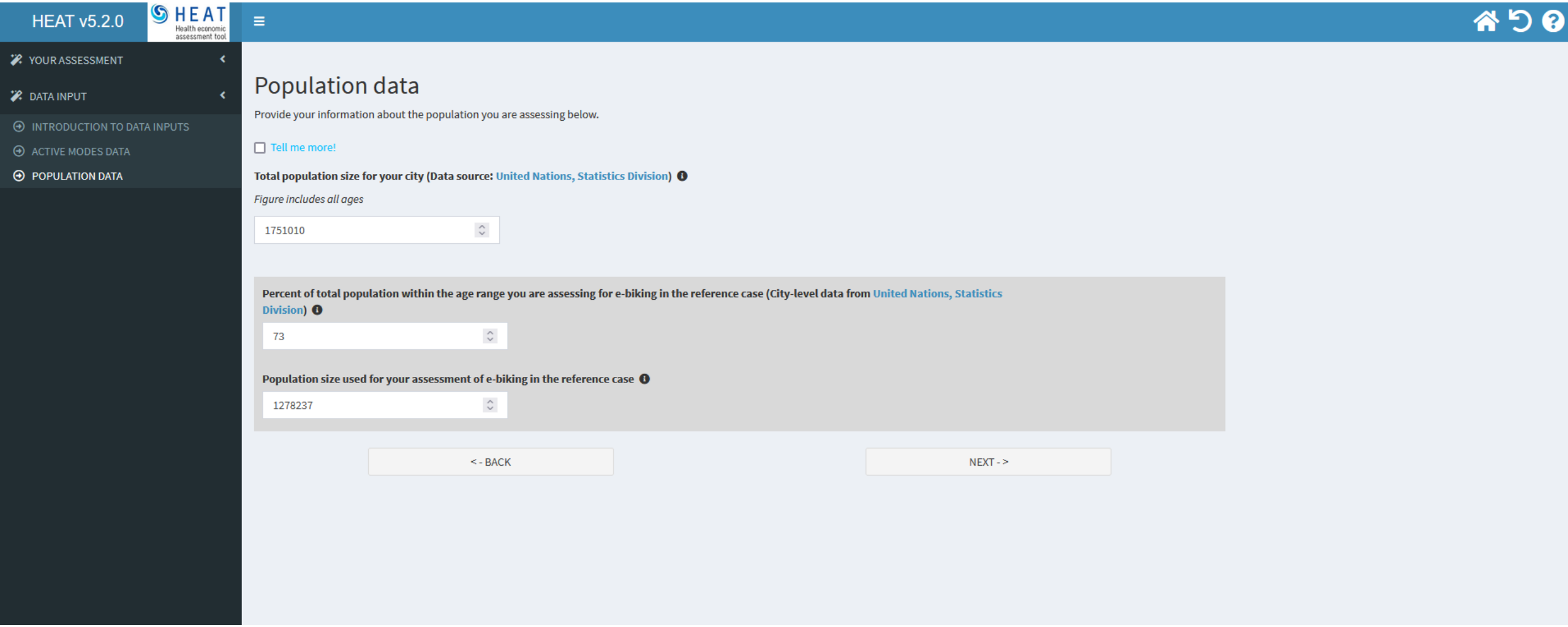
- Impacts of physical activity & carbon

www.heatwalkingcycling.org

Source: www.bfs.admin.ch/bfs/en/home/statistics/mobility-transport/passenger-transport/travel-behaviour.html


HEAT v5.2.0
HEAT
Health economic assessment tool
YOUR ASSESSMENT
INTRODUCTION
USER INTERFACE OPTIONS
ACTIVE TRAVEL MODES
Active travel modes
On this page, choose the active travel mode(s) you would like to assess.
Show me more options!
Which active travel mode(s) would you like to assess?
You can choose more than one.
Walking
Cycling
E-biking
Bikesharing
< - BACK
NEXT - >


HEAT v5.2.0
HEAT
Health economic assessment tool
YOUR ASSESSMENT
DATA INPUT
INTRODUCTION TO DATA INPUTS
ACTIVE MODES DATA
Active modes data
Provide your data for each of the active travel modes selected earlier.
Tell me more!
E-biking data for the reference case
Data source
Hypothetical scenario
Hypothetical scenario
Population survey
Intercept survey
Count data
Modeled data
App-based data
E-biking data
Amount
Must be in specified unit per person, per day.
1
Population data
Population type
This specifies what type of population the volume data is based on.
General population
Age range of the assessed population
If the walking or cycling assessed stems predominantely from younger or from older subjects, select the age range accordingly.
Adult population (20-74 years)
< - BACK
NEXT - >


HEAT v5.2.0
HEAT
Health economic assessment tool
YOUR ASSESSMENT
DATA INPUT
INTRODUCTION TO DATA INPUTS
ACTIVE MODES DATA
POPULATION DATA
Population data
Provide your information about the population you are assessing below.
Tell me more!
Total population size for your city (Data source: United Nations, Statistics Division)
Figure includes all ages
1751010
Percent of total population within the age range you are assessing for e-biking in the reference case (City-level data from United Nations, Statistics Division)
73
Population size used for your assessment of e-biking in the reference case
1278237
< - BACK
NEXT - >

Results for e-biking (all pathways)

Summary of your input data

The volume data you have entered corresponds to 1 minute per person per day. Your assessed population is 1,278,237.

Summary of impacts for mortality and carbon emissions

As a result, 54 premature deaths are prevented per year and carbon emissions are reduced by 675 metric tons of CO2 per year. Over the full assessment period of 10 years, 543 premature deaths are prevented and carbon emissions are reduced by 6,745 metric tons of CO2.

Economic value of impacts

Mortality is monetized using Value of Statistical Life (VSL) of 1,498,000 (US$) per premature death and carbon emissions are monetized using social cost of carbon (SCC) of 79 (US$) per metric ton of CO2.

This corresponds to an economic value of 81,400,000 (US$) per year.

Over the full assessment period of 10 years, the total economic impact is 814,000,000 (US$).

Adjusted to 2023 value (i.e. discounted/inflated), the total economic impact is 629,000,000 (US$).

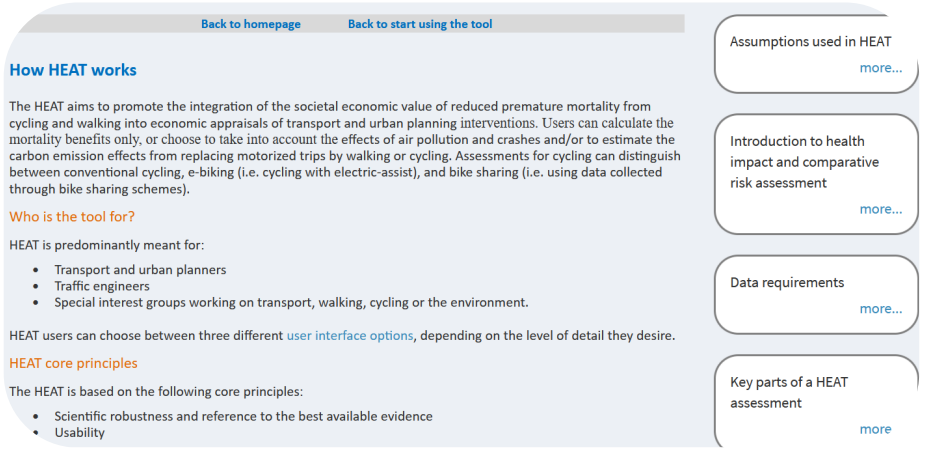
Supporting documentation

- **Website**: www.heatwalkingcycling.org
  including methods and user guide

- **Methodology**:
  - Latest methods paper:
    www.mdpi.com/1660-4601/17/20/7361

- **HEAT booklet**
  - Methods & user guide: https://www.heatwalkingcycling.org/#userguide
    (updated version forthcoming)

- **For technical support & input**
  - Email: heatwalkingcycling@who.int



sonja.kahlmeier@ffhs.ch