April 16th, 2024

Reducing Car Dependency for Greener and Healthier Pacific Island Cities

WHO Health Economic Assessment Tool (HEAT) for planning in PICs

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1. Introducing WHO HEAT for walking and cycling

This World Health Organization modeling tool can be accessed at: heatwalkingcycling.org

This is the landing page that explains the various use cases for which the calculator has been developed. >>>>>>>>>>>

Welcome to the Health Economic Assessment Tool (HEAT) for walking and cycling by WHO

>>> July 2023: Update to HEAT v5.2 with option to assess e-biking (see news for details). <<<

Start using the tool

The HEAT is designed to enable users without expertise in impact assessment to conduct economic assessments of the health impacts of walking or cycling.

What is HEAT?

The HEAT estimates the value of reduced mortality that results from specified amounts of walking or cycling, answering the following question:

If *x* people regularly walk or cycle an amount of *y*, what are the health impacts on premature mortality and their economic value?

Next to the health benefits from physical activity, HEAT also allows taking into account the mortality effects of **exposure to air pollution** and **traffic crashes** while walking or cycling. HEAT can further assess the **effects on carbon emissions** from shifting travel by motorized modes to walking or cycling.

The tool is based on the best available evidence and transparent assumptions. It is usable for a wide variety of professionals at both national and local levels. These include primarily transport planners, traffic engineers and special interest groups working on transport, walking, cycling or the environment.

What can I use HEAT for?

HEAT can be used for different assessments, for example:

- assessment of **current (or past) levels of cycling or walking**, e.g. showing what cycling or walking are worth in your city or country.
- assessment of **changes over time**, e.g. comparisons of **"before and after" situations**, or "scenarios A (with measures taken) vs. scenario B" (without measures taken).
- **evaluation of new or existing projects**, including **benefit-cost ratio calculations**.

HEAT can be used as a stand-alone tool or to provide input into more comprehensive economic appraisal exercises, or prospective health impact assessments.

See **examples of results** you can produce with our local data or scenario here.

How does HEAT work?

More information on how HEAT works can be found here. A detailed description of the development process, evidence used and main project steps as well as a step-by-step-guide can be found in the Methodology and user guide booklet.

More information and contacts

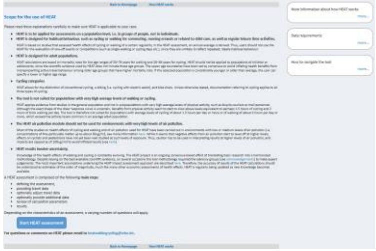
More information and materials are also available at http://www.euro.who.int/HEAT

For questions or comments on HEAT please email to heatwalkingcycling@who.int.

1. WHO HEAT – How it Works

Starting to use the tool, the user is prompted to review the following details leading to the main steps:

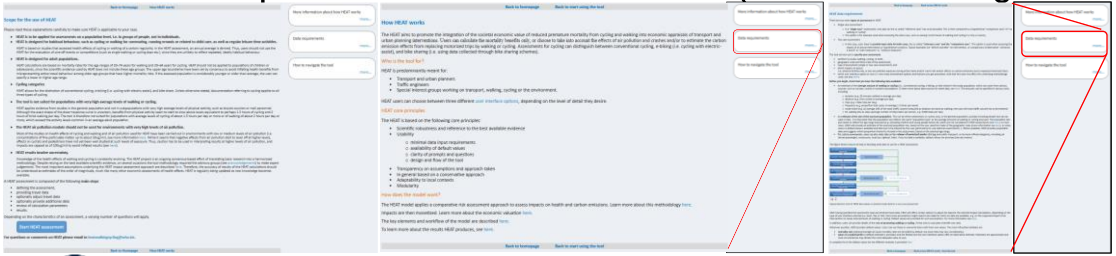
- **defining the assessment,**
- **providing travel data**
- **optionally adjust travel data**
- **optionally provide additional data**
- **review of calculation parameters**
- **results.**



The Methodology and User Guide is available by clicking on the title below. The examples of end results are not presented in the format that model projections are given, but detail various potential use cases and results to be expected. >>>

The user can immediately begin the assessment, or dive into further explanatory information using the sidebar links.

The info on how HEAT functions is provided through the first link on the sidebar, which provides links to further info. (Intro walkthrough below):



1. WHO HEAT – Limitations

- National-level data has been estimated based upon sources available to the WHO team,
- National and local-level will be crucial for improving the output of the scenario modeling when using the HEAT platform.
- WHO has made a number of ***key assumptions*** in setting up the base case data sets for each country.
- ***All features*** are available in the full interface tool. Including;

- **Bikesharing**
- **Two subnational, city, and project-level scales**
- **air pollution**
- **crash risk**
- **carbon emissions**

For the following assessments:

- The basic interface is used.

- “Two case assessments” to provide a ***comparative case*** from a starting scenario to a later date, post-intervention, fully implemented ***five*** years into a ***10-year*** lifespan.

- Given data paucity, national-level assessments are made.

WHO 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”.

User interface options and data adjustments for the HEAT calculations

Input data on active modes of transport provided by the user may not be adequate or sufficient for all calculations of impact. HEAT therefore offers several options to adjust the data or provide additional information to inform the calculation, depending on the characteristics of the assessment and the selected user interface option. Users can choose between 3 different "user experiences":

- basic user interface , with only the most important adjustment options, which is relying mostly on default values and assumptions (good for initial exploration of the tool and simple assessments).
- flexible user interface , where users can select "additional amendment options" as they see fit (good for users who are somewhat familiar with HEAT, have additional local data available and know how they intend to refine their assessment).
- full user interface, which offers all amendment features available in the tool (see below), as long as they are of relevance for the selected assessment (good for users who have additional local data available and would like to take advantage of all options to refine their assessment).

Data adjustment options in HEAT may include the following (depending on the type of assessment and only available in the “flex” and “full” user interface options):

- proportion excluded
- temporal and spatial adjustment
- uptake time for active travel demand
- proportion of new trips
- proportion of reassigned trips
- proportion of shifted trips
- proportion in traffic
- proportion for transport
- traffic conditions
- change in crash risk
- substitution of physical activity.

General adjustments of active travel data

Proportion excluded due to unrelated factors (“two case assessments” only)

When the impact of an intervention is assessed, not all the cycling or walking observed may be directly attributable to the intervention. For example, cycling may have become more fashionable over time, or gasoline or public transport prices may have changed and affected active transport behaviour. Walking or cycling arising from such external effects should not be included in the assessment of the infrastructure or project.

The precise effects of an intervention and unrelated factors can rarely be disentangled. Estimate the proportion you would exclude from the assessment (such as –30%) to the best of your knowledge. For more guidance on this, see also here.

The default setting is 0%.

Temporal and spatial adjustment

HEAT requires long-term average input on active travel (such as annual means). Active travel is highly affected by such factors as season, weather and time of day. Short-term counting, for example, is typically carried out in summer or fall and often during rush hour. If active travel data is from a short-term survey or count, it likely under- or overestimates the long-term average. This can be adjusted here (such as + 20% or – 30%). Data from continuous counters can be helpful in assessing the potential need for adjusting for time.

Similarly, the location where count data or intercept surveys are collected may not represent average volumes for the complete facility of interest (such as a bike path, trail, or network). This slider can be used to apply a spatial adjustment (such as + 20% or – 30%). Data from multiple locations are usually needed to inform spatial adjustment, but crude guesses may be adequate in some cases. Accurate spatial adjustment would require a spatial modelling approach.

The default setting is 0%.

Uptake time for active travel demand (“two case assessments” only)

Here users can specify a take-up time (in years) until the maximum volume of active travel is reached. This allows adjusting for the estimated time to reach the full level of walking or cycling entered, such as after an intervention has been implemented. For example, if a new footpath is built, and an estimated 5 years will elapse for usage to reach a steady state, this figure should be changed to 5. For steady-state situations, with no build-up time considered, this should be set to zero.

The default setting is 1 year.

2. Benefits of Physical Activity for Pacific Island Countries

Active Transport can:

- **Mitigate <u>Traffic Congestion:</u>** Reducing single vehicle occupancy of able-bodied commuters will free up substantial space to create a safe space for active travelers and public transit users, recovering lost productivity spent in traffic

- **Improve <u>Community Health:</u>** Active transport is the most cost-effective way to realize reduction in healthcare costs associated with non-communicable diseases exacerbated by sedentary lifestyle choices aligned with motor vehicle use.

- **Provide <u>an Equitable Transport System:</u>** Active transport helps reinforce the transport hierarchy, where the pedestrian with any accessibility issues should be the target of transport infrastructure and system design.

- **Provide <u>Economic Benefit</u> to the Nation and Community:** People plan routes more efficiently, change purchasing habits to support local retailers, and reduced spending on fuel, vehicles, and parts, maintenance and repair will have a significant impact on current trade imbalances and debt spending

2. Benefits of Physical Activity for Kiribati

Scenario: add daily active transport activity of...

1-3km walking | 1-3km cycling | 3-5km e-bike

Population: **114,153** (UN Pop. Division)

Adults aged 20-74 (54% of total): **61,643** for pedestrians

Adults aged 20-64 (51% of total): **58,218** for bikes/e-bikes.

All-cause mortality rate: pedestrians: **1,364** deaths/100,000 (WHO Global Health Observatory)

Bicycle/e-bike: **1,086** deaths/100,000

The Value of Statistical Life (**INT$263,000**) is calculated in International $ (2017) adjusted nationally for purchasing power parity (PPP).

Added physical activity ranges from 4 to 34 minutes:

Economic value of impacts

Mortality is monetized using a **Value of Statistical Life (VSL)** of **263,000** (Int$) per premature death

This corresponds to a 2022 (i.e. discounted/inflated) value of:

1km (11min) walk: $9.52m/year | $63.7m/2024-34

2km (23min) walk: $19m/year | $127m/2024-34

3km (34min) walk: $28.5m/year | $191m/2024-34

1km (4min) bike: $3.87m/year | $25.9m/2024-34

2km (9min) bike: $7.74m/year | $51.8m/2024-34

3km (13min) bike: $11.6m/year | $77.8m/2024-34

3km (11min) e-bike: $7.71m/year | $51.6m/2024-34

4km (14min) e-bike: $10.3m/year | $68.9m/2024-34

5km (18min) e-bike: $12.9m/year | $86.1m/2024-34

2. Benefits of Physical Activity for Solomon Islands

Scenario: add daily active transport activity of...

1-3km walking | 1-3km cycling | 3-5km e-bike

Population: **630,030** (UN Pop. Division)

Adults aged 20-74 (54% of total): **305,294** for pedestrians

Adults aged 20-64 (51% of total): **292,574** for bikes/e-bikes.

All-cause mortality rate: pedestrians: **1,524** deaths/100,000 (WHO Global Health Observatory)

Bicycle/e-bike: **1,222** deaths/100,000

The Value of Statistical Life (**INT$145,000**) is calculated in International $ (2017) adjusted nationally for purchasing power parity (PPP).

Added physical activity ranges from 4 to 34 minutes:

Economic value of impacts

Mortality is monetized using a **Value of Statistical Life (VSL)** of **263,000** (Int$) per premature death

This corresponds to a 2022 (i.e. discounted/inflated) value of:

1km (11min) walk: $29m/year | $194m/2024-34

2km (23min) walk: $58.1m/year | $389m/2024-34

3km (34min) walk: $87.1m/year | $583m/2024-34

1km (4min) bike: $12.1m/year | $80.8m/2024-34

2km (9min) bike: $24.1m/year | $162m/2024-34

3km (13min) bike: $36.2m/year | $242m/2024-34

3km (11min) e-bike: $24m/year | $161m/2024-34

4km (14min) e-bike: $32.1m/year | $215m/2024-34

5km (18min) e-bike: $40.1m/year | $268m/2024-34

2. Benefits of Physical Activity for Tonga

Scenario: add daily active transport activity of...

1-3km walking | 1-3km cycling | 3-5km e-bike

Population: **102,002** (UN Pop. Division)

Adults aged 20-74 (54% of total): **52,021** for pedestrians

Adults aged 20-64 (51% of total): **48,961** for bikes/e-bikes.

All-cause mortality rate: pedestrians: **639** deaths/100,000 (WHO Global Health Observatory)

Bicycle/e-bike: **437** deaths/100,000

The Value of Statistical Life (**INT$453,000**) is calculated in International $ (2017) adjusted nationally for purchasing power parity (PPP).

Added physical activity ranges from 4 to 34 minutes:

Economic value of impacts

Mortality is monetized using a **Value of Statistical Life (VSL)** of **263,000** (Int$) per premature death

This corresponds to a 2022 (i.e. discounted/inflated) value of:

1km (11min) walk: $6.48m/year | $43.4m/2024-34

2km (23min) walk: $12.9m/year | $86.2m/2024-34

3km (34min) walk: $19.4m/year | $130m/2024-34

1km (4min) bike: $2.26m/year | $15.1m/2024-34

2km (9min) bike: $4.48m/year | $30m/2024-34

3km (13min) bike: $6.77m/year | $45.3m/2024-34

3km (11min) e-bike: $4.5m/year | $30.1m/2024-34

4km (14min) e-bike: $5.99m/year | $30.1m/2024-34

5km (18min) e-bike: $7.49m/year | $40.1m/2024-34

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3. Purpose of HEAT

1. **What problem does this tool solve?**
   WHO provides a targeted approach to identifying impacts of non-motorized transport inputs into populations and areas of various scales. It builds upon a global database of transport-related evidence to generate modeled outputs.

2. **What benefits does it bring me?**
   HEAT enables targeted analysis of active transport-related interventions, enabling transport planning efforts to better incorporate monetization of health benefits using the value of statistical life approach.

3. **How is it used in other cities and what benefits did it bring?**
   Launched in May 2011 for the WHO European Region, it is used most widely in the United Kingdom and the United States, followed by China, Germany, France, Italy, and Finland, Spain, Switzerland and Australia. It's used by public health sector (43%), transport (28%) and academic sectors (27%) to estimate the value of future projected or hypothetical levels of cycling or walking, the value of measured increases and that of current levels of cycling or walking, with results used for presentations, internal or published reports, or academic papers aimed at local authorities or municipalities, national authorities and ministries, research bodies, or non-government organizations (Kahlmeier, et al, 2022).

3. Purpose of HEAT

1. **What are the practical uses of this for me being a transport specialist in the Pacific region?**
   This calculation can serve different types of assessment, for example, of current (or past) levels of cycling or walking, such as showing the value of cycling or walking in a city or country; of changes over time, such as comparing before-and-after situations or scenario A vs. scenario B (such as with or without measures taken); and evaluating new or existing projects, including calculating benefit–cost ratios.

2. **What City-level active transport scenarios exist in nations elsewhere to set a precedent for increased physical activity in a Pacific island context?**
   Denmark: Walking – 82.5min/day | Cycling – 8.31min/day (Johansson, et al., 2019).
   Netherlands: Walking – 1.5km|11.25min/day (de Hass & Hammersma, 2019) | (26.8% All-trip mode share) Cycling – 10min/day
   Japan: (11.5% All-trip mode share) Cycling – 10min/day
   Germany: (9.3% All-trip mode share) Cycling – 10min/day
   Finland: (7.8% All-trip mode share) Cycling – 15min/day
   Switzerland: (6.7% All-trip mode share) Cycling – 10min/day
   Argentina: (3.6% All-trip mode share) Cycling – 15min/day
   Chile: (2.7% All-trip mode share) Cycling – 20min/day
   England: (2.1% All-trip mode share) Cycling – 16min/day
   Australia: (1.8% All-trip mode share) Cycling – 15min/day
   USA: Walking – 14.9min/day (Yang & Diez-Rouz, 2013) | (1.1% All-trip mode share) Cycling – 15min/day
   Brazil: (0.8% All-trip mode share) Cycling – 20min/day (Goel, et al., 2020).

4. Challenges

- Data availability in PICs for scenario modeling
- Sunk cost of existing automotive-oriented infrastructure & market
- Inadequate or absent non-motorized transport technology options
- Routes without sufficient space for pedestrians and non-motorized travelers
- Insufficient amenities and facilities (bike racks, air pumps, lockers, showers)
- Slow bus operation due to needless and unpredictable bus delays
- Limited inclusion in formal physical education curriculum and athletic training
- Lack of quality retail and qualified service options
- Undervalued as provider of ***co-benefits***

5. The Way Forward

1. Quick Diagnose Potential of Pacific Islands Cities

WHO/World Bank Dialogue with PICs on data availability

2. Active Transport Participatory Monitoring & Evaluation

Survey 1: Pedestrian & Traffic Flow Count (useful at congestion points & feeder roads for modal baseline)
Survey 2: Fitness Tracking Study (confidential, longitudinal)
Survey 4: Fitness Tracking Competition (national, public, performance prize challenges)
Survey 5: School curriculum & athletic training open days for cycling, scooting, skateboarding (baseline interest and lessons learned interviews/questionnaires)
Survey 6: Hub and spoke mapping for bicycle security facilities/amenities adjacent to public transit stops
Survey 7: Interview import, retail and service sector to determine transition pathway for consumer market

3. Active Transport Development Plan

Market Development & Transition Facility - cultivate supply chain and skill base for quality retail and qualified service of bicycles, scooters, skateboards, and e-bikes (import substitution & waste reduction)
Active Transport Priority Network Design - to reclaim roads as safe commons for recreation and commerce
Fitness Valuation & Bio-caloric Tariff Design - Location/Identification/Financial Data Management & Security

6. Further Reading

HEAT provides a quantitative estimate of the societal value of the reduced, premature mortality. I.e. it uses the Value-of-a-Statistical-Life, which is common in many countries in the transport sector, which is based on a methodology called “willingness to pay” – Sonja Kahlmier

For more info visit: https://heatwalkingcycling.org/#vsl.
Please click on the article linked to the right for more details >>>

BRIEF RESEARCH REPORT article

Front. Sports Act. Living, 26 May 2023
Sec. Physical Activity in the Prevention and Management of Disease
Volume 5 - 2023 | https://doi.org/10.3389/fspor.2023.1146761

This article is part of the Research Topic
Walking, Cycling and Active Travel As Part of Physical Activity and Public Health Systems
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The Health Economic Assessment Tool (HEAT) for walking and cycling - experiences from 10 years of application of a health impact assessment tool in policy and practice

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Thank You

Questions & Feedback

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