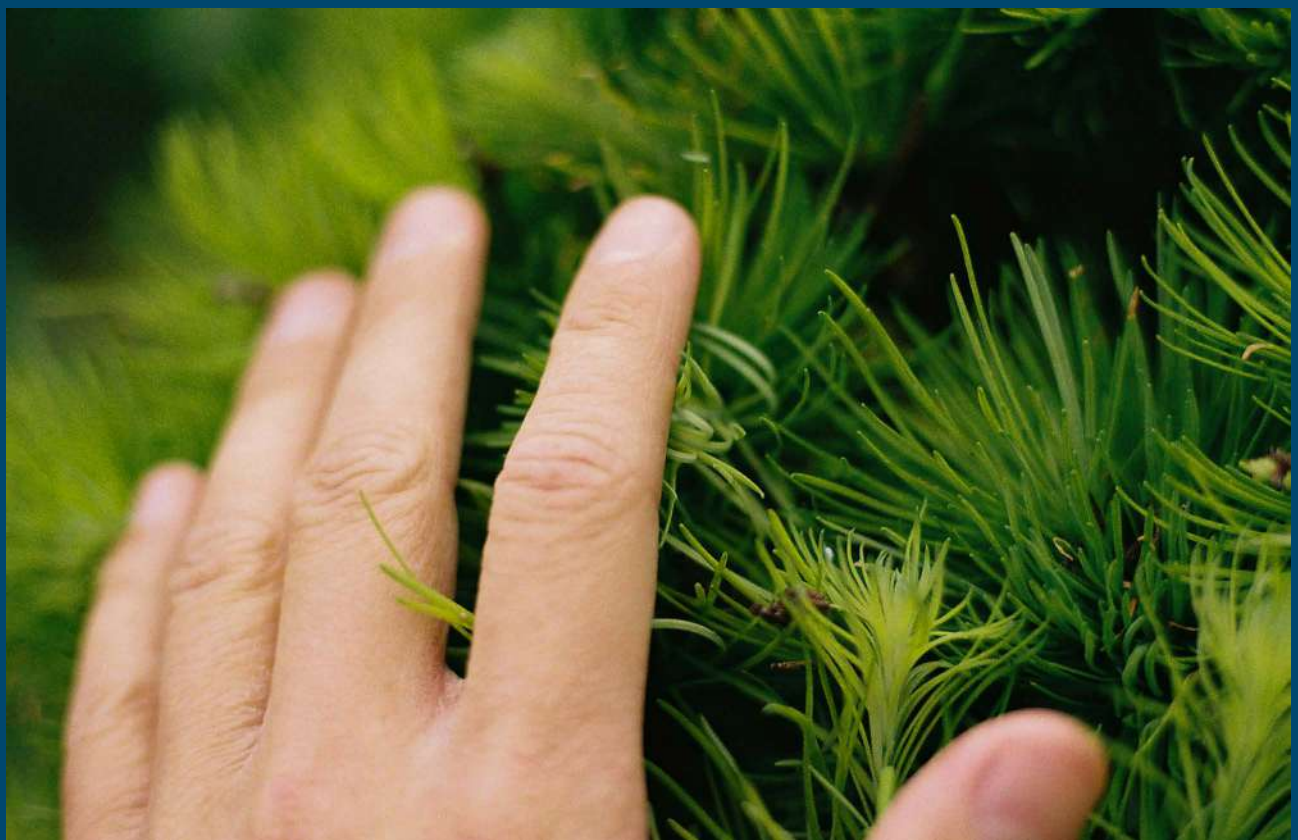
resonate
RESILIENCE THROUGH
NATURE-BASED THERAPIES

Guidance on assessing the Economic Value of Nature-based Therapies

ECONOMIC IMPACT ASSESSMENT GUIDE



KEY INFORMATIONS

Project Number: 101081420

Project: RESONATE

Duration: 48 Months

Start date of Project: 01-06-2023

End date of the Project: 31-05-2027

Coordinator: University of Vienna

Deliverable: 6.1

Due date of deliverable: 30/06/2026

Actual submission date: 30/06/2026

Work package number: WP6

WP Leader (name and organisation): Etifor | Valuing Nature

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Reviewers: Mathew White (UNIVIE)

Version: 1

How to cite : Doimo I., Svae L. K., Amato G., White M. (2026). Guidance on assessing the economic value of Nature-based Therapies. Economic Impact Assessment Guide. Deliverable 6.1, RESONATE, https://resonate-horizon.eu/resources/deliverables/

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The Resonate project is funded by the European Union's Horizons Europe Research and Innovation programme under grant agreement No. 101081420 and co-funded by the UK Research and Innovation grant award No. 10063874

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ACRONYMS

CBA: Cost-Benefit Analysis

CCA: Cost-Capability Analysis

CEA: Cost-Effectiveness Analysis

CHEERS: Consolidated Health Economic Evaluation Reporting Standards

CUA: Cost-Utility Analysis

CV: Contingent Valuation

DALYs: Disability-Adjusted Life Years

ES: Ecosystem Services

HRQoL: Health-Related Quality of Life

ICER: Incremental Cost-Effectiveness Ratio

IPBES: Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services

NbS: Nature-based Solutions

NbTs: Nature-based Therapies

NBRT: Nature-based Biopsychosocial Resilience Theory

NBSP: Nature-based Social Prescribing

NCDs: Non-communicable diseases

QALE: Quality-Adjusted Life Expectancy

QALYs: Quality-Adjusted Life Years

SROI: Social Return on Investment

TEV: Total Economic Value

WELLBY: Wellbeing Adjusted Life Year

WTP: Willingness-To-Pay

EXECUTIVE SUMMARY

Background and Context

NbTs are emerging as valuable interventions to support human health and wellbeing. However, the systematic integration of these practices into national health and social care frameworks is still far to be reached at a broad European level. While scientific evidence regarding their psychophysical benefits is documented, the underlying economic data remains scarce, low-quality, and methodologically fragmented. Most available research relies on observational pre-post designs that lack robust randomized control groups, preventing investigators from isolating the true causal effect of nature from other therapeutic variables.

Furthermore, high heterogeneity in study setups, target populations, and tracking tools creates substantial barriers to standardized replication. Available data is heavily concentrated within short-term monetary frameworks or isolated regional pilots, treating the natural environment as a mere passive scenery rather than an active driver of health equity and resilience. Because health-related co-benefits are often left implicit, NbTs remain largely disconnected from the broader landscape of Nature-based Solutions (NbS), losing critical systemic information across sectors.

Objectives of the Guide

This Guide bridges the gap between economic theory and practical healthcare application by establishing a tested and transferable valuation methodology. The Guide contributes to the following objectives:

- **Provide actionable guidance on assessing economic efficiency:** Deliver a practical "how-to" blueprint for conducting transparent economic evaluations that meet the strict verification standards expected by public health payers and institutional decision-makers.
- **Ground methodology in concrete case studies:** Anchor the proposed economic guidelines in the real-world logistical, structural, and data-collection experiences encountered across empirical field trials.
- **Support the transition from science to decision-making:** Empower local administrators, healthcare managers, and project coordinators with replicable operational tools to construct evidence-based business cases for sustainable financing and policy integration.

What is inside the Guide

While the empirical backbone of this document stems from the complex intervention case studies of the RESONATE project, this Guide is designed to be much more than a mere project report. To provide Guidance suitable for a wide range of stakeholders—from healthcare managers to local administrators—we have expanded the scope of this document by integrating our findings with the broader literature and experiences.

Consequently, the Guide is structured to offer both grounded empirical evidence and a methodological guidance:

- **The State of the Art & framework section:** Places our work within the global context of health economics and ecosystem services valuation, showing how the Nature-based Biopsychosocial Resilience Theory (NBRT) underpins economic returns across preventive, response, and recovery phases.
- **The Guidance Chapter:** Translates the lessons learned from real-world logistical and data-collection challenges into a step-by-step framework for future NbT assessments, with practical examples, lessons learned, and troubleshooting sections.
- The core of the **economic evaluation framework** consists of seven steps:
  Step 1: Establishing the framework

Step 2: Selecting the economic evaluation approach
Step 3: Measuring and valuing benefits
Step 4: Measuring and valuing costs
Step 5: Measuring the cost-effectiveness
Step 6: Measuring co-benefits
Step 7: Translating results for decision-makers

Key Recommendations

To scale up findings from localized pilot interventions into sustainable public systems, future evaluations should implement the following strategic actions:

- **Recommendation 1 —** Build economic assessment into the study design, through a participatory process: Research and intervention protocols must be co-created from the design stage onward, explicitly defining the perspective, comparators, and time horizon to ensure that data collection matrices align as much as possible with clinical workflows and international reporting standards.
- **Recommendation 2** — Control groups and longer time horizons: Invest systematically in robust counterfactual designs while extending observation periods past six months to adequately capture the long-term cost-avoidance effects predicted by resilience theory.
- **Recommendation 3** — Standardization without rigidity: Adopt a shared minimum set of baseline health tools and a common template for reporting summary results to enable qualitative cross-study comparisons.
- **Recommendation 4** — Do not lose the natural element and the co-benefits, even when they are hard to measure: NbTs can generate benefits that spill beyond the borders of traditional healthcare departments therefore, linking health economic indicators with environmental and social parameters can be useful to ensure that decision-makers across different sectors can see the shared returns on investment.
- **Recommendation 5** — Communicate effectively to decision-makers: Synthesize technical findings into highly operational summary sheets specifically customized to the thresholds and metrics already utilized by local managers and administrators.
- **Recommendation 6** — International replicability: Actively expand economic research by replicating unified evaluation protocols across diverse European healthcare, cultural, and regulatory contexts.
- **Recommendation 7** — Analyse who pays: Include a long-term sustainability analysis of the specific funding architecture—ranging from public budgets to public-private partnerships—recognizing that the choice of financing mechanism ultimately controls societal entry and patient access.
- **Recommendation 8** — Who benefits? Integrate equity into economic assessments: Standard economic metrics calculated on the average population of a study mask how health benefits and resource expenditures are distributed. Evaluating an intervention purely on population averages risks hiding systemic inequalities and can lead to suboptimal public investments. It is important to adopt measures to incorporate equity into the assessment to avoid environmental and social injustices while preventing highly efficient interventions on paper from failing their public health objectives in reality.

This Guide offers a necessary first methodological step toward standardized economic evaluation, providing a shared starting point to establish baseline guidelines so that every future nature-based program becomes an opportunity to deliver sustainable service and generate robust, decision-ready evidence.

INTRODUCTION TO THIS GUIDE

Why this guide?

Nature-Based Therapies (NbTs) are gaining significant ground in research and clinical practice as valuable complementary approaches for health promotion and prevention. Although evidence of their efficacy on psychophysical well-being is growing, their systematic integration into national healthcare systems with budget constraints often requires passing the test of economic efficiency. Faced with global healthcare systems under increasing financial pressure, the crucial question for mainstreaming NbTs will increasingly shift from "what works" to "what is financially, practically, socially and ecologically sustainable". In particular, demonstrating economic sustainability is crucial to securing stable, institutionalized funding sources for these solutions.

However, as highlighted by recent literature (Busk et al., 2022; Patwary et al., 2024; Puntscher et al., 2026), evidence on the economic impact of NbTs remains scarce, low-quality, and structurally fragmented. A critical limitation in existing research on NbTs is the frequent absence of robust control groups, i.e. comparison populations who are randomly allocated to not engage in nature activities or engage in some other type of therapy but who are nonetheless monitored over the same time period and with the same tools. This prevents studies from isolating and measuring the true effect of nature from other therapeutic factors. Furthermore, the heterogeneity of methodological approaches across different studies creates significant barriers, making it difficult for practitioners to replicate findings or advance economic studies on NbTs in a standardized way. Most available data limits itself to tracking short-term financial returns or standard cost-benefit ratios, reducing nature to a mere background setting for the intervention. In doing so, the fundamental opportunity to frame the value of NbTs beyond the monetary one, and looking at broader social and environmental impacts is lost.

This Guide acts as a bridge between theory and practice by first providing a comprehensive overview of the existing economic landscape, helping to organize what is currently a scattered field of research. Building on this overview, it proposes an operational, step-by-step framework designed to be easily adapted across different contexts, thereby offering a replicable pathway for future economic assessments. Finally, by showcasing the concrete implementations carried out within the RESONATE project, the Guide illustrates how these methodologies are applied in reality.

The original angle of the RESONATE project lies in looking at the impacts of NbTs holistically, striving to make this intangible value visible and recognizing that the natural environment is not a secondary element, but the very pillar upon which the therapy's effectiveness rests.

Who is it for?

Whether you are a local administrator, a healthcare manager, a social or NbT project coordinator, or a person interested in knowing more about NbTs, this guide will help you answer the question: **"What does it mean to assess the cost-effectiveness of a nature-based intervention, and why should I do it?"**.

For **non-expert readers**, the guide offers a clear and practical entry point into the economic assessment of NbTs. Its step-by-step structure explains the main concepts, the logic behind the methods, and what the results can and cannot tell us. The aim is not to turn readers into economists, but to help them understand the key mechanisms of economic assessment and use this knowledge to engage more confidently in planning, evaluation, and decision-making.

For **more experienced readers**, the guide provides an applied overview of how different economic approaches can be used in the emerging field of NbTs. It brings together practical examples, methodological reflections, and lessons learned from existing experiences, helping readers consider which approaches may

be most suitable in different contexts. Rather than replacing technical manuals, it complements them by translating methods into the specific context of nature-based interventions.

What you will find inside

This guide does not intend to definitively resolve the theoretical complexity associated with estimating health-related ecosystem services, nor does it aim to establish a universal framework. Instead, it is designed as a practical guidance document—a concrete first step toward laying the methodological foundations for future integrated assessments of NbTs.

This Guide focuses on quantifiable health outcomes and direct financial impacts (see next chapter for the details on the scope of the assessment). Therefore, it does not include an in-depth assessment or monetization of the wider socio-cultural co-benefits or the purely ecological and biodiversity enhancements generated by NbTs as ecosystem services. While we recognize these as vital pillars of NbTs, they were not estimated at this stage of the economic analysis and are comprehensively addressed in the other dedicated guidelines produced within the RESONATE project portfolio. Together with the other guidelines produced by the RESONATE project, this document aims to support the transition of NbTs from scientific evidence to decision-making. It integrates findings from two pillars of research:

- **Health Effectiveness:** Recognizing NbTs as interventions capable of producing measurable health outcomes comparable to standard therapies.
- **Economic Assessment:** A rigorous method for tracking costs and benefits, ensuring that data collected across various interventions and populations is transparent and ready for monitoring by decision-makers.

The core of the Guide is drawn from the analysis of multiple case studies developed within the RESONATE project, aiming to measure their costs and conduct cost-effectiveness and cost-benefit assessments. The document is therefore based on this specific experience, which features NbTs with a strong research character, conducted in diverse natural environments and various European cities, tracking a large number of health and well-being metrics, and navigating the complexity of coordinating and balancing the interests of 14 partners across 5 work packages investigating different aspects of NbTs. Consequently, the Guide is structured to offer both grounded empirical evidence and a methodological guidance:

- **The State of the Art & framework section:** Places our work within the global context of health economics and ecosystem services valuation.
- **The Guidance Chapter:** Translates the lessons learned from real-world logistical and data-collection challenges into a step-by-step framework for future NbT assessments, with practical examples, lessons learned, and troubleshooting sections.

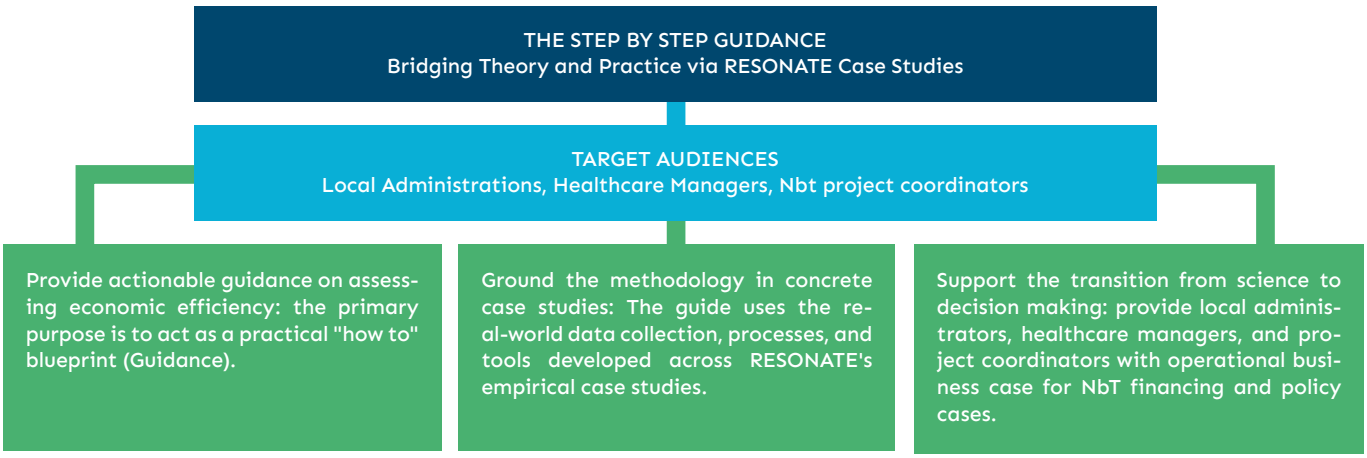


Figure 1. The step by step Guidance

FRAMEWORK

Brief state-of-the-art on health economics approaches to NbT

INTRODUCTION

The intersection of human health and the natural environment has undergone a significant conceptual evolution in recent decades. In the last decades, the economic approach to nature focused on ecosystems and green infrastructure levels, valuing them through utilitarian frameworks such as "Ecosystem Services" (ES) or "Nature's Contributions to People" (Pascual et al., 2017; Piccolo et al., 2022). As urbanization accelerates, global institutions call for valuing green and blue spaces to guide efficient resource allocation against competing land usages. Traditionally, nature has been valued through utilitarian frameworks such as ES or "Nature's Contributions to People" (Pascual et al., 2017; Piccolo et al., 2022). These approaches recognise that ecosystems provide tangible benefits—clean air, water regulation, food provision—alongside less tangible ones, such as cultural and spiritual values. More recently, anthropocentric valuations are being complemented by perspectives that also acknowledge our moral obligations to protect biodiversity for its intrinsic worth.

Simultaneously, healthcare systems face surging economic pressures from long-term, non-communicable diseases (NCDs) such as cardiovascular conditions, chronic stress, obesity, and depression (Vos et al., 2020). In response, public health strategies are paying increasing attention to preventive, community-based and personalized models of health (De la Torre et al., 2025). NbTs and the related concept of formalised Nature-Based Social Prescribing (NBSP) actively connect individuals with natural environments through structured interventions (Haywood, A et al., 2024; White et al., 2023). While evidence suggests that these interventions can be effective in improving people's physical, mental and social wellbeing, research on the economic effectiveness remains limited (Papon et al., 2026; Puntscher et al., 2026a). Being able to demonstrate the costs as well as the benefits, and thus cost effectiveness, of these interventions is necessary to inform policy and decision-makers (Papon et al., 2026).

NBTS AS ECOSYSTEM SERVICES AND NATURE-BASED SOLUTIONS

To fully understand the systemic value of NbTs, it is essential to anchor them within established environmental and ecological frameworks. Firstly, NbTs are closely linked to the ecosystem services paradigm. As ecosystem services encompass the benefits that human populations derive from natural systems (Millennium Ecosystem Assessment, 2005), NbTs can be conceptualized as a specific category of service, wherein the primary benefits — health and wellbeing — are realized through direct environmental engagement.

Secondly, NbTs are connected to the broader concept of nature-based solutions (NbS). NbS are defined as "Actions to protect, manage and restore natural or modified ecosystems, which address societal challenges, effectively and adaptively, providing human well-being and biodiversity benefits" (IUCN, 2016). NbS have gained traction as tools for achieving climate targets while delivering multiple co-benefits. These co-benefits, such as improved air quality, flood regulation, urban cooling effect, enhanced biodiversity, are well documented in the literature, making NbS attractive alternatives or complements in some cases, to purely engineering-based interventions (for more details see WHO, 2025).

However, the co-benefits associated with health that are generated by NbS projects are often implicit and insufficiently assessed (Dunlop et al., 2024). Consequently, **on the one hand NbTs often remain siloed, maintaining a peripheral role within the broader landscape of NbS, and on the other hand, they tend to be considered in the same way of traditional therapies, alienated from the ecosystem that actually provides the therapy, losing all the relevant information regarding co-benefits for humankind and nature itself.**

THE BENEFITS OF BEING IN CONTACT WITH NATURE

Growing evidence shows that regular contact with nature, whether through parks, forests, gardens or waterways, provides a range of health benefits extending across several domains:

- **Physical health benefits,** both direct (e.g., reduced exposure to air pollution and heat) and indirect (e.g., increased opportunities for physical activity, walking, and cycling).
- **Mental health and wellbeing benefits**, including stress relief, restoration, and reduced exposure to harmful noise.
- **Social, cultural, and spiritual benefits**, such as support for social contact and cohesion, opportunities for education and play, and connections to heritage and creativity.

These diffuse, often intangible benefits pose a challenge for traditional economic assessment. Some of these are quantifiable through objective measurements and modelling, such as reduced blood pressure, lower cortisol levels, improved immune function, or improved air quality (Bratman et al., 2019). Others are more intrinsic and harder to quantify, such as for the feelings of restoration and calm, sense of belonging and connection, enhanced creativity, and improved attention (Hartig et al., 2014; Kaplan, 1995).

In a context of competing interests and pressures over natural resources both in urban and rural areas, their value needs to be better understood by those making decisions on resource allocation, also to protect or enhance these spaces (Pascual et al., 2017). Despite advances in environmental and public health economics, a single monetary value cannot capture all the benefits these spaces bring—including benefits for future generations. A mixture of methods is best fitted to understand and make these values visible—bridging environmental, social, and health perspectives to inform more consistent and holistic decision-making about urban nature.

ECONOMIC APPROACHES TO VALUING NATURE AND HEALTH

As outlined in the previous chapter, the values connected to nature and NbTs are diverse and benefits generated are rarely traded in conventional markets. To capture the full spectrum of benefits and be able to inform policy decisions, researchers can use qualitative methods to reveal how and why people value nature, and quantitative methods to translate these values into metrics that can inform resource allocation.

Qualitative approaches use methods that aim to explore the experiential aspects of nature and pay attention to the way people perceive, measure and value natural spaces through collecting and analysing people's narrative accounts. Qualitative research may be particularly useful to uncover less dominant perspectives and understand the experiences and needs of marginalised groups, and to capture values that are difficult to express in monetary terms such as how a natural space contributes to community identity, social cohesion or spiritual experiences. Examples of qualitative methodologies are narrative mapping, which connect personal stories to specific places and features (Bell et al., 2017); and photovoice and participatory methods, where participants are invited to collect and curate their own visual and narrative data on their perceptions of their environments, which can inform or evaluate nature-based initiatives based on community preferences (Nykiforuk et al., 2011).

In this Guide we did not use qualitative methodologies given the objectives of the project; for more details and examples on those please refer to the WHO Report "Assessing the value of urban green and blue spaces[1]".

[1]Assessing the value of urban green and blue spaces for health and well-being. Copenhagen: WHO Regional Office for Europe; 2023. Licence: CC BY-NC-SA 3.0 IGO. Available at: https://www.who.int/europe/publications/i/item/WHO-EURO-2023-7508-47275-69347

Quantitative economic approaches can provide complementary tools for making visible the benefits of nature that usually are not exchanged on markets. Two broad disciplinary perspectives are relevant for assessing the value of NbTs and natural spaces: environmental and health economics. As they both stem from the field of economics and economic theory, they have retained common approaches and links, while developing into specialised areas and applications. A summary of the quantitative methods is proposed in Figure 2.

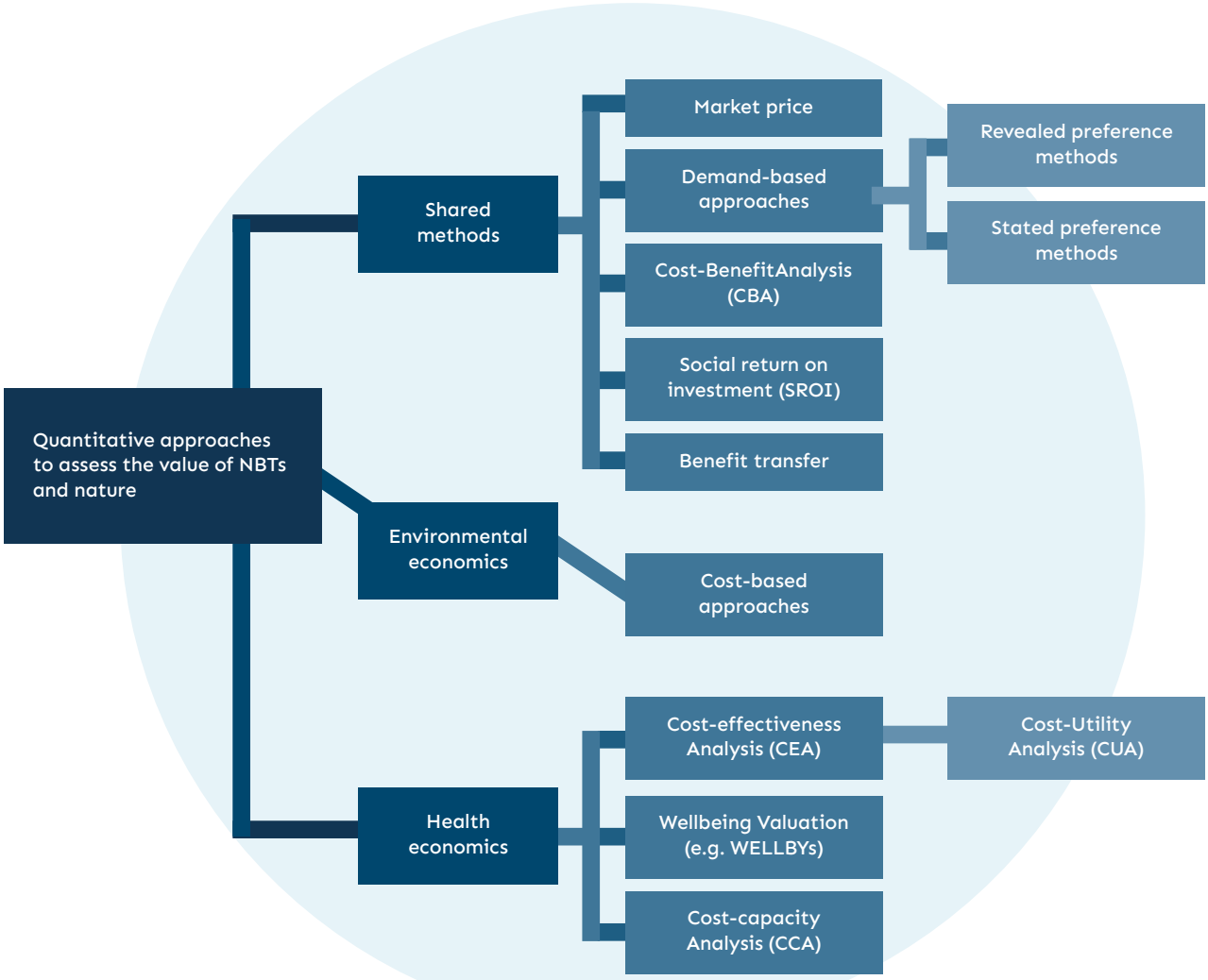


Figure 2. Summary of the main approaches for assessing the value of NbTs with a focus on the quantitative ones.

Environmental economics has traditionally used several valuation methods for assessing ecosystem services and the broader social and environmental benefits of nature. These approaches, that convert systematically such values in monetary terms, can capture a wide range of co-benefits beyond health alone — including climate regulation, biodiversity, recreation, and cultural values (FAO, 2019). **Health economics,** on the other hand, focuses on measuring health outcomes and conducts economic evaluations, a tool used by decision-makers to identify, measure, value and compare the costs and consequences of alternative healthcare interventions.

Some economic valuation methods are commonly used by both fields of economics:

- **Market price:** using the direct price of goods or services traded in markets (e.g., paid walking tours, timber, agricultural produce in the case of environmental economics, or the price of medicines or hospital visits in the case of health economics).

Demand-based methods

- **Stated preference methods** (e.g., Contingent valuation): asking people directly how much they would

be willing to pay (WTP) for access to natural environments or their preservation, highlighting the preferences and trade-offs.

- **Revealed preference methods** (e.g., Travel cost method): inferring value from observed behaviour, such as the time and money people spend to visit natural sites.
- **Cost-Benefit Analysis (CBA):** translating both costs and benefits into monetary terms for direct comparison of financial return on investment.
- **Social Return on Investment (SROI):** a stakeholder-driven approach that translates social, environmental, and health outcomes into a single monetary ratio representing value created per unit of investment (Puntscher et al., 2026). It can incorporate multiple outcome domains but requires careful and transparent assignment of monetary proxies.
- **Benefit transfer:** using results from existing primary studies conducted at one or more sites to predict estimates for other similar sites.

Some techniques are most commonly used in the context of environmental goods, and include cost-based approaches, which are used to estimate value based on the replacement cost of a service (e.g., the cost of replacing the cooling effect of trees with air conditioning) or the damage avoided by its presence (e.g., flood protection from wetlands).

In parallel, some methods have been developed to conduct economic evaluation of health care programmes:

Cost-Effectiveness Analysis (CEA): comparing the costs of interventions against health gains, often measured in natural units (e.g., blood pressure reduction, symptom improvement). These are typically useful for comparing options within a single clinical area, but cannot compare across different health conditions.

- **Cost-Utility Analysis (CUA):** measures outcomes in terms of healthy years, typically expressed as Quality-Adjusted Life Years (QALYs) or Disability-Adjusted Life Years (DALYs), enabling comparisons across different therapeutic fields. One QALY represents one year lived in perfect health. Health status measures (e.g. QALY) are usually derived from multi-attribute health status classification systems: standardised questionnaires (e.g., WELLBYs, EQ-5D, SF-6D) that are easily administered and converted. For converting them into monetary value, QALYs and DALYs use estimates derived from stated preference studies (see above and Donaldson et al., 2012). While the standard for agencies like the UK's NICE, QALYs can be insensitive to nuanced mental health changes and exclude broader societal benefits (Hinde et al., 2021; Vadim Saraev, 2021).
- **Wellbeing valuation** (WELLBYs): a newer approach that captures broader life satisfaction changes, endorsed by the UK government y and valued at approximately £13,000 per one-point change in life satisfaction per person per year (Dayson et al., 2026; Haywood, A et al., 2024).
- **Cost-Capability Analysis** (CCA): Projects like RECETAS[2] employ the ICECAP-A tool (Al-Janabi et al., 2012) to measure well-being in terms of a person's capability to achieve a good life, reporting the Incremental Cost-Capability Ratio (ICCR) (Papon et al., 2026).

While these methods are standard in healthcare evaluation, they may not fully capture non-health-related benefits, such as environmental or social co-benefits of a NbT as illustrated in Table 1.

[2] https://www.recetasproject.eu

METHOD	DISCIPLINE /APPROACH	WHAT IT MEASURES	KEY STRENGTHS	KEY LIMITATIONS
Qualitative Methods (e.g., Narrative Mapping, Photovoice)	Qualitative / Participatory Approaches	Experiential aspects, narrative accounts, perceptions of the environment, and social values (cohesion, identity)	Uncovers less-dominant perspectives; ideal for marginalized groups; captures values difficult to monetize	Cannot be expressed in monetary terms
Market & Cost-Based Methods (e.g., Market Price, Replacement Cost)	Environmental Economics	Direct market prices or costs associated with replacing an ecosystem service / damages avoided	Based on hard financial data or concrete alternative engineering costs	Limited to tangible/ physical services; fails to capture psychological or experiential health values
Contingent Valuation & Stated Preferences	Both Environmental and Health Economics	Stated Willingness to Pay (WTP) for access to or preservation of natural environments	Captures experiential, non-use, and intangible values based on user preferences	Subject to hypothetical bias (what people say they would pay vs. what they actually do)
Travel Cost Method (Revealed Preferences)	Both Environmental and Health Economics	Inferred value based on observed behavior (time and money spent to visit a natural site)	Based on actual, real-world consumer behavior and actions	May not capture all types of internal health benefits; complex data collection
Benefit Transfer	Environmental Economics	Predicted estimates for a site using existing primary economic studies from similar sites	Efficient; saves time and resources by utilizing existing literature	Lower accuracy if the baseline study site does not perfectly match the new context
Social Return on Investment (SROI)	Both Environmental and Health Economics	A single monetary ratio representing social, environmental, and health value created per unit of investment	Stakeholder-driven; successfully integrates multiple diverse outcome domains	Labor-intensive; requires a highly transparent and careful assignment of monetary proxies
Cost-Effectiveness Analysis (CEA)	Health Economics	Health gains expressed in natural clinical units (e.g., blood pressure reduction, symptom improvement)	Simple and direct; the gold standard for comparisons within a single clinical area	Best not to use to compare outcomes across different health conditions or track non-health benefits
Cost-Utility Analysis (CUA)	Health Economics	Quality-Adjusted Life Years (QALYs) or Disability-Adjusted Life Years (DALYs) via standardized surveys (EQ-5D, SF-6D)	Enables standardized comparisons across completely different therapeutic fields	Can be insensitive to nuanced mental health changes; excludes broader environmental benefits
Cost-Benefit Analysis (CBA)	Both Environmental and Health Economics	Translates all inputs, outputs, and health/ environmental impacts into a single monetary currency	Allows for direct financial return on investment (ROI) and cross-sectoral policy comparisons	Assigning a monetary value to highly intangible or intrinsic human/nature benefits is difficult
Wellbeing Valuation (WELLBYs)	Health Economics	Changes in overall life satisfaction (monetized at approx. £13,000 per 1-point change per person/year)	Captures a much broader definition of social and psychological well-being	Relatively new approach; less standardized across different international health systems
Cost-Capability Analysis (CCA)	Health Economics	Well-being defined as a person's capability to achieve a good life (measured via the ICECAP-A tool)	Deeply person-centered; focuses on functional capabilities rather than just clinical symptoms	Less widely used in traditional medical fields; offers limited comparability with standard care

Table 1. Summary table of economic evaluation methods for NbTs

TOWARDS AN INTEGRATED APPROACH

A key challenge in valuing NbTs is capturing both health-related and environmental benefits without double-counting. For example, if people consider health benefits when choosing to walk in a green space, health benefits may already form part of recreational value estimates. Care is needed when combining monetary values across domains.

Both health and environmental economics methods have been criticised for potentially undervaluing equity and distributional concerns. For methods addressing distributional issues, see Cookson et al., 2017, 2020 on distributional cost-effectiveness analysis and Frazão et al., 2018 on multi-criteria decision analysis. Integrated frameworks — such as the WHO framework for assessing urban green and blue spaces, or the IPBES approach to Nature's Contributions to People — encourage combining quantitative economic analysis with qualitative assessment of values that resist monetisation. Such approaches recognise that no single monetary value can capture all the benefits of nature, and that a mixture of methods is required to understand the diverse values that people attach to natural spaces (Judijanto, 2025).

AN OVERVIEW OF CURRENT EVIDENCE

As mentioned above, a growing body of reviews and pilot studies provides an encouraging picture in terms of the economic and health benefits of NbTs. Without presuming to provide a comprehensive literature review, we present here a brief overview of some of the most recent studies to offer a snapshot of some findings. For further information and discussions we suggest to consult the following reviews (Busk et al., 2022; Lynch et al., 2020; Puntscher et al., 2026).

When evaluating broader societal value, the return on investment seems promising. For instance, systematic reviews of nature-based social prescribing initiatives in the UK have revealed SROI ratios ranging from £2.6 to £5.36 for every single pound invested in NbTs (Jones et al., 2020; Puntscher et al., 2026).

Another study considering cost-benefit models, indicates that interventions can generate economic returns of £6,000 to £14,000 per person within just the first year, projecting up to £24,500 in societal value over a decade (Pretty & Barton, 2020; Puntscher et al., 2026). This high-value generation is corroborated by the recent UK National Evaluation of Green Social Prescribing, which estimated that the programme generated £14 million in WELLBYs, yielding a central SROI of £1.88 to £2.42 per £1 invested (Haywood, et al., 2024).

Beyond broad societal returns, NbTs show potential to reduce direct pressures on healthcare systems. A recent systematic review highlighted this potential, finding that 77% of evaluated studies reported protective associations between green space exposure and a reduction in either healthcare expenditures or pharmaceutical prescriptions (Patwary et al., 2024). When considered at a regional level, these savings can represent a substantial opportunity for the public health sector. A pilot study conducted in the Veneto region of Italy, for instance, estimated that shifting physically inactive populations toward active, nature-based lifestyles, with a conservative estimate could yield potential annual savings of up to €5.3 million in direct healthcare costs for treating non-communicable diseases, such as coronary artery disease and chronic obstructive pulmonary disease (Ortolan et al., 2022). Another study conducted in the UK, observed that 22 million adults above 16 years of age in England visited natural environments at least weekly. At reported volumes of nature-based physical activity, it was estimated a prevention of cases of six different NCDs (e.g. type 2 diabetes, stroke), creating annual savings of £108.7million (Grellier et al., 2024).

These results seem to be aligned with citizens' perspectives, showing that patients actively value the integration of nature into their care. For example, a contingent valuation study in Italy revealed that cardiovascular patients hold a median WTP of €27.26 per day to participate in an outdoor, nature-based rehabilitation program rather than a traditional indoor clinical setting (Sealy Phelan et al., 2025). Similarly, individuals in South Korea expressed a willingness to pay approximately $170 per month for access to horticulture therapy (Lee et al., 2008).

GAPS AND LIMITS

Despite the promising figures reported above, there is a general lack of economic studies on the benefit and effectiveness of NbTs (Busk et al., 2022; Coventry et al., 2021; Lynch et al., 2020). The wide variability in NbTs interventions and assessment methods, coupled with scarcity of economic assessments, make it difficult to draw clear conclusions to inform policy-makers (Busk et al., 2022; Lynch et al., 2020; Puntscher et al., 2026). The reasons for this gap are various and depend on methodological factors and systemic limitations.

Puntscher et al. (2026), in their systematic review on nature-based social prescriptions, for instance, highlight that the majority of economic evaluations rely on pre-post observational designs lacking randomized control groups. This makes it difficult to isolate the causal impact of nature on the observed results. Other reviews highlight that the studies under analysis often present insufficient detail and information on the NbTs, limiting the ability to estimate costs or benefits and thus restricting health economic evaluations (Busk et al., 2022; Coventry et al., 2021; Lynch et al., 2020; Puntscher et al., 2026). Further, Puntscher et al. (2026) observe how economic evidence on NbTs are heavily concentrated in the United Kingdom and high-income countries, limiting the transferability of cost structures to other health care systems.

The available studies suggest that economic evaluation of NbTs seem to be a relatively new area needing more research to pass from local pilots to mainstream healthcare integration (Busk et al., 2022; Hinde et al., 2021). This shift requires, among other things, high-quality economic research studies, ideally with randomized control groups, where the economic evaluation model is integrated directly in the study design. On this basis the RESONATE protocol was built to maintain the various dimensions involved in NbTs, supporting a holistic vision.

Economic assessment and resilience theory

According to the Nature-Based Biopsychosocial Resilience Theory (NBRT) framework, nature-based interventions do not merely produce an isolated therapeutic effect but rather enrich the "resilience capital" of both the individual and the community, activating systemic dynamics that reduce vulnerability to environmental and socio-economic stressors (White et al., 2023). NBRT provides a theoretical foundation for integrating the economic evaluation of NbTs and allows us to reinforce the findings on the effectiveness of these therapies in terms of resilience processes operating at three distinct phases in the stress-recovery cycle:

- Preventive resilience (avoidance or mitigation of the scale of the stressor);
- Response resilience (more adaptive initial reaction during stress);
- Recovery resilience (faster and more complete recovery).

Integrating economic analysis into the evaluation and monitoring protocols of NbTs has enormous potential. It can indeed support NBRT by enriching the three phases as follows:

- **Preventive Resilience and future cost reduction:** NBRT highlights how regular contact with nature proactively reduces the risk of physical and mental diseases (e.g., chronic stress, anxiety) from developing. From a Health Economics perspective, this dynamic translates directly into a reduction in future healthcare demand and future costs avoided by the healthcare system (cost-avoidance).
- **Response Resilience and cost-effectiveness:** The theory posits that during a stressful situation or the exacerbation of a pathology, individuals with greater biopsychosocial resilience capital demonstrate better adaptive responses. The economic approach here depends on the nature of the stressor. For beneficiaries experiencing chronic states of poor health, traditional cost-effectiveness and cost-utility assessments are utilized; they measure incremental improvements in psychophysical well-being (via QALYs for example) to determine if NbTs are an economically worthwhile investment for at-risk groups. Conversely, during acute stressors or sudden crises (such as the early stages of a pandemic or

socio-economic shock), the framework can shift to a cost-savings approach. In these dynamic scenarios, NBRT posits that nature-based resilience capital can mitigate negative reactions. By modelling a counterfactual—comparing the actual response to a more extreme, unmitigated reaction—we can quantify the immediate financial costs saved (e.g., avoided emergency care, crisis interventions, or sudden workplace absenteeism) because nature exposure dampened the initial shock.

- **Recovery Resilience and long-term efficiency:** NBRT defines recovery resilience as the return to a state of functional equilibrium after stress or trauma, with positive resilience reflected in a quicker and fuller return to this state. To translate this dynamic into economic terms that resonate with a policymaker, calculations such as SROI or comprehensive cost-benefit analyses can be utilized. With these methodologies, macroeconomic and multisectoral impacts become tangible: for example, by tracking days of hospitalization, absenteeism of beneficiaries (or their caregivers), job creation, and social reintegration.

By connecting NBRT with the ES approach, the Guide and the RESONATE project aim to suggest that the "natural site" is not a mere backdrop, but the primary provider of the ecological and cultural support essential to activate biopsychosocial resilience. Evaluating the cost-effectiveness of an NbT means, therefore, measuring the economic efficiency of the processes through which these resilience resources are co-designed, mobilized, and returned to society in the form of sustainable health and well-being.



DEVELOPMENT OF THIS GUIDE

This Guide is based on the evidence collected by some of the case studies included in the RESONATE study protocol. While the analysis presented in this section is grounded in these specific case studies, its purpose extends beyond them: the methodological choices, the structure of the research design, and the lessons learned from applying these approaches form the empirical foundation from which the step-by-step guidance offered later in this Guide has been distilled. In other words, this section should be read not only as a description of what was done, but as the evidence base that informs the more general, transferable guidance on how to conduct an economic impact assessment of NbTs, applicable beyond the RESONATE case studies themselves.

This section outlines how the scope of the analysis was identified, how the research plan was constructed, and how the data was collected and analysed. The focus of this section is strictly on the economic analysis of the NbTs, so the considerations on the co-benefits generated by NbTs as an ecosystem service are not included here as they were not estimated at this stage in the Project.

1. The starting point: the RESONATE protocol

The RESONATE protocol, which builds on NBRT, aims at testing this theory by conducting nine case studies across Europe, structured around a three-level health prevention pyramid:

- **Level 1 (General population)**: Three studies, namely case studies 1, 2, 3, follow individuals over a period to monitor how nature, quality of life, and biopsychosocial resilience change before, during, and after stressful circumstances.
- **Level 2 (At-risk groups):** Three studies, namely case studies 4, 5, 6, focus on adults at risk of metabolic syndrome (i.e. people with cardiovascular risk indicators such as high blood pressure). These involve 5-week nature-based mindfulness programs in different settings (urban woods in Italy, mountains in Austria, and coasts in Spain) to see if structured nature activities can actively reduce health risks.
- **Level 3 (Existing conditions):** Three studies, namely 7, 8, 9, tailored for individuals already dealing with specific health challenges, such as psychological distress, mobility issues, or cognitive impairments.

Crucially, the RESONATE project treats these NbTs as complex interventions. This means the project goes beyond simply testing if the therapy improved a patient's health. It also evaluates the broader implications necessary for scaling these therapies, including economic impacts, environmental impacts, and social and equity aspects.

2. What we assessed: identification of the scope of the assessment

Looking more closely at the case studies, Level 1 (case studies 1, 2, 3) are based on environmental exposure factors, such as the health impacts of living near blue or green areas. Since our aim is to assess the economic feasibility of NbTs, we decided to focus primarily on case studies testing an NbT intervention i.e. Level 2 and 3. Due to the structure of the case studies and data availability, the economic analysis ultimately concentrated on case studies 4, 5, 6, 7.

It is worth noting that the same logic of scoping can be applied by readers seeking to replicate this type of analysis on their own NbT case studies: identifying which interventions are suitable for economic assessment based on their design and on data availability is one of the first transferable steps that the Guidance later proposes to.

For CSs 4-6, participants were randomly assigned to either a wait-list control group or a treatment group, where the treatment group completed the NbT intervention immediately. After the study period, the control group was also offered the NbT activity. This design allowed the control group to serve as a counterfactual: because random assignment ensured comparability between groups, the health trajectory of the control group could be used to estimate how the treatment group's health would have evolved in the absence of the intervention.

CS 7 targeted Swedish university students without specific medical conditions. Participants were divided into four groups, three of which completed a five-week intervention consisting of a weekly two-hour instructor-led group session and daily 20-minute home exercises. The three intervention groups differed as follows: indoor mindfulness, mindfulness in nature, and simple nature walking without mindfulness. Similar to CSs4-6 the fourth group was a wait-list control group who could then choose which treatment they would like to engage in (providing an interesting revealed preference about which therapy people might prefer). This design makes it possible to isolate the effects of nature, mindfulness, and their combination.

These two designs — the wait-list control group used in CSs 4, 5, 6 and the four-arm comparison in CS7 — illustrate two replicable approaches to constructing a credible counterfactual.

As noted earlier, our main analytical focus is to assess whether and to what extent the NbTs generated health benefits in terms of resilience in participants. In practice, this means assessing how cost-effective NbTs are in helping individuals actively manage health risks or stressful situations. This requires, at minimum, data on the effectiveness of the intervention (hereafter referred to as its benefits) and on its costs. These are then combined to determine whether the benefits outweigh the costs, thereby establishing whether the NbT is cost-effective.

Based on this, in the RESONATE project we structured our analysis around four objectives:

- understand the **benefits** associated with NbTs in relation to health
- understand the **costs** associated with running NbTs (both excluding and including study costs)
- evaluate the **cost-effectiveness** of NbTs
- evaluate the **cost-benefit** of NbTs

These four objectives reflect the specific analytical activities carried out within the RESONATE project and were defined in relation to its case studies and data. As such, they constitute the empirical basis on which the step-by-step guidance presented in the following chapters has been built. However, they should not be read as a fixed or universally applicable sequence: practitioners using this Guide are encouraged to carefully define their own analytical objectives, tailored to the specific NbT, context, and data availability of their assessment, using the RESONATE experience as a reference rather than a template to be applied automatically.

3. How we did it: research design and data collection plan

To assess the effects of an intervention in terms of benefits and costs, a wide range of market and non-market valuation approaches exists, as mentioned in the Framework chapter. For this study, we adopted traditional economic evaluation methods. We recognize that these methods focus primarily on health and monetary outcomes and therefore come with limitations in capturing non-market or relational values.

The benefits were quantified through three different approaches: Quality-Adjusted Life-Years (QALYs), cost-savings, and contingent valuation (more details on the methodologies in the Guidance chapter and in Appendix).

The **estimation of costs** considers all the costs associated with the NbT. Thus, it covers both operational

costs borne by the organizers of the NbT and costs borne by NbT participants. In this study, we mainly analyzed the organizational and management expenses incurred to deliver the therapy. Personal costs for participants were generally considered negligible, so they were not included.

The estimates obtained from the benefit and cost analyses were combined into two further analyses: cost-effectiveness and cost-benefit analysis.

Our data collection plan was co-designed with the case studies to integrate economic requirements into the broader research protocols; however, given the large scale of the project and its diverse data needs, we had to compromise and prioritize which specific data entries to require. To ensure consistency and comparability across different countries and studies, the data collection plan utilized a mix of standardized tools: questionnaires to participants integrated in the study protocols, standardized cost matrices for NbTs managers, literature review to estimate standardized unit costs across the different countries.

This trade-off between methodological ambition and practical feasibility, together with the set of standardized tools adopted to manage it, is itself a key takeaway for readers of the Guidance: similar compromises and similar instruments — questionnaires, cost matrices, literature-based unit costs — are likely to be necessary in most real-world economic impact assessments.

4. How we processed it: data analysis and synthesis

Once collected, data from the cost matrices was standardized and converted where necessary to ensure cross-country comparability, separating trial-related costs from scalable implementation costs. On the benefit side, health states from participant questionnaires were translated into health-utility weights to calculate QALYs, while healthcare resource utilization was monetized using the country-specific unit costs identified in the literature.

Statistical analyses were then performed to compare the treatment and control groups, accounting for baseline differences and tracking trajectories over time. Finally, the combined cost-effectiveness and cost-benefit metrics were calculated. Due to the inherent uncertainties in health economic data such as attrition of respondents and varying cost item prices, sensitivity analyses were conducted to test the robustness of our economic conclusions under different scenarios.

Taken together, the scoping criteria, the counterfactual designs, the four analytical objectives, the data collection tools, and the data processing steps described above constitute the methodological backbone from which the Guide derives its general, step-by-step framework for conducting an economic impact assessment of NbTs — a framework intended to be applicable well beyond the specific RESONATE case studies discussed in this chapter.



GUIDANCE FOR THE ECONOMIC ASSESSMENT OF NbTs

This section explains how to evaluate the economic performance of nature-based therapies. Grounded in the Consolidated Health Economic Evaluation Reporting Standards 2022 (CHEERS) (Husereau et al., 2022) and Drummond's checklist for assessing economic evaluations (Drummond, 2015), the guidance ensures that economic assessments meet the verification requirements used by public health payers and institutional decision-makers.

This guide assumes that the structural and operational boundaries of the NbT have already been defined, including who delivers the program, the specific activities involved, target participants, locations, and intervention timeframe. Each section outlines core health economic principles and demonstrates their application within the RESONATE project, highlighting data adjustments and practical compromises made during analysis. The economic evaluation framework consists of seven core steps as illustrated in Figure 3.



Figure 3. Overview of the steps in an economic evaluation. Source: own elaboration.

Step 1: Establishing the framework: evaluation perspective, alternatives, and time horizon

Framing an economic evaluation requires defining the perspective, selecting the alternatives for comparison, and establishing the appropriate time horizon.

DEFINING THE PERSPECTIVE OF THE STUDY

Defining the perspective means deciding which lens to use when evaluating costs and consequences, whether looking at the healthcare sector, the patients, or society in general. Choosing your perspective early is crucial because it dictates exactly which resource impacts to include. A standard healthcare sector perspective tracks only the financial parameters of the medical system, such as staff time, clinical assessments, and medical reimbursements. A societal perspective expands this boundary to include all impacts regardless of who bears them, capturing participant travel expenses, productivity changes, caregiver burdens, and environmental co-benefits.

The choice depends on the target audience. If you want to convince a ministry of health to fund a program out of public resources, a healthcare payer perspective may be the most important. If you are looking for a donor to finance a local intervention that relies on community engagement, a broader societal perspective may be more appropriate.

In RESONATE, we adopted a societal perspective to capture cross-sector impacts across participants and the health care system, providing a comprehensive cost-effectiveness of nature-based therapies to inform health professionals, environmental managers, policymakers, and citizens alike.

DEFINING THE RELEVANT ALTERNATIVES

Next, you need to identify the alternative paths available to improve the health of your specific target population. Because health economic evaluations are comparative, you must clearly define a baseline counterfactual to show what the new intervention is being measured against and what would occur if public resources were allocated differently. In public health, this baseline typically takes the form of standard care, an active alternative program, or a do-nothing scenario. Competing alternatives must be mutually exclusive.

In our project, the definition of these alternatives depended on whether an existing baseline care program was present. For the case studies tracking individuals at risk of metabolic syndrome in Italy, Austria, and Spain (case studies 4, 5, and 6), no specific public green prescribing program or uniform baseline care existed. Therefore, the alternative scenario was a simple "do-nothing" waitlist control group. The two scenarios compared were executing the five-week nature-based therapy program or continuing with the status quo, meaning the intervention did not replace an existing therapy but was delivered on top of whatever routine care participants already received.

In contrast, case study 7 in Sweden illustrates a setup with multiple comparators, matching the primary NbT (nature combined with mindfulness) against a waitlist control group, a pure nature group (walking without mindfulness), and an indoor-only mindfulness group. This isolated the specific health contributions of the natural setting versus the behavioural practice itself.

To wrap up, it is useful to formulate what is called the decision problem, i.e. the question you are trying to answer with your analysis.

As an example, the decision problem for cases 4, 5, 6 was formulated as: *From a societal perspective, is a five-week structured nature-based therapy program of guided nature walks three times a week preferable to a do-nothing scenario of continuing routine life and medical care for adults who are at risk of developing metabolic syndrome?*

Instead, for case study 7, the problem was formulated as: *From a societal perspective, is a nature-based therapy program combining nature and mindfulness preferable to a pure nature walking activity, or an indoor-only mindfulness practice, for students experiencing stress and anxiety? Or is a do-nothing scenario preferable?*

Box 1. Troubleshooting

If a clear control group is unavailable, community organizations can track individuals on a program waitlist as a "do-nothing" baseline, ensuring they match active cohorts on key baseline characteristics. If control data cannot be acquired, a partial evaluation, such as a cost-outcome study, can look at the absolute costs and direct results of the program alone. While it lacks systemic comparative weight, it still provides evidence of cost-effectiveness.

DEFINING THE TIME HORIZON OF THE ANALYSIS

The time horizon is the total duration over which costs and health outcomes are tracked. Ideally, it must be long enough to capture all relevant future clinical and economic consequences of the intervention, though tracking is frequently constrained by trial duration.

A longer time horizon inevitably introduces data challenges: participants will drop out, forget to fill out surveys, or fail to accurately recall some of the data. When designing follow-up questionnaires, one must balance the length of the horizon against the risk of diminishing data quality. To maintain reliability, there are statistical methods that account for missing data that can help ensure that the conclusions remain robust.

The RESONATE evaluation utilized a 10-week total observation window (a 5-week walking program followed by a 5-week post-intervention follow-up). To handle participant attrition (i.e. participants dropping out of the programme), we used a statistical approach called linear mixed-effects models that utilizes all available data points from every participant, even those with missing entries at specific time points.

Box 2. Aligning the methods with the time horizon

Brief observation windows (under six months) are generally insufficient for tracking changes in medical visits or medication intake. In this project, we asked respondents before the start of the NbT to report their medication intake and visits done in the previous six months. Then, after the intervention, they were asked to report the same data but referring to the previous five weeks. This comparison yielded counterintuitive, statistically non-significant increases in healthcare visits post-intervention. This anomaly was driven by three factors:

- Respondents probably easily remembered medical visits from the recent five-week window but underreported visits from the six-month baseline.
- Entering a health trial and undergoing initial screening may have increased participants' health awareness, thus prompting them to seek check-ups.
- Routine healthcare visits (e.g. physiotherapy, psychology) and chronic medication intake do not change significantly during a short 5-week program.

Step 2: Selecting the economic evaluation approach

Choosing a methodology depends on the nature of the study and the required health outcomes. As mentioned earlier, the main economic evaluation methodologies applied in health economic studies are cost-effectiveness analysis (CEA), cost-utility analysis (CUA), and cost-benefit analysis (CBA).

For NbTs, the choice among these methods should be guided by your target audience and funding mechanism. If you are aiming for formal integration into a public healthcare system or a national health insurance framework, a CUA is highly advisable. If instead your program relies on partnerships with municipal planners, environmental agencies, or community donors, a CBA is more appropriate, as it can value non-health impacts and justify cross-sectoral public spending.

In our case, we adopted cost-utility analysis as the main technique and complemented it with a simplified cost-benefit analysis. The CUA was adopted to ensure that our results could speak to national health service administrators, whereas the cost-benefit analysis was adopted to allow NbT participants to implicitly value the intervention, and to obtain out-of-pocket willingness to pay to repeat the NbT if it weren't subsidized.

Step 3: Measuring and valuing benefits

While some economic evaluations consider broader, non-health-related benefits, most focus primarily on measuring health gains within the target population, which is the approach also used in this chapter.

MEASURING HEALTH GAINS

There are two primary pathways for measuring health gains in an economic evaluation: clinical outcomes and patient-reported health-related quality-of-life (HRQoL) measures. Clinical outcomes (such as blood pressure or blood glucose levels) are particularly relevant when evaluating interventions for a specific medical condition, but they may not be directly comparable with other conditions. Therefore, HRQoL outcomes are widely adopted because they translate different health improvements into a universally comparable metric. HRQoL measures can either be disease-specific (like a specific diabetes questionnaire) or generic. Unless targeting a specific disease, a generic measure of HRQoL will often be the most appropriate choice for studies looking at NBTs, as they typically target general mental health and well-being issues or chronic co-morbidities (e.g. those associated with metabolic syndrome such as heart disease, diabetes etc.).

VALUING HEALTH GAINS

To value health gains, individual health states are converted into numerical weights called health utilities. This is necessary because the value attached to a health status is different from the health status itself. Because the personal impact of a physical or mental impairment varies heavily based on individual circumstances, health economics avoids case-by-case measurements. Instead, it uses standardized weights derived from the preferences of a reference population (usually the general public).

Because directly measuring a population's specific health preferences is complex, the field relies on some standardized preference-based instruments. These tools profile a patient's health status across multiple dimensions and apply pre-derived population value sets to assign a final utility weight. Three of the most commonly used tools are:

- EuroQol 5 dimension scale (EQ-5D): It classifies health states across five dimensions (mobility, self-care, usual activities, pain/discomfort, anxiety/depression). The five-level version (EQ-5D-5L) allows for 3,125 unique health states and is the most frequently used in recent years (Devlin, 2020). A health state can be equal to having slight problems in walking about and washing or dressing, severe problems doing usual activities, having slight pain or discomfort while not being anxious.
- Short Form 6 dimension scale (SF-6D): It is derived from standard short-form health surveys (like the SF-12v2) and profiles health states across six dimensions (physical functioning, role limitations, social functioning, pain, mental health, vitality). In its latest version, it captures 18,750 possible health states (Mukuria et al., 2025b).
- Health Utilities Index (HUI): A detailed system focusing heavily on structural, neuro-sensory, and cognitive functional capacities.

Choosing the right system (also from other options) comes down to balancing at least four criteria:

1. Clinical suitability and responsiveness: Does the instrument match your participants? Does it avoid “ceiling effects” where relatively healthy people repeatedly report a perfect score, leaving no room for improvement?
2. Target audience: Do funders or local health authorities prefer a specific instrument? For example, the UK’s National Institute for Health and Care Excellence (NICE) explicitly mandates the EQ-5D as its preferred metrics (NICE, n.d.).
3. Participant burden: If the study scope is wide and the patient questionnaire includes many questions, avoid lengthy tools to reduce survey fatigue.



4. Financial accessibility: Costs of using these tools can range from completely free for public research to thousands of euros in licensing and analysis fees.

Although economic evaluations of NbTs are still emerging, a review of seven existing studies highlights a preference for EQ-5D (four studies) and SF-6D (two studies), while one study utilized the specialized CORE-6D for psychological distress (Elsey et al., 2018). The EQ-5D was favored for its simplicity, its visual analog scale (0–100), and the availability of a youth version (EQ-5D-Y) tailored to younger cohorts (Boarini et al., 2024; Doctorman & Boman, 2016). Additionally, some researchers complemented the EQ-5D with specific mental health or loneliness scales (Jones et al., 2020; Massey et al., 2026). Conversely, the SF-6D was selected for its superior sensitivity to common mental health issues (CJC Consulting, 2016; Willis et al., 2016). Across multiple studies, tool selection was also heavily influenced by existing literature precedents.

If your NbT targets the general public or non-clinical groups, picking a tool that avoids that "ceiling effect" is crucial. SF-6D has been shown to have lower ceiling effects, due to the nuances of its 18,750 health states (Mukuria et al., 2025b), against the 3,125 states captured by the EQ-5D-5L (Devlin, 2020). At least for the RESONATE project we felt that the nuance of the SF-6D, combined with its explicit focus on social functioning and mental well-being, made it more suitable for capturing health improvements associated with the kinds of NbTs we were interested in – but your circumstances may be different.

For instance, the sensitivity of the SF-6D comes with trade-offs in time and money. The survey behind the SF-6D (the SF-12 or SF-36) is longer and more complex than the EQ-5D, risking participant fatigue. On the financial side, the EQ-5D is free for academic and public health research, though commercial licenses cost between €4,000-€7,000 (EuroQol Research Foundation, 2025). In contrast, the SF-6D is significantly less accessible, operating under three pricing tiers where fees are rarely waived entirely, even for non-commercial funded research (IQVIA, n.d.).

If your evaluation operates on a constrained budget, the EQ-5D is highly accessible, widely accepted, and offers a robust body of literature for comparative analysis. However, if you possess adequate funding and are tracking a non-clinical cohort, the SF-6D may be a more optimal choice to capture subtle multi-dimensional well-being gains.

For our evaluation, we chose the SF-6D framework as our main health outcome. We found that the EQ-5D focuses too heavily on physical limitations and severe clinical illnesses, which made it less capable of capturing the mental well-being shifts and resilience building associated with NbTs. We also wanted to avoid the ceiling effect, especially where the population was largely healthy, such as the university students of case study 7.

Once these health utilities are calculated via the chosen instrument, health economists integrate them into generic QoL frameworks to feed into two main metrics: Quality-Adjusted Life Years (QALYs), which combine life quantity and quality, and Disability-Adjusted Life Years (DALYs), which measure years lost to premature mortality and disability. While DALYs are suited for measuring severe disability averted or mortality prevented, QALYs allow you to measure the incremental gains in physical, mental, and social well-being, making them better suited for evaluating most NbTs.

Box 3. A practical example of measuring QALYs using EQ-5D-5L

Consider a 5-week NbT tracking four individuals over a 10-week total observation window: treatment participants (A and B) and waitlist control participants (C and D). Surveys are administered at baseline (T0), post-intervention (T1), and follow-up (T2).

First, we convert the answers into numbers. When a participant fills out the EQ-5D-5L, their answers

across five dimensions create a 5-digit health state code. Each digit ranges from 1 (no problems) to 5 (extreme problems), and the health states range from the highest (11111) to lowest level of health (55555). For example, 12111 means slight problems in self-care and no problems in any of the other dimensions. . Then, by looking at national value sets, for example for Poland, (which can be found on EuroQol's website), we find that 12111 translates to a health utility score of 0.969. EQ-5D values generally range from less than 0 (where 0 is the value of death; negative values representing values worse than death) to 1 (perfect health) (EuroQol Research Foundation, 2025).

Using this method, we find the utility scores for our group, indicated in Table 2, on a scale from 0 to 1.

	T0	T1	T2
Participant A (treatment)	0.652 (13341)	0.969 (12111)	0.969 (12111)
Participant B (treatment)	0.718 (11135)	0.947 (11221)	0.977 (11211)
Participant C (control)	0.699 (11341)	0.596 (52123)	0.596 (52123)
Participant D (control)	0.616 (51321)	0.656 (51121)	0.656 (51121)

Table 2. Fictitious utility scores of the four participants, at different time points (T0, T1, T2). The original health state profiles are indicated in brackets.

To calculate QALYs, we apply the trapezium rule (Torrance, 1996): we take the average utility score between two time points and multiply it by the amount of time that passed (expressed as a fraction of a 52-week year). The total gain in terms of QALYs can be expressed as:

$$Total\ QALYs = \left(\frac{Utility_{TO} + Utility_{T1}}{2} \times \frac{5}{52}\right) + \left(\frac{Utility_{T1} + Utility_{T2}}{2} \times \frac{5}{52}\right)$$

Let's now look at Participant A's QALYs:

• **T0-T1:** Utility grows from 0.652 to 0.969. Average = 0.81, which multiplied by the time interval gives: 0.81*5/52 = 0.078 QALYs.

• **T1-T2**: Utility stays at 0.969. 0.969*5/52 = 0.093 QALYs.

• **Participant A's total QALYs:** 0.078 + 0.093 = 0.171 QALYs.

Repeating this calculation for all individuals yields the total QALYs accumulated over the 10-weeks period:

TREATMENT GROUP	CONTROL GROUP
Participant A = 0.171 QALYs	Participant C = 0.100 QALYs
Participant B = 0.173 QALYs	Participant D = 0.124 QALYs
Group average = 0.172 QALYs	Group average = 0.112 QALYs

The final net QALY gain generated by our NbT is the difference between the average health accumulated by the treatment group and the average health of the control group:

Final QALY gain = 0.172 - 0.112 = 0.060 QALYs

By comparing these two averages, we isolate the impact of the NbT intervention, suggesting

that it generated a net benefit of 0.060 QALYs per participant over the course of 10-weeks. Annualized, this results in a gain of 0.31 QALYs over a year per person.

In RESONATE, we applied a similar methodology, using the SF12v2 questionnaire to obtain the health state profiles, which were then converted into utility values using SF-6D. The mean participant QALY gain for CSs 4, 5, 6 was 0.028 QALYs over one year, whereas for CS7 it was 0.022 QALYs per participant (compared to the wait-list control group).

ALTERNATIVE MEASURES OF BENEFIT

While health gains are the primary focus of economic evaluations, benefits can also be assessed through a population's WTP. Typically measured via stated preference methods using hypothetical scenarios, WTP captures "consumer surplus", i.e. the welfare gain representing the difference between what people are willing to pay and the actual cost of a service. Aggregating this surplus forms the basis of a cost-benefit analysis, revealing consumer demand for non-market social goods like many healthcare programs. Due to their technical complexity, a detailed description of these methods is omitted here. For further readings on the topic, see McIntosh et al. (2011) or Robinson et al. (2019).

Box 4. Willingness-to-pay estimates in RESONATE

To set up a basic WTP framework, you can mirror the approach used in the RESONATE project. Because WTP evaluations often rely on a hypothetical scenario, you must first describe the context clearly. In our study, we surveyed only the treatment group after the NbT to ensure their valuations were the most accurate and realistic. The introductory text stated:

Given your recent experience, we would like to know how much you would be willing to pay to replicate the same activity (3 weekly walks during 5 weeks). Based on market analysis, the average price for this service ranges between €150–€400. What would be your willingness to pay for it? You can write whatever amount you consider most appropriate.

The questionnaire included four core questions to capture and validate these preferences:

1. My willingness to pay for the service is _____ €.

2. If you answered 0 €, please state why. (Options included financial constraints, a belief that the state should fund it, or lack of institutional trust).

3. If participation was free of charge, would you be interested in participating in such activities? (Yes/No)

4. If you answered No, please state why. (Options included a lack of interest and non-appreciation of the trial).

Once collected, the raw data must be cleaned and validated to isolate genuine economic preferences from biased entries or "protest votes" across two pillars:

- **Identification of "protest votes"**: Participants who declared a €0 WTP due to political or institutional objections are excluded. These entries represent a rejection of the payment mechanism rather than a true zero-value for the therapy.
- **Logical consistency:** WTP values are cross-referenced against the participant's stated interest in free participation. Incoherent combinations, such as offering a positive WTP while

simultaneously rejecting a free version of the exact same activity without justification, are removed.

Following this screening phase, invalid responses are discarded to calculate the final mean and median WTP. If socioeconomic variables are captured elsewhere in your survey, you can run a linear regression to identify the statistical drivers behind valuation shifts, such as income level or baseline engagement. In the RESONATE cohort, this data cleaning step removed 15% of responses as invalid, leaving a final valid sample that yielded a mean WTP of €132.5 and a median WTP of €150.

Another key benefit metric sometimes worth analysing is the volume of resources saved, evaluated through a cost-savings analysis. This approach measures the savings an intervention generates across categories like reduced hospital burden, caregiver impacts, or productivity shifts. The specific categories selected for tracking depend on the chosen analytical perspective, the time horizon of the study, and the unique characteristics of the cohort. To execute this analysis, data regarding the raw quantities of resources used must be collected and combined with associated unit costs retrieved from existing literature or public, country-specific datasets.

In RESONATE, given our societal perspective, we tracked resource quantities and unit costs before and after the intervention across six areas: general medical visits, support services (social workers, home care workers), hospitalizations, medicines, travel to health services, and sick days.

As detailed in Box 2, our cost-savings analysis did not show meaningful changes in resource utilization due to methodological issues and the brief study window. For evaluations with follow-up periods exceeding six months, it is advisable to embed resource-use questions within the monitoring questionnaire to track potential savings across sectors. For instance, if an NbT reduces a participant's visits to a physiotherapist, this results in a resource saving for either the participant or the healthcare system. It is also important to tailor the cost items to the cohort's characteristics. Because our participants were primarily aged 40–60, tracking home visits or social support services was unnecessary. Similarly, routine or highly specific visits unlikely to change during the study timeframe should be omitted. Only track visits and medications directly relevant to your target group; for our metabolic syndrome risk cohort, we focused specifically on antihypertensives, fibrates, statins, and antidiabetics.

Step 4: Measuring and valuing costs

The assessment of costs associated with alternative interventions, also known as costing, is common to all economic evaluation methods. Costing involves identifying and measuring the quantities (q) and unit prices (p) of all resources consumed. The main cost categories include those incurred by the health sector, resources used by patients and their families, resources used in other sectors, and productivity changes (Drummond, 2015).

The first step is deciding which costs to include, usually based on the study perspective, the compared alternatives, and the order of magnitude of costs. The perspective determines whether costs are evaluated from the viewpoint of patients, the healthcare system, or society, which dictates whether for example one tracks patient out-of-pocket bills or government reimbursement rates. The number and type of alternatives matter because common cost categories can be excluded; for example, shared overhead costs (buildings, administration) between two programs in the same department can be omitted. Finally, negligible costs that will not alter the study outcome, e.g. water bottles distributed to participants, should be excluded.

Researchers must then choose whether to conduct a new costing analysis from scratch or rely on existing summary values. If used, available literature must be evaluated for quality, credibility, and transferability. If existing estimates do not align with the specific intervention setting, it is better to conduct a new costing study.

If a new costing study is planned, the measurement approach must be defined. The two main approaches in the literature are gross-costing and micro-costing (Turner et al., 2025). Gross-costing evaluates resources at an aggregate level (e.g., dividing total annual budget by patient volume), whereas micro-costing disaggregates the intervention into highly detailed items (exact staff time, consumables, medication). A hybrid method is activity-based costing, which assigns costs based on the resources required for specific activities, like a diagnostic test. Data availability and resource constraints usually dictate this choice.

Once the level of precision is decided, researchers must determine whether to allocate those resources using either top-down or bottom-up approaches. A top-down approach distributes aggregate costs proportionally to a specific service, whereas a bottom-up approach multiplies individual resource units by their output cost. These methods are not mutually exclusive; a study may use bottom-up tracking for direct patient care alongside top-down allocation for shared overheads.

Another important consideration is the time horizon of the study. If an asset's useful life extends beyond the study horizon (e.g., equipment lasting 10 years used for a 1-month study), discounting and annualization factors should be applied to allocate only the proportional share used. Discounting is necessary to adjust future costs and health consequences back to their present-day value, reflecting the principle that resources available today are generally valued more highly than those realized in the future. Depending on national guidelines and institutional preferences, the most commonly utilized discount rates in health economics are 3% and 5% per year (Drummond, 2015).

Cost analysis also distinguishes between average costs (total costs divided by the number of participants) and marginal costs (the cost of adding one extra participant). Tracking both demonstrates economies of scale, as fixed start-up costs are spread across larger cohorts. Finally, researchers must decide whether to evaluate costs according to strict guidelines or reflect "real-world" implementation.

The inclusion of productivity costs in economic evaluations is common yet contentious due to underlying methodological issues and equity implications. Typically, productivity costs are included when a societal viewpoint is adopted and when they are directly relevant to the specific alternatives being compared. For instance, if a new intervention reduces a patient's hospital stay by two weeks compared to standard care, it is highly appropriate to calculate the resulting productivity gains. To navigate equity and double-counting concerns, Drummond (2015) recommends reporting productivity costs and resource quantities separately from direct expenses and unit prices.

In health economics, paid labour losses are generally quantified using either the human capital approach, which maps lost gross wages across the entire duration of an absence based on market-based marginal productivity, or the friction cost approach, which limits estimated losses strictly to the temporary "friction period" an employer requires to replace the worker.

Monetizing unpaid labour (such as domestic chores) and leisure time involves even greater debate due to the lack of market pricing. However, empirical estimates have been provided to resolve this; for instance, Verbooy et al. (2018) utilized contingent valuation techniques to establish a proxy value of approximately €16 per hour for lost unpaid work and leisure.

In RESONATE, we decided not to include productivity costs as the NbT was carried out mostly during participant's leisure time, creating no or little disruption to paid labour. Furthermore, given the lack of a standardized and established method for accounting for leisure time in economic evaluations, and challenges in collecting the precise data needed, we concluded that attempting to monetize these hours would have introduced highly approximate values without adding value to the conclusions.

Box 5. Cost classification

There are many ways of classifying costs, and associated rules on how to account for them. Here we present a brief description of the categories we deem more relevant in the context of NbTs. These categories are not mutually exclusive nor exhaustive. For a complete overview, see Turner et al. (2025); for accounting principles, refer to Vassall et al. (2017).

By cost attribution:

- **Direct costs:** Costs associated with the treatment or management of a health condition, split into direct medical costs (e.g., diagnostic tests) and direct nonmedical costs (e.g., transportation, paid caregivers).
- **Indirect costs:** costs incurred as a consequence of the intervention. This includes productivity costs (losses in productivity).
- **Shared costs:** Costs relating to resources that are jointly used between different interventions which must be allocated proportionally based on their relative use.

By lifespan:

- **Capital costs:** One-time costs for items that have a lifespan exceeding one year.
- **Recurrent costs:** Costs for resources consumed within a year (e.g. personnel salaries).
- **Start-up costs:** Costs that relate to initial one-time activities (e.g. training activities).

By scale:

- **Fixed costs:** Costs that do not vary with scale (e.g., buildings).
- **Variable costs:** Costs that change with the level of output or the scale of the intervention.

By accounting context:

- **Incremental costs:** The difference in cost between two alternatives.
- **Marginal costs:** The additional cost incurred by producing one extra unit of output. Unlike average costs, marginal costs generally do not factor in fixed costs.

In RESONATE, we standardized economic data collection by developing uniform accounting matrices in Excel. The costs were classified according to four categories: start-up costs (like protocol design), capital costs (one-time equipment purchases), fixed recurrent costs (such as staff training), and variable recurrent costs (like insurance). While productivity costs are highly important in most economic valuations, we decided not to include them as explained above.

Due to some missing data across sites, we selected the Salzburg case (CS5) as our baseline economic reference as it had the most complete cost dataset, proportionally imputing missing fields for Padua and Barcelona using the Salzburg values.

To isolate project-specific costs from real-world delivery costs, we modelled two separate cost scenarios:

- **Trial scenario:** captured all trial-specific expenses, including study registration, data coordination overhead, recruitment, and clinical protocols (e.g. blood tests, saliva assays, blood pressure monitoring).
- **"Real-world" scenario:** removed purely scientific research expenses, under the assumption that a public health service would not require lab tests for non-clinical populations completing NbTs. The clinical trial scenario incorporated capital costs for medical equipment and significant personnel

costs for clinical assessments at three time points which would not usually be included in most NbTs.

For case study 5, the trial scenario resulted in a cost of approx. €800 per person, whereas the real-world scenario cost approx. €390 each[3]. The fixed cost for establishing an NbT amounted to approx. €40,600 in the trial scenario, and the variable costs to approx. €390 per person. This means that we estimate that replicating an NbT similar to RESONATE's in Austria will cost €40,600 to set up, and then an additional €390 euro for each participant. For the real-world scenario, the fixed cost amounted to approximately €17,300 and the variable costs to approximately €210 per person.

Step 5: Measuring the cost-effectiveness

The final economic value is determined by comparing the additional costs that one programme imposes over another with the additional benefits it delivers. This relationship is usually captured by the incremental cost-effectiveness ratio (ICER), which is expressed as:

$$ICER = \frac{Cost_{Intervention\ A} - Cost_{Intervention\ B}}{QALY_{Intervention\ A} - QALY_{Intervention\ B}} = \frac{\Delta Cost}{\Delta QALY}$$

where Δ Cost is the incremental cost, and ΔQALY is the incremental effect.

The ICER represents the cost of buying an additional year of perfect health (1 QALY). This value must be evaluated against a national cost-effectiveness threshold, which represents the maximum price a healthcare system is willing to pay for an extra QALY before a resource allocation is deemed inefficient or displaces health benefits elsewhere. A cost-effectiveness threshold of €20,000 per QALY means that every extra €20,000 spent on health care resources are expected to displace one QALY elsewhere in the health care system. So, if the ICER is lower than this threshold, the new intervention generates more health for a given amount of resource than the programme it might displace. Where formal national thresholds are missing, empirical investment proxies or macroeconomic benchmarks (such as the WHO-CHOICE threshold of one times the GDP per capita) are used (WHO, 2001). The empirical thresholds usually refer to the health care system perspective, whereas the macroeconomic benchmarks usually reflect a societal perspective.

In RESONATE, the incremental cost-effectiveness ratio (ICER) was calculated as:

$$ICER = \frac{Cost_{NbT} - Cost_{Control}}{QALY_{NbT} - QALY_{Control}}$$

We calculated country-specific ICERs by constructing proxy benchmarks from published empirical data or using macroeconomic proxy thresholds as in Table 3 below:

CASE STUDY	COUNTRY	EMPIRICAL THRESHOLD	GDP-BASED THRESHOLD (1×GDP)[4]
CS4	Italy	~€33,000 / QALY[5]	~€38,000 / QALY[2]
CS5	Austria	Not available	~€53,000 / QALY[2]
CS6	Spain	€22,000 – €25,000 / QALY[6]	~€31,000 / QALY[2]
CS7	Sweden	€22,000 – €91,000 /QALY[7] depending on disease severity	~€55,000 / QALY[2]

Table 3. ICER thresholds for selected case studies, based on empirical estimates and GDP estimates.

[3] All costs from RESONATE are calculated at a 3% discount rate.

[4] (Eurostat, 2026)

[5] Russo et al. (2023)

[6] Vallejo-Torres et al. (2018)

[7] Viollet et al. (2022)

The cost of the NbT in CS5 was assessed at approx. 800 euros per person, for the clinical scenario, and the QALY gain was equal to 0.0303.

The ICER calculation is illustrated below:

$$ICER = \frac{€800 - €0}{0.7670\ QALYs - 0.7367\ QALYs} = \frac{€800}{0.0303\ QALYs} = 26{,}402\ €\ per\ QALY$$

Given that the ICER is well below the ICER threshold for Austria (€53,000 per QALY), it can be said that the NbT is cost-effective.

The intervention was even more cost-effective when considering the real-world scenario, where clinical assessments were excluded. In fact, the cost decreased to approx. 390 euros per person, resulting in an ICER of €391/0.0303 = €12,885 per QALY, 76% below the QALY threshold for Austria.

Another way of expressing cost-effectiveness is in terms of incremental net monetary benefits, which uses the ICER threshold to establish how many additional resources would be required to generate the same health benefits elsewhere.

In RESONATE, we calculated the net monetary benefits for the NbTs and as an example, we refer again to CS5. In Austria, which has an ICER threshold of €53,000, and where the average QALY gain per person thanks to the NbT was 0.0303, the maximum cost the intervention could have while remaining cost-effective is €1,605 (calculated as €53,000*0.0303). In other words, the Austrian healthcare system would have to spend €1,605 in routine care structures to match the health benefits generated by the NbT. Given that the NbT in the real-world scenario cost approx. 390 euros per person, it generates a net monetary benefit of €1,215 per person, whereas in the clinical scenario it still generates a positive net monetary benefit of €805 per person.

Step 6: Measuring co-benefits

A critical component of this methodology involves establishing a strategy to integrate environmental co-benefits into the economic analysis (refer to the section on The Ecosystem Services Perspective: bridging NBS and NbTs).

This step supports a holistic assessment of NbTs, assessing the societal and environmental services that nature provides and that the broader community benefits from. By systematically expanding the scope of impacts considered, the resulting economic estimate more closely approaches — though does not fully capture — the Total Economic Value (TEV) (Pearce & Turner, 1990).

Generally, co-benefits are integrated in the cost-benefit analysis, if conducted. In CBAs, the estimation of co-benefits must also follow some of the steps outlined for the main analysis:

1. Establishing the framework and time horizon
2. Selecting the economic valuation approach
3. Measuring and valuing benefits
4. Measuring and valuing costs

As established in the state-of-the-art review, several approaches exist for this operation; in particular in this case you will draw on the range of environmental economics methods. Such analysis should yield a set of economic values (typically expressed in €/year) that can be aggregated to approximate the TEV and subsequently integrated into cost-benefit assessments.

Box. 6 An example of measuring environmental co-benefits

We here present as a case a study that was conducted in 2024 in the city of Brescia (Italy), with the aim of showing the variety of ecosystem services that can be estimated and integrated with health outcomes of NbTs. The objective of the study was to conduct an economic valuation of the main ecosystem services provided by green areas (public and private) in the municipality.

The following table shows the adopted methodologies and the results of the study. The VET, calculated as the sum of the considered ecosystem services, results in 76.519.252 €/year for the whole city.

ECOSYSTEM SERVICE	METHODOLOGY	RESULTS (BIOPHYSICAL)	RESULTS (ECONOMIC)
Carbon sequestration	Market price	44.667 tonCO2/year	2.680.040 €/year
Oxygen production	Production cost	32.484 tonO2/year	10.818.502 €/year
Air pollution removal	Avoided cost	n/a	547.759 €/year
Temperature regulation	Avoided cost	Average heat mitigation 0,6 °C	7.575.701 €/year
Urban flood risk mitigation	Replacement cost	1.585.903 m3/year	22.921.345 €/year
Habitat quality	Restoration cost	n/a	5.171.477 €/year
Recreation	Benefit transfer (Willingness To Pay)	n/a	26.804.428 €/year
VET	/	n/a	76.519.252 €/year

Table 4. Ecosystem services valuation results

[8] https://www.comune.brescia.it/it/documenti_pubblici/piano-del-verde-e-della-biodiversita#documenti

The Brescia case study demonstrates how applying diverse environmental economics methods can successfully monetize complex ecosystem services into a single cohesive metric. By aggregating these distinct values, researchers can provide a robust approximation of the TEV generated by nature, in addition to NbTs. Consequently, this comprehensive figure ensures that environmental co-benefits are integrated into cost-benefit assessment, and that decision-makers are equipped with the comprehensive economic justification needed to support green urban planning.

Step 7: Translating results for decision-makers

The final step of any economic evaluation is to move beyond the raw calculation of numbers and interpret the findings within the wider decisional context.

An evaluation is only useful if it addresses the practical issues faced by decision-makers. Analysis must address the feasibility of implementation, evaluate whether the program can free up institutional clinical capacity, and establish external validity by showing whether pilot results remain stable when scaled up to broader demographic groups or differing regions.

It is also important to discuss broader ethical, distributional, and equity considerations that might not be captured in standard QALY metrics. Because NbTs often generate benefits that spill far beyond the borders of traditional healthcare departments, impacting climate resilience and community cohesion, linking health economic indicators with environmental and spatial parameters can be useful to ensure that decision-makers across different sectors can see the shared returns on investment.



RECOMMENDATIONS AND CONCLUSIONS

Where we come from, where we are going

The message running through this Guide is that if one of today's main bottlenecks to NbTs integration and wider uptake is the sector's ability to produce economic evaluations that are high-quality, comparable, and genuinely useful to decision-makers, when NbTs are measured rigorously, the economic signals that emerge are promising. RESONATE has tried to take a step in this direction by building economic analysis into the research design from the outset. This closing chapter turns that experience, together with its acknowledged limits and context-specific conditions, into recommendations meant to travel beyond RESONATE itself.

RECOMMENDATION 1 — BUILD ECONOMIC ASSESSMENT INTO THE STUDY DESIGN, THROUGH A PARTICIPATORY PROCESS

The most recurring limitation in the economic literature on NbTs is the ex-post nature of evaluations, which are conducted after the intervention has ended and therefore lack control groups (Busk et al., 2022; Puntscher et al., 2026). To address this, research and intervention protocols should be built through co-creation from the design stage onward, involving multidisciplinary researchers, participants, communities, and key stakeholders when possible and pertinent to study objectives. This is what RESONATE attempted through the shared development of integrated data collection plans and questionnaires. The trade-off between methodological ambition and practical feasibility is a lesson worth transferring, including the time needed to co-develop a protocol and the compromises required to safeguard output quality while assessing multiple dimensions at once.

Concretely, studies should define the analytic perspective, comparators, and time horizon before research begins. Tools for collecting cost and benefit data must be integrated into clinical or social protocols rather than added afterwards. Of course attention needs to be put in proposing tools that should not overburden participants, remaining proportionate to available resources and appropriate to potentially complex or diverse contexts. Finally, recognized standards such as CHEERS (Husereau et al., 2022) or the Drummond checklist can be adopted from the design stage to ensure the resulting evidence can withstand institutional and payer scrutiny.

RECOMMENDATION 2 — CONTROL GROUPS AND LONGER TIME HORIZONS

The near-systematic absence of control groups and the shortness of observation windows remain recurring problems. Building on the previous recommendation, co-design can help establish credible counterfactuals even in real-world applied settings, as shown by RESONATE's direct experience.

Future initiatives should invest systematically in study designs that include a control group, favoring pragmatic solutions like wait-list designs when full randomized controlled trials are not feasible. However, extending the time horizon in wait-list designs should be supported by strategies to retain participants, such as periodic follow-ups or small incentives, alongside constant monitoring of their autonomous exposure to nature during the waiting period to prevent data contamination and dropouts. Concurrently, short windows are generally insufficient to capture genuine changes in healthcare utilization, extending observation periods beyond the typical three-to-six months can be useful to solve this problem. Longer time horizons are also consistent with the preventive nature of NbTs described by the Nature-Based Biopsychosocial Resilience Theory, where much of the economic value lies in future costs avoided, an effect that takes time to materialize.

RECOMMENDATION 3 — STANDARDIZATION WITHOUT RIGIDITY

Methodological heterogeneity is a problem flagged consistently across the available literature, which describes it as an obstacle to any common interpretation of results, given that the included studies differ in design, type and dose of intervention, outcome measures, and target population (Busk et al., 2022; Puntscher et al., 2026).

This should not translate into a single rigid method to be transferred uncritically to every context. The recommendation is instead to adopt a shared minimum set of tools and reporting practices: an explicit, well-justified choice of health-related outcome measures suited to the target population, the context, the objectives, and the resources available; and a common format for reporting summary results, allowing at least a qualitative comparison across studies even when the headline metrics are not directly comparable — as Puntscher et al. (2026) explicitly note regarding the lack of direct comparability between SROI, CBA, and CUA.

RECOMMENDATION 4 — DO NOT LOSE THE NATURAL ELEMENT AND THE CO-BENEFITS, EVEN WHEN THEY ARE HARD TO MEASURE

Traditional economic evaluations often treat nature as mere scenery, reducing NbTs to conventional therapies that simply take place outdoors. This risk, flagged throughout this Guide, is leaving NbTs at the margins of the broader NbS landscape and exposes them to methods borrowed wholesale from conventional therapies, losing relevant information about co-benefits for both people and nature. It is also important to add in the discussion considerations that might not be captured in standard QALY metrics. Indeed, NbTs often generate benefits that spill beyond the borders of traditional healthcare departments, linking health economic indicators with environmental, social and spatial parameters can be useful to ensure that decision-makers across different sectors can see the shared returns on investment.

To avoid double counting, which occurs when for example recreational and health benefits stemming from the same exposure to nature are mechanically summed together, we recommend a two-track approach. This involves a core economic analysis centred on health and conducted rigorously according to standard guidelines, accompanied by a separate qualitative or semi-quantitative estimate of environmental and social co-benefits presented alongside rather than added to the main health result. This two-track approach is necessary because the health component evaluates the micro-economic impact on the individual patient, while the environmental component captures the macro-economic and collective impact on the community. This approach helps you address the "wrong pocket problem," where benefits from a local environmental investment fall on a different budget, such as national healthcare, than the one that bore the initial cost, such as a municipality (Rutten-van Mölken et al., 2025). Making this misalignment explicit to decision-makers is essential for honest communication of NbT value.

RECOMMENDATION 5 — COMMUNICATE EFFECTIVELY TO DECISION-MAKERS

Even when an economic analysis is methodologically sound, its influence on policy decisions depends on the ability to translate it into language comparable with the thresholds and tools decision-makers already use. The recommendation is to avoid stacking too many indicators without a clear hierarchy, prioritizing metrics already recognized by the relevant decision-making systems. "Decision-ready" summary sheets, designed specifically for local administrators and healthcare managers, can help bridge the distance between the technical complexity of the analysis and the needs of those who must allocate resources quickly.

RECOMMENDATION 6 — INTERNATIONAL REPLICABILITY

The economic literature available on NbTs and nature-based social prescribing is today almost entirely concentrated in the United Kingdom: Puntscher et al. (2026) note that 45% of the studies they identified originated there. Extending these evaluations to different healthcare, regulatory, and cultural contexts — as RESONATE itself has begun to do through its case studies in Italy, Austria, Spain, and Sweden — is a priority for understanding how far current results are genuinely transferable, rather than specific to the UK health system.

RECOMMENDATION 7 - ANALYZE WHO PAYS

A rigorous economic evaluation of an intervention is not enough if it fails to address explicitly the question of who should bear its costs over time. As discussed in the report on sustainable financing and in the WHO guidance on assessing green and blue spaces, financing can take many different forms, none of which is truly neutral — from Social Impact Bonds to public-private partnerships, from pooling public funds across different levels of government to mobilizing non-financial community resources such as social prescribing itself (Rutten-van Mölken et al., 2025). NbTs, as interventions often sitting at the intersection of the health, environmental, and social sectors, are by their very nature well suited to these hybrid models.

The concluding recommendation is that future economic studies on NbTs should not limit themselves to assessing the costs and benefits of the intervention itself, but should also include an explicit analysis of the intended financing mechanism and its sustainability over time — because the question of "who pays" largely determines the equally crucial question of "who can access". For further details on the market ecosystem and sustainable financing options you can refer to the “Nature-based Therapies Sustainable Financing Guide” produced by the RESONATE project.

RECOMMENDATION 8 - WHO BENEFITS? INTEGRATE EQUITY INTO ECONOMIC ASSESSMENTS

Access to the benefits of urban green and blue spaces is not equitably distributed. People living in northern and western European cities generally have greater access to urban green space than those in the southern and eastern ones. Within cities, higher socioeconomic groups enjoy greater access to these spaces than lower socioeconomic groups, and neighbourhoods with larger migrant or ethnic minority populations tend to have less green space available. When disadvantaged socioeconomic groups do gain access to green and blue spaces, they may experience even greater health and well-being benefits than more advantaged groups. Furthermore, other groups, such as older people or people with disabilities, make less use of spaces lacking adequate facilities like seating or toilets, while perceived safety heavily influences willingness to use these areas, particularly for women, LGBTQ+ communities, and older individuals.

These elements have a direct bearing on how we produce and read economic evaluations. An aggregated ICER calculated on the average population says nothing about who actually benefits and who remains excluded, risking to mask the very inequalities a well-designed intervention could help reduce.

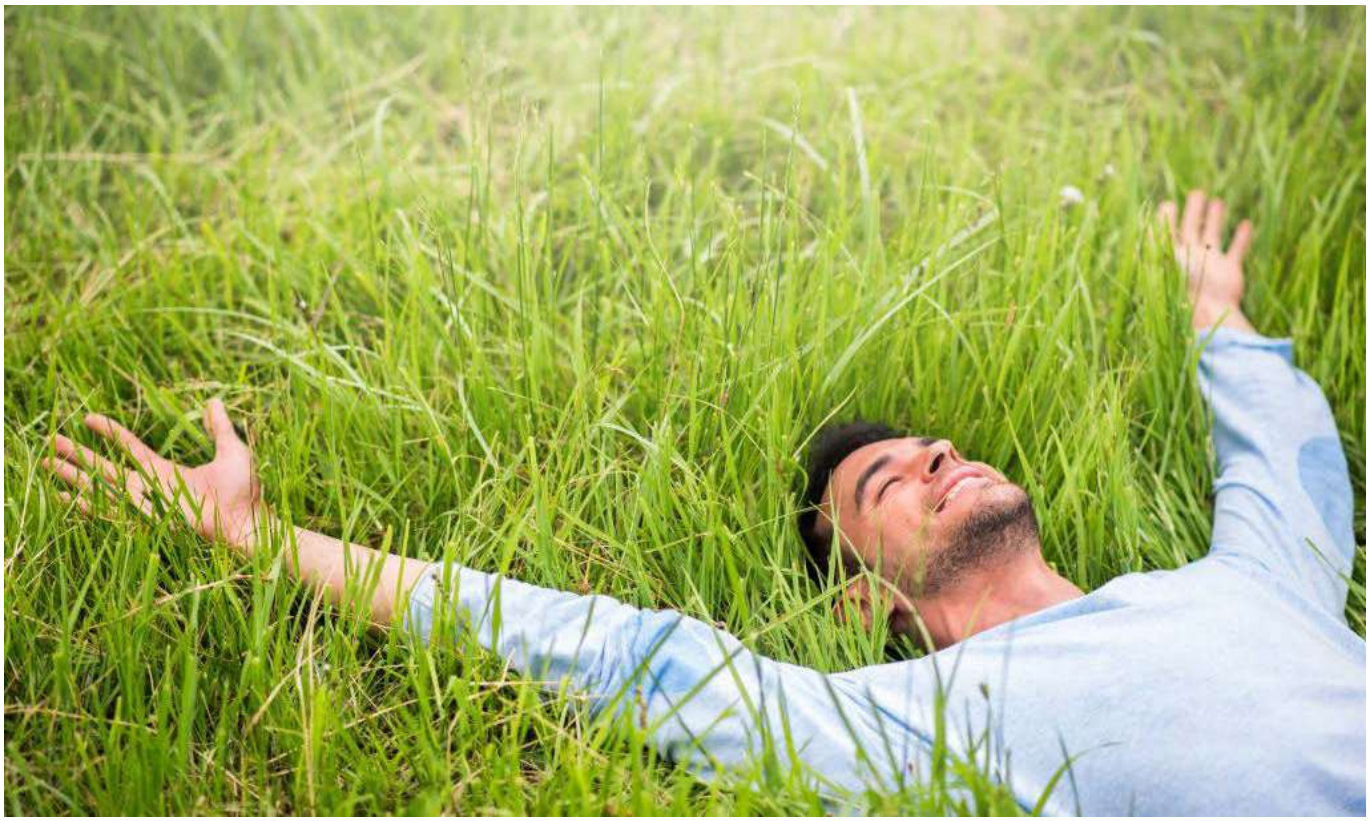
The recommendation, therefore, is threefold:

- Support the disaggregation of results by subgroup, including income, ethnicity, gender, age, disability, and geographic area, when studies have the appropriate sample size.
- Ensure future protocols do not just disaggregate data, but programmatically accept that the public health objective of an NbT can justify a provisionally higher cost per unit of health within vulnerable groups, precisely for the sake of reducing systemic, long-term inequalities.
- Consider non-economic access barriers, from perceived safety to the adequacy of facilities, explicitly at the intervention design stage. An intervention that produces a good average cost-benefit ratio can still fail its public health objective if the groups most in need remain systematically excluded.

Who pays and who benefits are not separate questions, but two sides of the same decision. A poorly designed financing system, such as one based on undifferentiated entrance fees, can undermine even the most cost-effective intervention on paper by excluding the populations that would benefit most. This confirms a central message of this Guide: economic efficiency alone is not enough to justify an intervention. It must be accompanied by an evaluation, communicated with the same technical care, on the equity, accessibility, and social and environmental sustainability of its benefits (see the other guidance documents developed within the RESONATE project on these topics[9]).

CONCLUSIONS

The evidence gathered in this Guide, despite the limitations inherent to a pioneering project such as RESONATE, indicates that NbTs can generate economic value in addition to health benefits, in line with what the broader international literature on NbTs and nature-based social prescribing suggests, albeit with caution. This value, however, will remain largely invisible to decision-making systems until it is measured with a methodological rigour comparable to that required of other health interventions, and until the questions of who bears the costs and who actually benefits are addressed with the same technical seriousness reserved for calculating cost-effectiveness indicators. Our hope is that future national and regional guidelines will include minimum requirements for economic evaluation, so that every new programme becomes an opportunity not only to deliver a service but also to generate comparable evidence. This Guide offers itself as a first methodological step in that direction: not a definitive framework, but a shared starting point, to be refined, expanded, and corrected through the experience of those who, in the years ahead, will attempt to replicate it in different contexts.



[9] Guides and other project resources are available at this website https://resonate-horizon.eu/resources/

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APPENDIX

More details about methodology used in the development of this Guide

To comprehensively assess the economic impact of the NbTs evaluated in this study, a systematic, multi-step methodological approach was implemented. The process moved from measuring individual quality of life and healthcare utilization changes to estimating non-market values, ultimately synthesizing these inputs into broader cost-effectiveness and cost-benefit frameworks. More details on the different methodologies used are outlined below:

MEASURING QUALITY OF LIFE AND HEALTH GAINS (QALYS)

A QALY is a metric generally used to evaluate the quantity and the quality of life a medical intervention provides. It is calculated by combining various dimensions of health-related quality of life into a single health-state value, which is then multiplied by the time spent in that state. One year of life in perfect health equals one QALY. Living one year at 50% of full health, for example by being impaired by a chronic disease, equates to 0.5 QALYs. This method was applied to evaluate the changes in the health state of participants to the NbT before, after, and 5 weeks after the intervention.

COST-SAVINGS APPROACH

The Cost-savings approach assesses if a medical intervention leads to general savings for society by reducing the need for medical visits. In practice, healthcare utilization data are compared before and after the intervention, and if a decrease in utilization is detected, one can estimate how much each visit saved is worth. In this study, the difference between healthcare utilization before and after the intervention was calculated, both for the intervention and the treatment group of each case study.

CONTINGENT VALUATION

Contingent valuation is a valuation method used to estimate the monetary value of a benefit that isn't typically bought or sold in a traditional market, such as the health improvements associated with an NbT. In this study, we asked NbT participants in a survey how much they would be willing to pay to take part in the NbT again if it required an out-of-pocket cost. Their stated willingness-to-pay provides an estimate of the perceived value of the NbT intervention and its associated benefits.

COST-EFFECTIVENESS ANALYSIS

Cost-effectiveness analysis is used to determine whether an intervention is a worthwhile investment by comparing both its costs and health benefits against an alternative, such as standard care or a control group. It answers the question: "How much does it cost to buy a year of perfect health with this therapy?". The result of this analysis is typically expressed as the Incremental Cost-Effectiveness Ratio (ICER). The ICER measures the additional cost required to gain one extra unit of health benefit (e.g. one QALY). Decision-makers use the ICER by comparing it to a threshold, which represents the maximum amount society is willing to spend for one additional year of perfect health. If the intervention's ICER falls below this threshold, it is considered a cost-effective use of public health resources.

COST-BENEFIT ANALYSIS

Cost-benefit analysis translates both costs and health effects into monetary terms to determine whether a program creates a net financial gain for society. By subtracting the costs of the NbT from the economic value generated, such as the monetary value of QALYs, we obtain the intervention's Net Benefit. In this study, this approach was applied to evaluate NbTs from both a personal and a societal perspective. At the personal level, the average monetary value participants placed on the therapy was compared against its per-person cost to see how much of the expense they might be willing to bear. At the societal level, participants' net health gains were converted into financial value using standard public healthcare spending thresholds and balanced against total intervention costs. Ultimately, a positive net benefit indicates that the intervention successfully increased overall societal welfare.

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