sweep
Investing in Nature for Health RESOURCE

Economic and Non-economic Measures and Tools

Evaluating the health and wellbeing benefits of nature based health interventions

This Resource

Who should read this?

This information is relevant for individuals and organisations who are planning or implementing interventions in green and blue spaces, whether they are from the environmental management, urban planning and public health sectors or voluntary sector organisations. It will also be of interest to funders and policy makers working in this space.

Why this resource matters

For centuries, people have found solace and respite through nature. Now, increasing evidence (Wheeler et al. 2020) shows that the benefits of spending time in nature extend beyond 'feeling good' to longer term improvements in our physical and mental health, and wellbeing. This has resulted in a growing number of environmental projects aimed at improving public health through a variety of interventions. These include activities that increase the extent and access to green and blue spaces, enhance the quality of these spaces (both ecologically and the physical infrastructure they provide) and the programmes of activities that aim to enhance their use.

At a time of rapidly escalating mental and physical health concerns and costs, coupled with an ever increasingly competitive funding environment, there is an urgent need to develop more robust business cases that ensure continued and appropriate investment into this area. In order to do this, practitioners and funders need to better understand, and be able to communicate about, the effectiveness of nature-based health projects.

To do this, they need access to the latest evidence around evaluation metrics and approaches suitable for evaluating the impacts and outcomes of programmes that invest in the environment for health.

What is this resource about – and what is its value?

This resource presents a list of some of the economic and non-economic measures and tools most commonly used to measure health and wellbeing outcomes. It draws on some of the latest research evidence, as well as literature that examines applied case studies of investments in the environment for health.

The evidence contained in this resource has been derived both from a database of evidence created as part of this SWEEP Investing in nature for health project, as well as from wider publically available evidence. In 2020, the team carried out a literature review across two academic databases; Web of Science and SCOPUS. 400+ papers were identified that considered nature-based health interventions, explicitly connecting natural resources with health outcomes, both from and outside the UK. These included reviews, concept papers and empirical studies, to which approximately 100 grey literature items were added to include contemporary programmes, projects and research findings.

Benefits to you:

By bringing this information together in one place, we aim to ease your access to the range of measures and tools that currently exist for evaluating the success of nature-based interventions and programmes. These include both broad, non-economic measures as well as those that have been converted to economic values. We hope this provides you with inspiration for your own work - replicating successes, avoiding pit falls, extending your contacts and evidence-base, and supporting you to –

- Communicate with others about known pathways through which green and blue space interventions may benefit human health
- Make a more informed choice as to which measures and tools might be most appropriate to evaluate the success of your own programmes and interventions in terms of the social, environmental and economic outputs, outcomes and impacts they deliver
- Use these to show how investment in nature-based health interventions can deliver on multiple priority aims and outcomes and can deliver an economic case for further investment

Good to note …

Is this a comprehensive list of metrics and tools?

Whilst useful, this is an active, non-exhaustive list. Please contact the author if you have further measures and tools to add.

Measuring health outcomes

Whilst improved health and wellbeing may be the ultimate aim of these projects, it is not always appropriate, or achievable, to measure health outcomes directly. This is due to a variety of factors such as the intangible nature of some health outcomes, ethical issues, and the long timeframes often involved in delivering interventions that lead to health outcomes. For this reason, alternative measures may need to be considered, such as the use of secondary, intermediate outcomes or proxies, where pathways between components of the intervention and health are known. For example, between increased levels of physical activity and more immediate impacts to mental health (Hunter et al. 2017).

Other useful SWEEP resources

The SWEEP Investing in Nature for Health team has delivered a suite of resources, some of which provide more detailed information on frameworks suitable for evaluating and communicating the success of programmes that invest in nature for health. Please see:

- Understanding environmental investment for health in the South West – a resource exploring dynamic mapping case studies
- Evaluating interventions in green space: Derriford Community Park, Plymouth, Devon – using causal loop diagrams
- 5 capitals model approach

Evidence-based measures for evaluating the success of nature based health interventions

The tables below display a non-exhaustive list of both economic and non-economic metrics and tools used to measure various relationships between human health and wellbeing, and green/blue space interventions.

The tables provide a brief description, or definition, of each measure, the main methods used to deploy the measures, and links to related resources and case studies of applications.

The need for further research

The relative paucity of evidence that attempts to derive economic values from measures of natural environment based health benefits is a point of note in itself. This would suggest that further research is needed to secure more standardised measures that offer practical solutions for providers of health based environmental programmes and interventions.

Most common and useful units of measure

The Quality Adjusted Life Year (QALY) is the most commonly used unit of measure for conversion to economic value across the case studies presented here. It therefore represents the closest thing to a standard measure of health benefits. This measure is often used as it can readily be translated to an economic value, although it should be noted, that values derived from, or attributable to, any one QALY can vary.

In view of the benefits and common use of QALYs, it is worth considering, when making decisions on which scales or metric combinations to use, how easily these can be converted to QALYs. Incorporating anticipated economic values of health and wellbeing from such measures into cost-benefit analyses, along with other direct costs, will help to strengthen your proposals and persuade service providers or funders to invest.

Social Return On Investments (SROIs) also provide an effective valuation option, particularly where it is useful to compare values of investments, or particular services and/or interventions.

Case studies

A range of case studies have been included in the tables below that illustrate how economic and non-economic measures and tools have been used to evaluate the health and wellbeing benefits of nature-based health interventions.

Table 1 Case studies here link to the study paper and are referenced at the end of the document.

Table 2 Case studies here link to a separate SWEEP supporting document. Based on feedback from our partners, this provides an easy to use overview of the key points of interest for each case including, a brief summary; name of the measure used; method of application; results; effort required to obtain measure and potential users of the metrics.

Top resource

Although this document signposts to a number of resources, one that stands out for breadth and depth of indicators related to nature-based solutions (NBS) is the European Commission's **Evaluating the impact of nature-based solutions : appendix of methods** (https://data.europa.eu/doi/10.2777/11361). This handbook offers a compilation of indicators and methodologies to assess impacts of nature-based solutions across 12 societal challenge areas. Contributions were drawn from experts from 18 EU Horizon2020 projects and other European programmes.

Table 1 NON-ECONOMIC Health and wellbeing measures and approaches

PHYSICAL HEALTH	Method and description	Resources	Case studies
Visit frequency/time in nature	**Survey** Spending time in nature is associated with mental well-being (White et al. 2019). Nationally representative surveys such as the Monitor of Engagement with the Natural Environment (MENE) survey ask visitors to self-report how often they visit nature and the duration of their last visit to nature.	MENE technical report, including survey questions	White et al. (2019) Spending at least 120 minutes a week in nature is associated with good health and wellbeing
Evaluation of site quality and experience	**Use of various measures** To assess the quality of a green/blue space, and user experience of the space. May typically be done via longitudinal methods i.e. before and after a change to the site (environmental intervention).		
i.e. WIAT (Woods in and around Towns) Environmental Audit Tool	**Combines an environmental audit and survey questionnaire** To assess woodland site interventions. Inc. measures of wellbeing, physical health, perceived stress, nature connectedness, general health, social capital, and perceptions of environment.	Protocol for WIAT questionnaire and audit tool	Forestry Commission Glasgow Case Study 2010 Report: overview of WIAT
System for Observing Parks and Recreation in Communities (SOPARC)	**Observation** A validated tool for assessing activities within parks, involving observation of users' physical activity levels, type of use, and demographics e.g. gender. It also collects information on the area's characteristics e.g. accessibility.	SOPARC App (online app no longer available but guides are) SOPARC User Guides	Vert et al. 2019 Evaluation of an urban riverside regeneration project which aimed to improve access for pedestrians and cyclists.
SOPARNA	**Observation** An adaptation of SOPARC for measuring recreation- and physical activity-related behaviour in natural open spaces. Measures level of physical activity in relation to specific environmental features.	SOPARNA description and procedures manual	Case studies provided within the Supporting Document - Economic and Non-economic Measures and Tools
World Health Organisation Health Economic Assessment Tool (HEAT)	**Observation** HEAT calculates the reduction in mortality, and value of this reduction, resulting from walking and cycling. It can assess current levels and changes over time, as well as evaluating projects. Application is to populations, not individuals. Data is needed on the size of the population and the amount of time people walk or cycle in the space being assessed.	HEAT assessment tool and guide WHO HEAT Methods and User Guide	Cavil et al. 2014 Assessment of the value of walking on the coast path.
International Physical Activity Questionnaire (IPAQ) *See also SOPARC above*	**Survey** This measures health-related physical activity in populations. Long and short versions are available. Can be self-administered.	IPAQ questionnaire and scoring guide	Saran et al. 2018 Use of IPAQ for monitoring physical activity of patients with cardiovascular diseases.

MENTAL HEALTH	Method and description	Resources	Case studies
The 5-item World Health Organization Well-Being Index (WHO-5)	**Survey** A measure of current wellbeing, consisting of five statements which are rated on a scale.		
Office for National Statistics personal wellbeing scale (ONS-4)	**Survey** As with the WHO-5, the ONS-4 are four statements that are rated on a scale. They measure three aspects of wellbeing: life satisfaction, feeling that life is worthwhile, and wellbeing in the moment (feelings of happiness and anxiety).	ONS Personal well-being user guidance	NEAR Health toolkit (p57 and Appendices) – a resource to connect nature with health & wellbeing.
Warwick-Edinburgh Mental Wellbeing Scale (WEMWBS)	**Survey** A measure of mental wellbeing with two scales, a 14-item and shorter 7-item scale (SWEMWBS). Applied widely and in various settings. Good for evaluating interventions/projects.	WEMWBS Overview and guide to use	Wetlands for Wellbeing – a Wildfowl & Wetlands Trust site pilot study.
Other relevant scales e.g. Perceived Stress Scale, Perceived Restorativeness Scale	**Survey** The survey includes the Perceived Stress Scale questionnaire, which includes 4 items on the amount of time in the last month that the participant felt a certain way. The answers are on a scale from 0 (never) to 4 (very often). Repeated before and after the implementations of NBS in order to observe a potential change in mental health status.	NBS Appendix, section 21	Social prescription referrals to Wellbeing Garden
Social Media	**Quantitative and qualitative analysis of social media content** Use of social media platforms to record sentiment as a measure of wellbeing.	Twitter sentiment to measure wellbeing of public park users	Berger, 2021 The Effect of a Combined Nature-based and Virtual Mindfulness Intervention on Perceived Stress in Healthcare Workers.
Connection to nature	**Survey** Nature connection is associated with health outcomes such as happiness and wellbeing as well as pro-environmental behaviours e.g. (Capaldi et al. 2014; Pritchard et al. 2019). There are several validated scales which can be used to measure nature connection e.g. Nature Connection Index (NCI); Connectedness to Nature Scale (CNS), Inclusion of Nature in Self Scale (INS)	Paper: Connectedness to Nature Scale Connectedness to Nature Scale survey questions and code Salazar et al. (2020) Nature Connection Index Salazar et al. (2020) Inclusion of Nature in Self Scale (p34-36).	Mayer & Frantz, 2004 The connectedness to nature scale: A measure of individuals' feeling in community with nature. Richardson et al. 2019 A Measure of Nature Connectedness for Children and Adults: Validation, Performance, and Insights. Richardson & McEwan 2018 30 Days Wild evaluation for Wildlife Trusts.

NEAR Health toolkit	**Survey** Incorporates several measures (ONS-4, NCI, MENE) in a before and after questionnaire to assess how blue and green nature-based activities impact on changes in various aspects of people's lives. A 5-point scale version for children was also produced.	Research 348 Toolkit: Connecting with Nature for Health and Wellbeing	NEAR Health toolkit – a resource to connect nature with health & wellbeing.
Engagement with nature	**Survey** A simple measure of nature connection which asks about activities performed e.g. watching wildlife, smelling wildflowers, listening to birdsong, taking photos of nature, using a scale of 1 (never) -4 (often).	Engagement with nature	Richardson et al. 2021 Moments, not minutes: The nature wellbeing relationship
Pro-nature Conservation Behaviour Scale	**Survey** A validated scale which measures active behaviours that support the conservation of biodiversity e.g. volunteering, litter-picking.	Pro-nature Conservation Behaviour Scale Blog: Pro-nature Conservation Behaviour Scale	Barbett et al. 2020 Measuring Actions for Nature - Development and Validation of a Pro-Nature Conservation Behaviour Scale.

SOCIAL HEALTH	Method and description	Resources	Case studies
Nature Prescriptions	**Green prescriptions** Such as gardening, can be used as a non-medical asset-based approach by health professionals working in the community as a way to promote health and wellbeing.	Community wellbeing	Howarth et al. 2020 An example of gardening of as a nature-based social prescription provided by the RHS Bridgewater Wellbeing Garden.
See also SOPARC	**Observation** One pathway for connecting physical health and public parks is through collective efficacy where neighbourhood parks act as a hub for social cohesion.	SOPARC App (online app no longer available but guides are) SOPARC User Guides	
See also WIAT	**Environmental audit** The protocol followed for environmental audit of a green space in this case focuses on a community-level evaluation of WIAT interventions aimed at improving woodlands so as, ultimately, to improve people's quality of life.	Protocol for WIAT questionnaire and audit tool	Forestry Commission Glasgow Case Study 2010 - Report: overview of WIAT
Sense of empowerment	**Survey** role of community gardening in advancing community empowerment.	NBS Appendix, p834	Cumbers et al. 2018 The Work of Community Gardens: Reclaiming Place for Community in the City.

Table 2 ECONOMIC Health & wellbeing measures and tools that can be used to derive economic values

These case studies all link to a separate SWEEP supporting document [add hyperlink] where they correspond directly to the same health category and case study number as shown below.

PHYSICAL HEALTH	Method and description	Resources	Case studies
Quality Adjusted Life Years (QALY)	A measure of the health benefits that combine duration and quality of life, with one QALY representing one year of life in full health.	Do you know what a QALY is, and how to calculate it?	Moseley et al. (2018) developed a quantitative physical indicator for woodland recreation that can help managers to quantify the health benefits of recreation activities undertaken in their woodlands to inform local scale planning. The authors first obtained a non-financial estimate of annual calorific expenditure (ACE) based on a quality of experience survey that consisted of a standard set of questions for participants. This was accompanied by a measure of intensity of activities in calories and METs (Metabolic Equivalence of Task) where one MET is the energy equivalent to an individual seated at rest. Finally, the METs were used to calculate QALYs to which an economic value was applied. (**Case Study 1)**
Disability Adjusted Life Years (DALYs); PREVENT model	One DALY represents the loss of the equivalent of one year of full health. DALYs are the sum of the years of life lost due to premature mortality (YLLs) and the years lived with a disability (YLDs) due to prevalent cases of a disease or health condition in a population.	What is a DALY?	Dallat et al. (2013) estimated the potential health impacts and cost-effectiveness of an urban regeneration project in Northern Ireland, the Connswater Community Greenway, offering new cycle and walk-ways and providing accessible and safe green space. (**Case Study 2)**
	PREVENT was developed in 1988 to estimate the health benefits of changes in risk factor prevalence for a population. It is based on the epidemiological effect measure 'potential impact fraction' which derives a proportional change in disease risk from a change in risk factor exposure and relative risk of that factor related to the health issue under study	Full details of the methods and theory behind the original model developed by L. Gunning-Schepers (1989).	Macro-simulation PREVENT model used to model the impact of physical activity on the incidence of several physical-related diseases. Physical activity and health data obtained from before and after Global Physical Activity Questionnaire, as well as various other secondary data sources. The model calculated the gains in life expectancy (LE) and disability-adjusted life expectancy (DALE) for intervention beneficiaries and the years lived with disability (YLD) saved by the Greenway population. Costs saved through diseases averted were calculated and summed to get total disease cost savings; health outcomes were derivedi n DALYs.

Blue Active Tool; DALYs , SOPARC	This tool provides estimates of the health impacts in terms of all-cause mortality, morbidity, and DALYs, as well as health economic assessment in terms of the value of statistical life (VSL) and direct health costs. Estimates of impacts for each type of physical activity and age group are estimated.	Bespoke spreadsheet Blue Active Tool described in journal paper at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6388232/	Vert et al. 2019 Health Benefits of Physical Activity Related to an Urban Riverside Regeneration. This aimed to quantify health and health-related economic impacts associated with physical activity in an urban riverside park in Barcelona, Spain. (**Case Studies 4 & 7)**
WHO's Health Economic Assessment Tool (HEAT); QALYs; UEA MOVES tool	HEAT is a web-based tool used to estimate the health and economic impacts of increased walking and cycling. It assesses impacts on premature mortality in an integrated manner through changes in physical activity levels. Can be used to assess the anticipated health benefits or harms of policies, strategies and projects that lead to changes in walking and cycling population levels.	HEAT assessment tool and guide WHO HEAT Methods and User Guide	Petersen (2020) provides a health and wellbeing valuation of the South West Coast Path (SWCP) based on available visitor and population data on visits to the trail. Drawing on visitor data, online survey and secondary data, the author applies the HEAT tool to calculate the reduced death rate using the statistical value of a life; QALYs to calculate the value of the additional years lived as a result of improvements in health and reduced incidence of disease, and MOVES to calculate the savings in health care costs based on the reduced incidence of disease among walkers compared to non-walkers, converting this into savings to the NHS. (**Case Study 5**) Cavil et al. (2014) uses the World Health Organisation Health Economic Assessment Tool (HEAT) to conduct an economic assessment of the health benefits arising from people walking regularly on the Wales Coast Path. Used data from counters on the path, and user surveys. (**Case Study 6)**

MENTAL HEALTH	Method and description	Resources	Case studies
Personal Wellbeing Index (PWI); QALYs	A self-administered scale that measures satisfaction with the following life domains: standard of living, health, life achievement, personal relationships, personal safety, community connectedness and future security.	Protocol for the Personal Wellbeing Index for an Adult	Buckley et al. (2019) evaluate methods to calculate the economic value of protected areas derived from the improved mental health of visitors, and compare these to values arising from ecosystem services, biodiversity prospecting, and tourism. **(Case Study 8)** The PWI was measured for visitors to Australian national parks and compared to national statistics to derive an estimate per capita differential (ΔPWI). Published estimates of $ per QALY were used to convert ΔPWI to $/visitor. Scaled up to provide a total annual value for Australia.
Wellbeing Valuation approach via Mental Health Social Value Calculator	A software calculator that can help organisations to monitor the impact of their activities on mental health. Incorporates WEMWBS and wellbeing evaluation.	The Mental Health Social Value Calculator can be downloaded at UK Social Value Bank | HACT	Maund et al. (2019) conducted a pilot study of a 6-week nature-based health intervention aiming to engage individuals with wetland nature for the treatment of anxiety and/or depression. **(Case Study 9)** Questionnaires were applied to the programme participants and included a range of mental health indicators. The Mental Health Social Value Calculator was used to apply the Wellbeing Valuation approach to the WEMWBS data to obtain a monetary value of the intervention.

SOCIAL COHESION	Method and description	Resources	Case studies
CONNECT social prescribing service, carbon footprint	The CONNECT project was operated by Carlisle Eden Mind from 2011-2014 and involved non-healthcare staff referring patients to local environmental projects.	Information about the CONNECT project	Maughan et al. (2016) assessed the effects of a social prescribing service development on healthcare use and the subsequent economic and environmental costs. **(Case Study 11)** Outcome measures from the CONNECT project intervention included no. of GP appointments, prescriptions of psychotropic medications and the no. of secondary care referrals. Financial impacts were calculated for each outcome using national averages or accepted conversion factors.
Social Return on Investment value	Quantifies the value of work an organisation provides for the communities they work with. The tool provides guidance for allocating a financial value to a wide range of outcomes even if not originally measured in financial terms.	Guidance on Starting Out on SROI A Guide to SROI	Bagnall et al. (2019) undertook a SROI analysis of the findings of a report in 2017 that investigated the changes in the attitudes, perceptions and mental wellbeing of Wildlife Trust volunteers taking part in nature conservation volunteering activities over a 12 week period. Financial proxies for social values (WEMWBS, good overall health, nature relatedness, level of physical activity, volunteer time) were found using the Global Value Exchange Tool, the Social Value Calculator, and a spreadsheet resource from the Greenspace Scotland SROI. **(Case Study 12)**

WHOLE VALUATION OF AN INTERVENTION	Method and description	Resources	Case studies
Cost-consequences analysis (CCA) and exploratory cost-utility analysis (CUA)	CCA is an economic appraisal that uses a cost-benefit analysis framework, but does not try to measure all of the costs and benefits in money terms. CUA is a form of cost effectiveness analysis in which benefits are measured in terms of changes in QALYs	Techniques of economic appraisal	Thompson et al. (2019) evaluated whether the implementation of a programme designed to improve the quality of, and access to, local woodlands in deprived communities in Scotland, UK, was associated with lower perceived stress or other health-related outcomes. They assessed physical (footpath construction and maintenances, new signage and entrance features) and social (programme of community-level activities and events, e.g., guided walks, 'family fun' days, 'scavenger hunts', and woodland based classes for school-children) interventions undertaken over a period of eight months, as part of the Forestry Commission Scotland's Woods In and Around Towns (WIAT) programme. Non-economic measures included Perceived Stress Scale, quality of life EQ-5D, the International Physical Activity Questionnaire, INS, QALYs and social cohesion based on 3 items from the English Citizenship Survey. **(Case Study 13)** CCA was used to identify cost related to the primary and secondary outcomes while CUA was applied to the EQ-5D responses for the WIAT interventions.

BROAD SCALE REVIEW	Method and description	Resources	Case studies
Scoping synthesis	Review of various applications of physical and mental health measures to assess cost effectiveness of nature-based interventions.		Lovell et al. (2019) completed a scoping synthesis which sought to contribute to the process of identifying 'what works' in natural environment-based health interventions. They reviewed various applications of mental health measures to assess cost-effectiveness of NBI's. **(Case Studies 10, 14 & 15)**

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