**Discover** Sustainability

Research

# Evaluating the tangible and intangible parameters of cultural heritage: an economic meta-analysis in a global context

**George E. Halkos**[1,2,3] · **Phoebe C. Koundouri**[2,3,4] · **Panagiotis-Stavros C. Aslanidis**[1,2,3] · **Angelos Plataniotis**[2,3]

Received: 3 April 2024 / Accepted: 5 August 2024
Published online: 12 August 2024


**Abstract**
Sustainable development ensures the longevity of civilization by balancing economic growth, environmental protection, and social equity. The present study evaluates cultural heritage assets via a meta-regression analysis function transfer, in which 85 studies were examined that revealed 106 different willingness-to-pay (WTP) values in the period 1995–2022. The meta-regression methodology enables the valuation of cultural heritage—tangible and intangible—goods and services, as well as cultural values (e.g. aesthetic, spiritual, symbolic, etc.). The utilization of WTP would enable us to compare the two models (i.e., European and non-European) on how much a citizen would value cultural heritage based on non-market valuation. The results would inform policymakers about the importance of cultural heritage assets in the sustainable development agenda. The empirical findings present that the WTP for the European sample is 37.6€ and for the non-European is 60.12€. In essence, the Europeans are influenced mainly by intangible cultural assets, whereas non-Europeans are influenced by oral tradition. Overall, cultural heritage conservation necessitates for proper economic valuation through a holistic approach, in short—the valuation of both tangible and intangible cultural goods and services is imperative for sustainable development.

**Keywords** Willingness to pay · Tangible cultural heritage · Intangible cultural heritage · Meta-regression analysis · Benefit transfer · Value transfer

**JEL Classification** Z1 · Z18 · C5 · Q53 · Q54

## 1 Introduction

The current multi-crisis era has gravely affected *cultural heritage* (CH), either for lowering tourism (e.g. inflation and COVID-19) or due to climate change. The safeguarding of civilization is prerequisite of sustainable development, meaning that there is need to balance economic growth, environmental protection, and social equity for current and future generations as stated the notion of sustainable development in World Commission on Environment and Development [1].

**Supplementary Information** The online version contains supplementary material available at https://doi.org/10.1007/s43621-024-00398-w.

✉ George E. Halkos, halkos@uth.gr | [1]Laboratory of Operations Research, Department of Economics, University of Thessaly, Volos, Greece. [2]School of Economics and ReSEES Research Laboratory, Athens University of Economics and Business, Athens, Greece. [3]Sustainable Development Unit, ATHENA RC, Athens, Greece. [4]Department of Technology, Management and Economics, Technical University of Denmark, Copenhagen, Denmark.

The present work adopts the framework for cultural statistics (FCS) of UNESCO [2] consists of tangible and intangible aspects of culture. The FCS (page 25) defines CH as the tangible aspects consist of monuments, buildings, archaeological sites. Furthermore, the intangible cultural heritage (ICH)[1] as defined by UNESCO [3] contains, inter alia, oral stories, traditions, and social practices. CH and ICH are important, since not only provide evidence of the past, but also shape the present—individual and communal— identity [4]. Moreover, culture can augment the sense of *place* (e.g. sense of belonging) and *aesthetic wellbeing* of local populations [5], additionally it can be considered an irreplaceable and extremely valuable record of human activity [6].

CH and ICH can be *drivers* of the economy at the local, regional, and national levels, contributing to tourism development and urban growth [7, 8]. COVID-19 has negatively affected CH, either through the loss of revenues or the cultural deprivation of local communities due to closures of museums and archeological sites [9]. Similarly, cultural values should be considered as an important component of quality of life [10], especially in urban green spaces as Vidal et al. [11, 12] noted.

Threats to CH, posed by climate change, might cause severe damage to historical inheritance, leading to the loss of important and irreplaceable –tangible and intangible–assets to communities [13–15]. Climate change-related events can have an impact on heritage sites through changes in environmental conditions that can change the conservation conditions for the sites' materials [16, 17]. It is advisable that climate-related threats to cultural heritage are generally recognised as a threat to society [13].

CH can be severely impacted by water- or wind-related phenomena. It has been found that water is one of the main reasons behind material degradation, meaning that an increase in precipitation or humidity can enhance corrosion, degradation, or other decay mechanisms. At the same time, wind and atmospheric pollutants can lead to surface abrasion and damage, and warmer temperatures can intensify the weathering of materials [5].

Another challenge is that environmental refuges can lose their cultural roots because of climate change. Rising temperature risks could lead to facades' deterioration or biochemical deterioration, whereas risks related to sea level rise could lead to coastal erosion and population migration [18]. The latter is a poignant effect of climate change that can lead to the loss of rituals and cultural memories, which are significant aspects of ICH [19, 20].

The need for CH adaptation to climate change involves the implementation of protective measures to preserve historical sites from environmental or anthropogenic threats, while integrating sustainable practices (e.g., eco-friendly material for restoration and climate-resistant design) to ensure their resilience for future generations [21, 22]. CH and ICH are confronted with various barriers that hinder its conservation. Fatorić & Biesbroek [23] found that in the case of the Netherlands, institutional and technical barriers pose significant challenges in adapting CH to climate change. Sesana et al. [24] identified that barriers to the adaptation of CH to climate change can be classified into the following themes: (i) diversification, (ii) uncertainty, (iii) resignation, (iv) loss, (v) value preservation, and (vi) financial resources. Additionally, Sesana et al. [25] found that some of the main barriers that constrain climate change mitigation when it comes to CH include lack of regulation, lack of knowledge, heritage values, inefficiencies in energy use, and incompatible solutions, among others. Phillips [26] found that *heritage managers* require more case studies and guidance, as well as more predictions on the impacts of climate change at a local level, so that they are incorporated into their decision-making.

Eventually, the management of CH can also have a positive effect on environmental change management; management planning developed for the protection of historic assets can lead to better protection of adjacent landscapes [6]. Heritage can be proven as a valuable source of information and knowledge, inspiring policies related to climate change, and heritage assets can also support climate change mitigation and decarbonization [7]. In essence, it is imperative that the repercussions of climate change on CH be mitigated through people's education and the promotion of effective policies and strategies [27].

Owing to the frequency and intensity of extreme weather events in the world, the need to adapt CH to climate change effects has become more urgent [28]. The 17 Sustainable Development Goals, introduced by the United Nations in 2015, refer briefly to CH in Target 11.4, as part of the bigger 11th Goal of making *"cities and human settlements inclusive, safe, resilient and sustainable"* [29]. This limited reference mentions CH along with natural heritage and focuses on protection and safeguarding, and not on valorization or regeneration [30]. Henceforth, it might be advisable that the SDGs in the future distinguish CH from natural heritage and give prominence to their distinct values.

[1] The convention for the safeguarding of the intangible cultural heritage focused on the respect of ICH, on raising awareness, and stimulate cooperation, for more information please see: UNESCO [3] (Articles 1 and 2).

The present research aims to provide an economic valuation of CH and ICH goods and services by relying on meta-regression analysis function transfer. Halkos [31] defined as the economic valuation of tangible and intangible cultural assets as the quantification of their intrinsic value in monetary terms, therefore this process helps in understanding their contribution to the economy and society, guiding preservation and investment decisions. Through a meta-analysis, it might be possible to compare two models that evaluate willingness to pay (WTP) in European and non-European samples.

The present study is based on two hypotheses. Firstly, it explores whether there are statistically significant differences between socioeconomic factors, cultural values, and cultural heritage aspects, and secondly, if there is statistically significant difference between European and non-European studies. The goal of this study is to answer the following research questions (RQ) that are based on the two hypotheses. The RQ1 checks how socio-economic factors affect respondents' WTP for environmental protection. The RQ2 examines how the cultural values influence respondents' attitudes towards environmental protection. The RQ3 inspects how cultural heritage acts on respondents' attitudes towards environmental protection. Finally, RQ4 monitors whether the European WTP is higher than the non-European WTP.

The novelty of this research is the comparison of WTP on a global scale by giving prominence on core CH and ICH assets, often overlooked by the economic literature. Moreover, regarding the structure of the research, Sect. 2 delves into the main literature review in economic valuation of cultural tangible and intangible assets, Sect. 3 presents the meta-analysis methodology, Sects. 4 and 5 are dedicated to the core results and discussion respectively, lastly Sect. 6 provides central policy implications regarding the showcase of tangible and intangible cultural assets.

## 2 The cultural capital in economic valuation

The total capital of an economy comprises (i) natural capital, (ii) human capital, and (iii) man-made capital [31–33], all of which are intertwined with the notion of human welfare. First, *natural capital* includes all stocks and flows of renewable and non-renewable resources derived from nature. Second, *human capital refers* to the stock of human knowledge, skills, abilities, and experiences, which are pivotal for the generation of constructive employment for society and the economy. Finally, the *man-made* capital stock covers the sum of the constructed environment (e.g. infrastructure, telecommunications, water, and energy).

Nevertheless, both cultural and environmental economics need to classify other forms of capital as well, in order to monitor social and cultural capitals. Dasgupta [33] refers to *soci*al *capital* as society's involvement, trust, and volunteerism in democratic societies, whereas *cultural capital*[2] addresses issues such as the stock of an asset's cultural value, knowledge, history, language visions, myths, and people's view of the world and its function. Figure 1 illustrates UNESCO's CH classifications in order to present both CH and ICH determinants of cultural capital.

Obviously, cultural capital is more difficult to be quantified, as many cultural goods are public or quasi-public goods, with changes in their provision being associated with possible externalities that have to be considered in any cost–benefit analysis (CBA). Any estimate of the value for public goods is significant. Moreover, in the case of CH, various assets are included, and sites often need maintenance, repair, or restoration. Apparently, such a case is different from any economic good, as it cannot be substituted if damaged or lost, as there are no markets, and they cannot be reproduced due to their uniqueness. Recently, there has been an increasing recognition of the necessity of identifying and assessing the value of CH assets to guide investments in maintenance and conservation programs [34, 35].

In assessing the economic impact of CH on urban development, a notable methodological approach is the hedonic pricing model, which elucidates the influence of heritage attributes on real estate prices [36]. This model has been instrumental in revealing that while the heritage status and the construction year of properties might not uniformly elevate real estate prices, factors such as location, heritage context, and architectural uniqueness significantly enhance property values [37]. For instance, properties situated in proximity to cultural events like the Fiesta of the Patios or within World Heritage sites often command a price premium, underscoring the economic valorisation of CH [38, 39]. These findings suggest that CH possesses intrinsic economic value that can manifest in higher property prices, thereby contributing to urban economic vitality and social cohesion. In the cultural economics literature, the methodology of economic valuation of CH and ICH goods aims to approximate cultural capital, hence an asset that

[2] The cultural capital contains culture and behavioral-related aspects as defined in Dasgupta [33] (page 38).

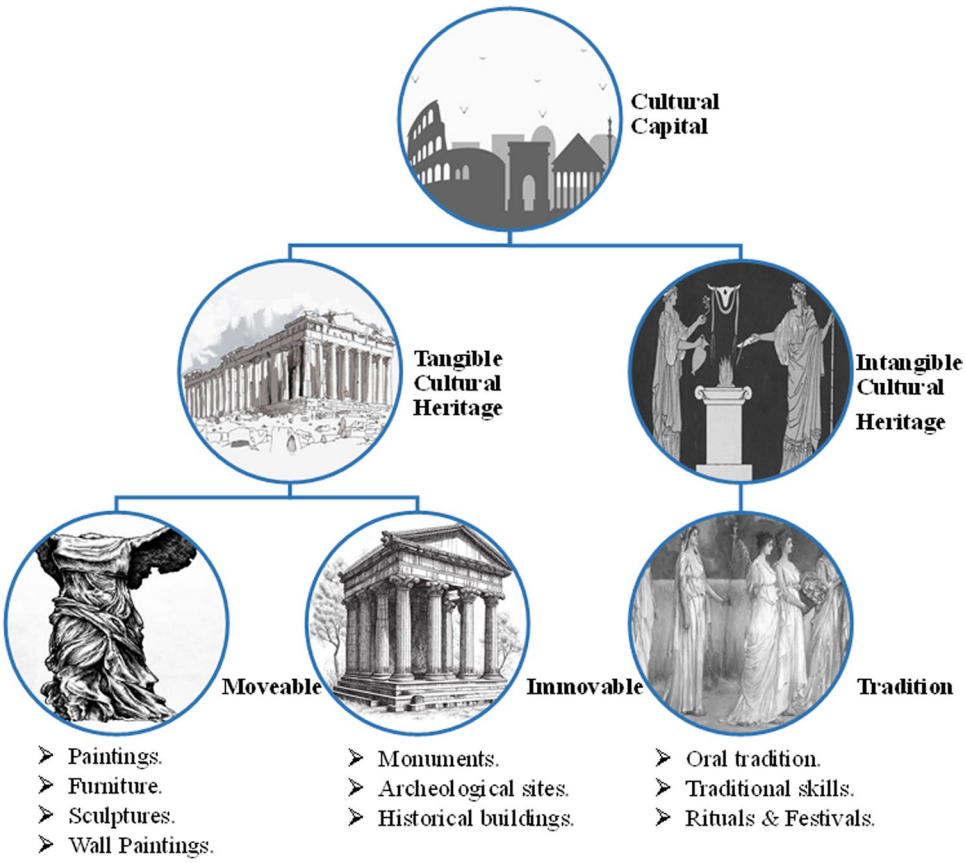


**Fig. 1** Tangible and intangible aspects of cultural capital. Source: Authors' elaboration inspired by UNESCO [3]

gives rise to both economic and cultural value. There is a rich literature on the economics of cultural heritage, as in [40–50].

The total economic value (Eq. 1) of cultural goods can be decomposed into *use values* (*UV*—i.e. values associated with direct, indirect and future use) and *non-use values* (*NUV*—i.e. derived from existence, bequest, and altruistic). Therefore, the Total Economic Value (TEV) for cultural goods can be expressed as:

$$TEV = UV + NUV \tag{1a}$$

$$TEV = (DUV + OV + QOV) + (EV + IV + BV + SV) \tag{1b}$$

In addition to the direct use value (*DUV*), option value (*OV*), and quasi-option value (*QOV*) of cultural goods, we may also consider the non-use values as those derived from existence (EV), intrinsic (IV), bequest (BV), and synergistic (SV) values. It emerges that cultural capital concept is similar to that of natural capital, indeed as Riganti & Throsby [34] declare «natural capital includes natural resources, both renewable and non-renewable, whilst cultural capital includes cultural resources, tangible or intangible too. Both forms of capital impose a duty of care on the present generation, and both have direct interrelationships with the real economy» [37, p. 2]. This means that methodologies applied to measure the economic benefits generated by natural capital can also be applied to measure the economic value of heritage goods and services.

On the other hand, cultural value, as Throsby [51–53] reports, comprises *aesthetic, spiritual, social, historical, symbolic, authenticity, and scientific*. Some other values might be the CH goods classification, this study refers to the Cultural Heritage Classification from UNESCO [3]. Figure 2 presents the economic and cultural values of cultural capital.

Accordingly, the use values generated by cultural capital can be assessed through observable data sources, whereas non-use values can be measured through revealed preference methods (e.g. travel cost method, hedonic pricing method) or stated preference methods (e.g. contingent valuation, conjoint analysis, or discrete choice experiments) [31].

The statistical analysis of previous research studies is called secondary analysis or *meta-analysis*, in essence Glass [54] briefly described it as "the analysis of analyses" (p.3). The three main reasons for utilising the meta-analysis methodology

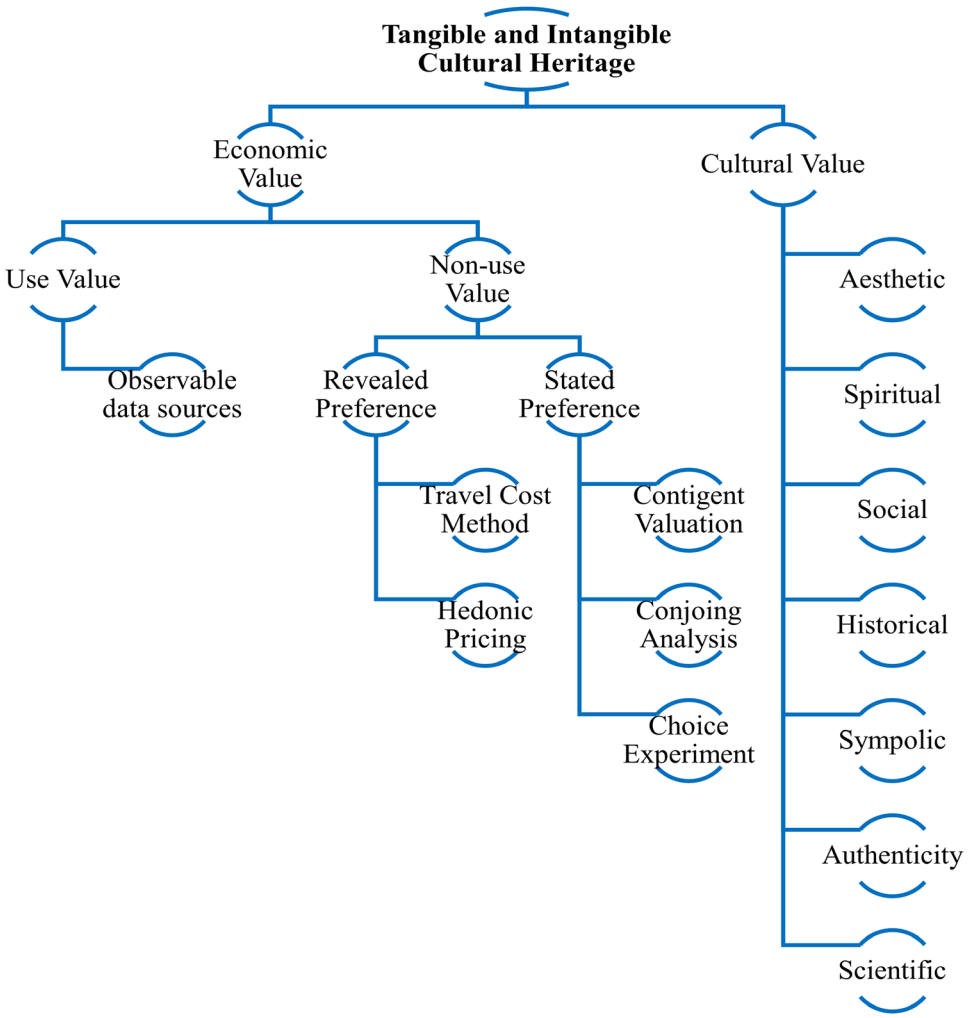


**Fig. 2** Economic and cultural values and valuation methodologies. Source: Authors' Elaboration

are, as Smith and Pattanayak [55] noted: *research synthesis*, *hypothesis testing*, and *benefit transfer*. However, the benefit transfer accuracy might be at stake due to three forms of error: (i) generalization error (i.e., the application of benefit transfer); (ii) measurement error (i.e., endogenous problems of primary researches); and (iii) selection bias (i.e., choice of only statistically significant results and omission of other information) [56, 57].

Regarding the assessment of the cultural value of a heritage site, the usual approach refers to the Burra Charter developed by ICOMOS or (for items of universal importance) the criteria for nomination to the World Heritage List of UNESCO. The application of benefit transfer techniques is still limited, but as primary data studies grow, their use is expected to increase.

## 3 Methodology

This study aims to prove an economic valuation of cultural heritage goods by relying on a meta-regression analysis function transfer. Primary literature related to cultural heritage valuation was selected. In total, 85 studies were identified and reported relevant information on 106 actual ICH or CH WTP values, which were therefore retained for the dataset creation between 1995 and 2022 and providing estimation of cultural heritage goods at the global level. For more information regarding the 85 studies and 106 WTP values please refer to the supplementary material (Table S.1). We expect to extend this information by relying on Dümcke & Gnedovsky [58], which offers a review of several studies focused on the social and economic value of cultural heritage. The descriptive statistics of the socioeconomic and cultural variables are presented in Table 1, along with their descriptions and units of measurement.

**Table 1** Descriptive Statistics of socio-economic variables, cultural goods and values

| Variables | Description | Units and measurement | Mean (std. dev.) |
|---|---|---|---|
| Gender[a] | Indicates the percentage of male and female in the sample population | Binary (0 and 1). [Female = 1] | 0.50 (0.04) |
| Income[b] | A continuous variable indicating the mean annual income of the sample population in euro | Range (Euro, € \| or expressed in Euro) | 20,449.60 (17,868.46) |
| Age[c] | A continuous variable indicating the mean age of the sample population expressed in years | Range (24–53) | 37.93 (5.95) |
| Education[d] | Indicates the percentage of the sample population that have a high education level | Range (0.04–1.49) [university degree = 1] | 0.37 (0.29) |
| Economic values | Dummy variables indicating the economic value of cultural capital | Binary (0 and 1) | |
| Existence | | [Existence = 1, otherwise = 0] | 0.64 (0.48) |
| Bequest | | [Bequest = 1, otherwise = 0] | 0.36 (0.48) |
| Cultural values | Dummy variables indicating the cultural value generated by cultural capital | Binary (0 and 1) | |
| CV_aesthetic | | [aesthetic = 1, otherwise = 0] | 0.47 (0.50) |
| CV_spiritual | | [spiritual = 1, otherwise = 0] | 0.17 (0.38) |
| CV_social | | [social = 1, otherwise = 0] | 0.44 (0.50) |
| CV_historical | | [historical = 1, otherwise = 0] | 0.44 (0.50) |
| CV_symbolic | | [symbolic = 1, otherwise = 0] | 0.48 (0.50) |
| CV_authenticity | | [authenticity = 1, otherwise = 0] | 0.48 (0.50) |
| Tangible goods | Dummy variables indicating seven typologies of tangible cultural heritage goods | Binary (0 and 1) [tangible good = 1, otherwise = 0] | |
| Tangible_paintings | | [paintings = 1, otherwise = 0] | 0.06 (0.23) |
| Tangible_sculptures | | [sculptures = 1, otherwise = 0] | 0.08 (0.28) |
| Tangible_furniture | | [furniture = 1, otherwise = 0] | 0.00 (0.00) |
| Tangible_wall | | [wall = 1, otherwise = 0] | 0.06 (0.23) |
| Tangible_historicalbuildings | | [historical buildings = 1, otherwise = 0] | 0.32 (0.47) |
| Tangible_monuments | | [monuments = 1, otherwise = 0] | 0.24 (0.43) |

**Table 1** (continued)

| Variables | Description | Units and measurement | Mean (std. dev.) |
|---|---|---|---|
| Tangible_archeogogicalsites | | [archaeological sites = 1, otherwise = 0] | 0.19 (0.39) |
| Intangible goods | Dummy variables indicating three typologies of intangible cultural heritage goods | Binary (0 and 1) [intangible goods = 1, otherwise = 0] | |
| Intangible_oraltraditions | | [oral traditions = 1, otherwise = 0] | 0.13 (0.34) |
| Intangible_social habits-festivals | | [social habits-festivals = 1, otherwise = 0] | 0.34 (0.47) |
| Intangible_traditionalskills | | [traditional skills = 1, otherwise = 0] | 0.26 (0.44) |

[a]For studies in which gender data were not available for the population, we extracted that information from webpages providing official statistics, such as Statista [59] and Statistics Times [60]

[b]In the studies in which, monthly annual income was provided, the monthly amount has been multiplied per twelve months. For studies in which income data were not available, we extracted that information from webpages providing official statistics, such as Eurostat [61], CEIC [62], Trading Economics [63], and USCB [64]. Eurostat database provides mean equivalized net income by year

[c]For studies in which age data were not available, we extracted that information from Worldometer [65]

[d]In case in which educational level data were not available, we extracted relevant information from webpages providing official statistics, such UNESCO [66] as that adopt the International Standard Classification of Education (ISCED)

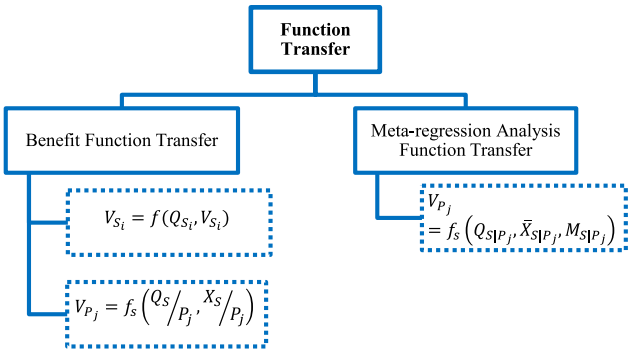


**Fig. 3** Function transfer models. Source: Halkos [31]

The dataset is composed of the following seven variables based on the recent Sustainable Development Solutions Network (SDSN) senior working group on the European Green Deal [67] and EAERE 2023 by Halkos [31]: (i) *study name* which contains information about the authors, name, journal, and year of publication; and (ii) WTP, which is a continuous variable which expresses the annual mean WTP (in Euro, €) for cultural services, but in cases in which the value of the WTP was expressed in a currency other than euro, the exchange rate of the current year in which the study was developed was applied. In some studies, consumer surplus values are considered equal to the WTP. In the estimation, the WTP variable will be considered as the dependent variable; (iii) year of study development indicates the year of data collection; (iv) year of study publication; (v) location: a categorical variable reporting the geographical location in which the analysis has been developed; (vi) country: a categorical variable reporting the country in which the analysis has been developed; and (vii) valuation method: a categorical variable indicating the method used to develop the analysis. The analysed studies used contingent valuation or travel cost methods.

As the availability of primary data is limited or non-existent, we have summarised and synthesised the empirical findings of various studies in a meta-regression analysis function transfer with the meta-analysis model presented in Eq. 2:

$$WTP_i = \alpha + \sum_{i=1}^{I} \beta_i Q_i + \sum_{i=1}^{I} \gamma_i X_i + \sum_{i=1}^{I} \delta_i M_i + \varepsilon_i \quad (2)$$

where *i* corresponds to each observation gathered from studies considered, WTP is the dependent variable in our case (i.e., a continuous variable expressing annual mean WTP for cultural services expressed in euros), $\alpha$ is the intercept (if necessary); $\beta$, $\gamma$, *and* $\delta$ represent the parameters to be estimated as slopes of the specifications, quality-quantity variables ($Q$), socioeconomic variables and area characteristics ($X$), and methodological variables ($M$) are the matrices of the explanatory variables, and $\varepsilon$ error term with the usual properties.

Benefit transfers can be classified as value and function transfers. In our case, attention is given to the latter. In Fig. 3, function transfer consists of benefit function transfer and meta-regression analysis function transfer, where the benefit function transfer relies on the argument that the study area *i* considered is related to various characteristics of a study area context ($V_{S_i}$—e.g., location or climate) and a number of independent variables ($X_S$—e.g., socioeconomic and demographic variables). On the meta-regression analysis transfer function part, $V_{P_j}$ is the value of policy area *j* as a function of the data considered from each study area *i*. The rest variables may be quality-quantity variables ($Q$), socioeconomic variables and area characteristics ($X$), and methodological variables ($M$) [31].

## 4 Results

When dealing with robust value transfer, it is advisable that the examined studies depend on reliable data and properly specified qualitative methods. In addition, to have lower levels of heterogeneity, if possible, the study sites should have similar characteristics and populations. Moreover, assuming uniformity and the fulfilment of these assumptions may allow us to assess the relevant *shadow prices* for such goods. Non-use values often account for a large part of the TEV of cultural goods, with CVM being the method that is mainly applied. In essence, WTP is calculated as a function of explanatory variables.

Table 2 presents the correlation coefficients between socioeconomic variables, cultural goods, and values. All the correlation coefficients were less than 0.7, implying that potential multicollinearity among the explanatory variables

**Table 2** Correlation coefficients of socioeconomic and cultural variables

| | Gender | Income | Educ | Age | CV_Aest | CV_Auth | CV_Spir | CV_Symb | CV_Soc | Int_Goods | Int_Soc | Int_skill | Int_ oral | Tan_arch | Tan_hist | Tan_paint |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gender | 1 | | | | | | | | | | | | | | | |
| Income | 0.12 | 1 | | | | | | | | | | | | | | |
| Educ | 0.08 | 0.25** | 1 | | | | | | | | | | | | | |
| Age | 0.00 | 0.00 | 0.05 | 1 | | | | | | | | | | | | |
| CV_Aest | 0.18 | − 0.16 | 0.04 | − 0.13 | 1 | | | | | | | | | | | |
| CV_Auth | 0.11 | − 0.10 | 0.20* | − 0.07 | 0.23* | 1 | | | | | | | | | | |
| CV_Spir | − 0.10 | − 0.12 | 0.13 | 0.00 | − 0.12 | 0.17 | 1 | | | | | | | | | |
| CV_Symb | − 0.02 | 0.09 | 0.25** | 0.03 | 0.09 | 0.45** | 0.02 | 1 | | | | | | | | |
| CV_Soc | − 0.04 | 0.12 | 0.00 | 0.02 | 0.09 | 0.18 | − 0.23* | 0.23* | 1 | | | | | | | |
| Int_Goods | − 0.05 | 0.00 | − 0.35** | − 0.17 | 0.20* | − 0.12 | − 0.23* | 0.08 | 0.34** | 1 | | | | | | |
| Int_Soc | 0.00 | − 0.01 | − 0.12 | 0.02 | 0.01 | − 28** | − 0.16 | − 0.19* | 0.14 | 0.66** | 1 | | | | | |
| Int_skill | − 0.03 | − 0.13 | − 0.17 | − 0.05 | 0.29** | 0.36** | 0.02 | 0.34** | 0.48** | 0.55** | 0.12 | 1 | | | | |
| Int_oral | 0.07 | 0.04 | − 0.02 | 0.06 | − 0.03 | − 0.15 | 0.05 | 0.13 | 0.01 | 0.36** | 0.25** | 0.21* | 1 | | | |
| Tan_arch | .19* | 0.11 | 0.11 | 0.06 | − 0.06 | 0.12 | 0.10 | − 0.03 | − 0.17 | − 0.36** | − 0.19 | − 0.18 | 0.03 | 1 | | |
| Tan_hist | 0.08 | 0.03 | 0.19* | 0.31** | − 0.08 | − 0.01 | 0.07 | − 0.01 | − 0.23* | − 0.60** | − 0.35** | − 0.26** | − 0.15 | 0.23* | 1 | |
| Tan_paint | 0.00 | − 0.01 | 0.16 | 0.15 | − 0.15 | 0.17 | 0.00 | 0.09 | 0.11 | − 0.18 | − 0.09 | − 0.05 | − 0.09 | − 0.01 | 0.18 | 1 |

*Correlation is significant at the 0.05 level (2-tailed)

**Correlation is significant at the 0.01 level (2-tailed)

**Table 3** Results of the specifications with WTP for cultural heritage as dependent variable

| Variables | European Countries (n = 51) | Non-European countries (n = 55) |
|---|---|---|
| Gender | 6.0392<br>[0.3536] | |
| Income | – 1.0532<br>[0.1177] | – 0.2460<br>[0.0586] |
| Education | 8.0032<br>[0.0074] | – 10.4789<br>[0.2434] |
| Age | | 1.4511<br>[0.1288] |
| Cultural value | | |
| CV_Aesthetic | – 63.5646<br>[0.0018] | 17.8077<br>[0.4664] |
| CV_Authenticity | | 32.9540<br>[0.2798] |
| CV_Spiritual | – 50.0845<br>[0.0252] | – 40.7892<br>[0.2342] |
| CV_Symbolic | | 32.3384<br>[0.2036] |
| CV_Social | | 38.0880<br>[0.2361] |
| Cultural heritage goods & services | | |
| Intangible goods | 114.3066<br>[0.0114] | 164.1822<br>[0.0238] |
| Intangible social habits | – 50.5228<br>[0.0582] | – 177.9597<br>[0.0551] |
| Intangible traditional skills | – 57.2029<br>[0.0512] | 147.2847<br>[0.0164] |
| Intangible oral tradition | | – 168.7514<br>[0.0034] |
| Tangible archaeological | – 78.6118<br>[0.0017] | |
| Tangible historical buildings | 73.5298<br>[0.0083] | |
| Tangible paintings | – 77.8216<br>[0.0077] | |
| Diagnostic tests | | |
| R-square | 0.4064 | 0.5127 |
| ARCH effect test | 0.0128<br>[0.9099] | 0.1259<br>[0.7226] |
| Heteroskedasticity Glejser | 14.1405<br>[0.2253] | 21.54<br>[0.0430] |
| HeteroskedasticityHarvey | 14.8782<br>[0.1881] | 21.5420<br>[0.0430] |
| Heteroskedasticity White | 9.6655<br>[0.5607] | 14.878<br>[0.1881] |
| Total WTP (in EUR) | 37.6 | 60.12 |

For the last specification, HAC standard errors and covariance (Bartlett kernel Newey–West fixes) were used. P–values in brackets

was not expected. It is important to mention that education is slightly correlated with authenticity and symbolic values, as well as tangible historic buildings, but negatively correlated with intangible goods. Another interesting result from Table 2 is the positive correlation of intangible goods with intangible social skills and oral traditions but a negative correlation with tangible archaeological sites and historic buildings.

The empirical results of the present research are based on two hypotheses, firstly on the matter whether there is statistically significant difference between the inspected factors, and secondly, whether there is statistically significant difference between the European and non-European samples. Regarding the RQ1, the WTP approximations, as presented in Table 3, reached 37.6€ and 60.12€ for European and non-European case studies, respectively. Our final model

specifications rely on the statistical significance of the variables included. For the socioeconomic variables, education was statistically significant in Europe, whereas income was statistically significant in non-European cases. Moreover, referring to the cultural values aesthetic and spiritual in Europe, but in the rest of the world, relaxing the usual strict statistically significant levels to $\alpha = 0.25$, spiritual, symbolic, and sociocultural values can be deemed as important in the WTP estimation.

Next, cultural heritage goods and services are incorporated into the WTP calculation regarding the RQ2. In both models, intangible goods, social habits, and traditional skills are statistically significant. On the above cultural goods and services can be added the tangible archeological sites as part of RQ3, historical buildings, and paintings referring to the European studies, whereas on the non-European countries important is the influence of intangible oral tradition. Briefly, European studies show that tangible cultural heritage (e.g., castles, ancient monuments, statues, mosaics, frescos, and paintings) might stimulate WTP, while the oral tradition (e.g. stories, legends, and myths) influences non-European countries more.

Thus, it is crucial to provide appropriate diagnostic tests. In order to answer RQ4, both European and non-European models have decent predictability, with 40.64% and 51.27%, respectively. Additionally, no ARCH effect can be spotted, and there is no heteroskedasticity based on the White test; however, there is heteroskedasticity based on the Glejser and Harvey tests.

In addition, the mean willingness to pay (MWTP) for the case studies is illustrated in Fig. 4. It can be purported that while European total WTP has lower total WTP than the non-European as presented in Table 3, the MWTP shows a totally different pattern. It should be noted also that some countries have higher MWTP than others due to the averaging of the total WTP and due to the lack of data availability, to exemplify there is only one case in Bolivia, thus the total WTP is also the MWTP.

The MWTP, interestingly, unveils that Asia has the lowest MWTP values (i.e., brown colour), even though Asia hosts the oldest civilizations. The MTWP of the laggards reach almost the 3€, as for example in India (0.68€), Indonesia (0.72€), and Iran (3.05€). On the contrary, the greatest Asian MTWP can be attributed to Taiwan (85€), China (88€), and Nepal (125€).

Europe has also rich CH. The highest MWTP values (i.e., green and deep blue colours) in Europe can be linked to North Macedonia (120€), Albania (127€), Croatia (134€), and Romania (343€). In the value range of €40–100 there is Spain, Denmark, and Sweden, furthermore, in the range of €20–40 there is Türkiye, Greece, Netherlands, and Portugal. The fourth value category (i.e., €10–20) is composed by Austria, Ireland, the UK, and Italy. Nevertheless, the lowest European MTWP belongs to Slovenia (1.62€). Overall, it is peculiar that countries with a relatively rich ancient history, i.e., Greece and Italy, do not express high cultural MWTP.

The Americas, Africa, and Oceania are undoubtedly important for their cultural capital, but there is not a large amount of research that can fit the scope of the present study and this is the reason for their underrepresentation. The Americas show that the highest MWTP is in Bolivia (763€) followed by Canada (57€), the lowest MWTP can be found in the Brazil (2.87€). In Africa and Oceania there are only three four studies. Therefore, for Africa the total WTP is 10.46€ in South Africa and 15.64€ in Zimbabwe (15.64€), whereas in Oceania the MWTP is 40€, by which the total WTP of the two Australian studies are 6.47€ and 74.27€.

## 5 Discussion

Civilization is at risk due to several reasons, especially the outdoor cultural heritage sites are exposed to threatening phenomena such as climate change. In parallel, other crises such as COVID-19, inflation pressures, and conflicts between countries might have averted people from scheduling travel and excursions to CH sites and monuments. Cultural values are pivotal for peoples' wellbeing and health [11, 12]. Hence, it is pivotal that the economic and environmental assets of CH be specified, in order to safeguard civilization through the adoption of initiatives, projects, policies, and strategies.

In addition, some of the factors that can enable climate change mitigation include overcoming barriers. The literature, inter alia Sesana et al. [25], has focused on important barriers to legislation and regulations, economic resources and incentives, sustainable refurbishment and transportation strategies, and changes in user behaviour.

It is also important to understand people's WTP in protecting World Heritage Sites and CH assets from the risks posed by climate change. For example, Laplante et al. [68] examined the WTP of the Armenian diaspora in the US for the protection of Armenia's Lake Sevan, which constitutes a symbol of their CH. The findings suggest that each household of the Armenian Diaspora in the US would be willing to pay approximately $80 on average, as a one-time donation, in order to prevent Lake Sevan's further degradation, as well as approximately $280 in order to restore the lake's quality. Lo and

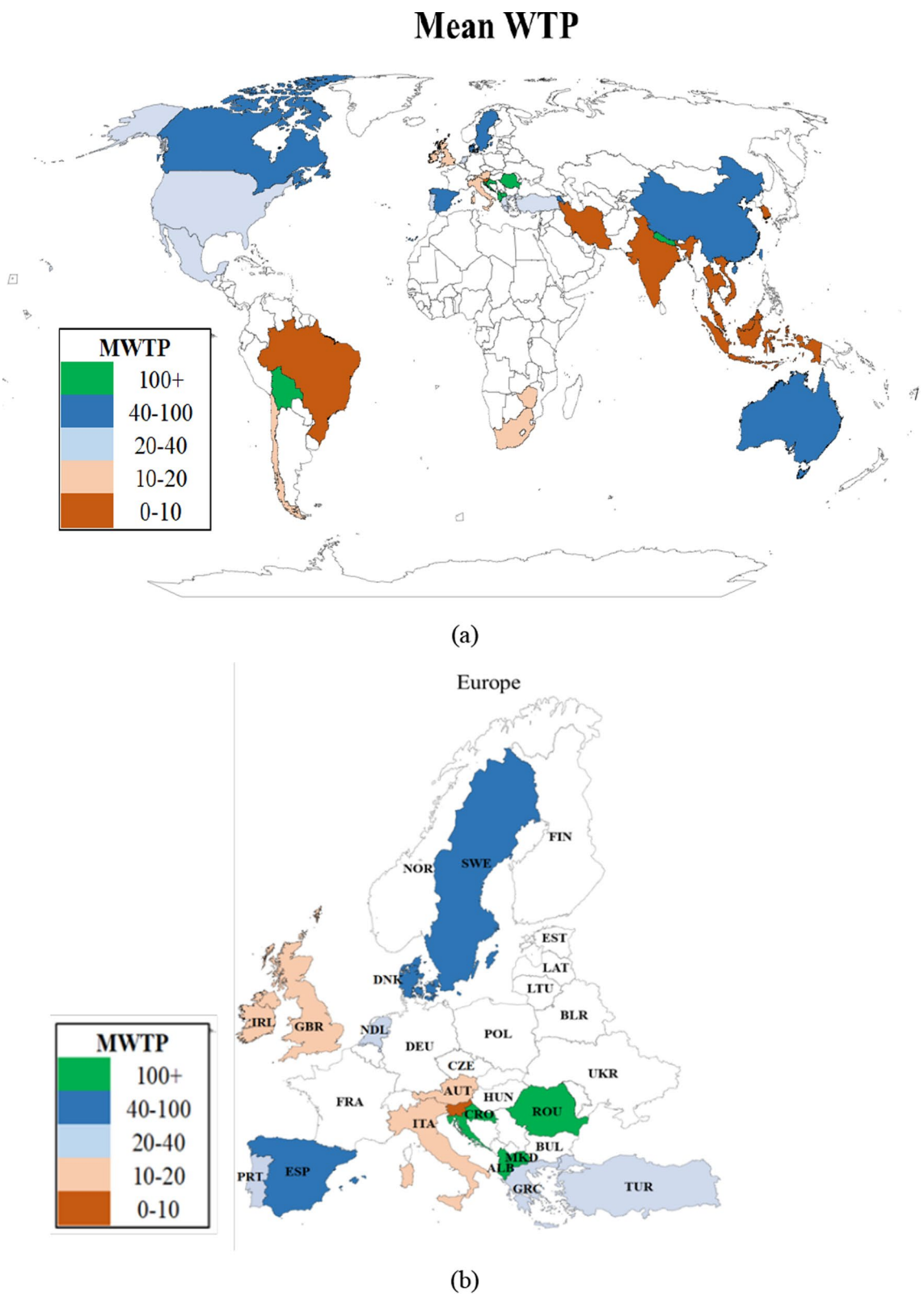


**Fig. 4** **a** Mean willingness to pay of the case studies and **b** the case of Europe. White colour indicates non availability of data

Jim [69] evaluated residents' WTP forr the preservation of stonewall trees that are of cultural significance in Hong Kong, with the results showing that 28% of respondents returned a zero WTP.

Furthermore, M.-H. Nguyen et al. [70] have examined local residents' WTP for the protection of a World Heritage Site in Vietnam from coastal erosion. A resident's WTP for a coastal erosion management program is estimated at USD $1.7 per year, on average. Similarly, L. A. Nguyen et al. [71] have focused on tourists' WTPfor the protection of the same site in Vietnam from coastal erosions. The authors found that each tourist is willing to pay USD $13.45 for an erosion protection program, an amount that is almost 7 times greater than what local residents are willing to pay for a similar program.

Overall, the economic valuation of cultural heritage has attracted the attention of both academics and policymakers. It is possible, via value transfer techniques, that cultural values and goods obtain a monetary value, even if they belong to non-market assets. This is extremely significant for policymakers to blueprint strategies for the safeguarding practically our civilization.

## 6 Conclusions and policy implications

The present analysis applied a meta-analysis methodology in order to approximate the WTP in two value transfer models. Two hypotheses were monitored, the first hypothesis examined the impacts of socio-economic and cultural-centered parameters, whereas based on the second hypothesis the European studies attained 37.6€, whereas the non-European studies presented 60.12€ WTP. Therefore, the answer to the second hypothesis is that European WTP is lower than non-European WTP.

The two models present divergence among socioeconomic and cultural variables, issues that raised under the scope of RQ1, RQ2, RQ3, and RQ4. It can be purported that the Europeans are more attracted by tangible cultural heritage (e.g., monuments or paintings); on the other hand, non-Europeans are influenced mainly by oral tradition. In tandem with these results, Europeans are more attached to beauty (i.e. aesthetic issues) and spirituality from the above tangible heritage assets, while non-Europeans have symbolism and social values derived from the oral tradition. Another conclusion is that education determines WTP levels in Europe, but income guides WTP in non-European studies.

The present research proposes core policy implications that could address the environmental, economic, and cultural sustainability. In order to properly address the impact of climate change on cultural heritage, policy frameworks must incorporate heritage preservation into overall strategies for mitigating and adapting to climate change, promoting a comprehensive approach to sustainability. First, cooperation and information sharing on climate change and acid rain abatement are pivotal because these phenomena can severely and irreversibly impact civilisation. We recommend the establishment of specialized funding mechanisms designed to support cultural heritage conservation projects, particularly those facing emerging threats from environmental changes. Such mechanisms could range from targeted grants to tax incentives aimed at facilitating restoration and preventive measures. Second, promoting sustainable tourism practices through policy initiatives is crucial for protecting cultural heritage while fostering economic growth in local communities, thereby ensuring that tourism delivers positive conservation outcomes and harmonizes economic advantages with cultural preservation. Finally, oral tradition is as significant as tangible cultural heritage and should not be omitted from the policymaking process. Oral traditions, as noted previously, are at risk due to environmental migration. The conservation of intangible cultural heritage requires equal attention in policy-making, recognizing the intrinsic value of traditions, languages, and practices is essential for sustaining the cultural identity and continuity of communities in the face of environmental changes.

Overall, the above policy implications are in tandem with our results. On the one hand, the environmental and economic sustainability is represented by the tangible CH aspects as the European are willing to pay more for the conservation of CH against the impacts of climate change. On the other hand, the cultural sustainability for the non-Europeans not only is based on the tangible aspects, but also on the ICH parameters such as the respect towards oral traditions.

To recapitulate, this study shows that the economic valuation of tangible and intangible cultural assets relies on diverse factors such as location, educational level, and income. Therefore, policymakers should incorporate such information into sustainable cultural management. The safeguarding of our civilization should be strengthened by the proposed value transfer methodology applied here, extending the economic valuation literature by revealing monetary aspects to non-marketed assets. In a nutshell, the complexity of cultural asset approximation through economic valuation necessitates more holistic approaches, in short: the valuation of intangible cultural heritage is imperative for sustainable development in an era of multi-crisis.

**Author contributions** G. E. Halkos: Conceptualization, Methodology,Data curation, Formal analysis and investigation,Writing—review and editing, Supervision; P. C. Koundouri: Conceptualization, Writing—review and editing, Supervision; P.-S. C. Aslanidis: Writing—original draft preparation, Visualization; A. Plataniotis: Writing—original draft preparation.

**Funding** This research was supported by the ARSINOE project, which has received funding from the European Union's Horizon H2020 innovation action programme under grant agreement 101037424. The authors would like to express their gratitude for this support, which has been instrumental in the completion of this work.

**Data availability** The data of our research are available on request.

## Declarations

**Competing interests** The authors declare no competing interests.



## References

1. WCED. The Brundtland Report: "Our Common Future." World Comm. Environ. Dev. 1987.
2. UNESCO Institute for Statistics. 2009 UNESCO Framework for Cultural Statistics (FCS). 2009.
3. UNESCO. Convention for the Safeguarding of the Intangible Cultural Heritage, https://ich.unesco.org/en/1com.
4. Orr SA, Richards J, Fatorić S. Climate change and cultural heritage: a systematic literature review (2016–2020). Hist Environ Policy Pract. 2021;12:434–77. https://doi.org/10.1080/17567505.2021.1957264.
5. Sesana E, Gagnon AS, Ciantelli C, Cassar J, Hughes JJ. Climate change impacts on cultural heritage: a literature review. WIREs Clim Chang. 2021. https://doi.org/10.1002/wcc.710.
6. Harkin D, Davies M, Hyslop E, Fluck H, Wiggins M, Merritt O, Barker L, Deery M, McNeary R, Westley K. Impacts of climate change on cultural heritage. MCCIP Sci Rev. 2020;16:616–41.
7. Fatorić S, Egberts L. Realising the potential of cultural heritage to achieve climate change actions in the Netherlands. J Environ Manage. 2020;274: 111107. https://doi.org/10.1016/j.jenvman.2020.111107.
8. Tuan TH, Navrud S. Capturing the benefits of preserving cultural heritage. J Cult Herit. 2008;9:326–37. https://doi.org/10.1016/j.culher.2008.05.001.
9. Kasiola A, Metaxas T. Studying COVID-19 impacts on culture: the case of public museums in Greece. Heritage. 2023;6:4671–91. https://doi.org/10.3390/heritage6060248.
10. Tweed C, Sutherland M. Built cultural heritage and sustainable urban development. Landsc Urban Plan. 2007;83:62–9. https://doi.org/10.1016/j.landurbplan.2007.05.008.
11. Vidal DG, Teixeira CP, Dias RC, Fernandes CO, Filho WL, Barros N, Maia RL. Stay close to urban green spaces: current evidence on cultural ecosystem services provision. Eur J Public Health. 2021. https://doi.org/10.1093/eurpub/ckab120.048.
12. Vidal DG, Dias RC, Oliveira GM, Dinis MAP, Filho WL, Fernandes CO, Barros N, Maia RL. A Review on the cultural ecosystem services provision of urban green spaces: perception, use and health benefits. In: Sustainable Policies and Practices in Energy, Environment and Health Research. pp. 287–331. 2022.
13. Hambrecht G, Rockman M. International approaches to climate change and cultural heritage. Am Antiq. 2017;82:627–41. https://doi.org/10.1017/aaq.2017.30.
14. Stergiopoulou L, Koundouri P, Vassilopoulos A. Monetary and non-monetary valuation of cultural ecosystem services in marine protected areas. In: Koundouri P, editor. The ocean of tomorrow the transition to sustainability. Cham, Switzerland: Springer Nature Switzerland AG; 2021. p. 125–34.
15. De Masi F, Porrini D. Cultural Heritage and natural disasters: the insurance choice of the Italian Cathedrals. J Cult Econ. 2021;45:409–33. https://doi.org/10.1007/s10824-020-09397-x.
16. Kaslegard AS. Climate Change and Cultural Heritage in the Nordic Countries. https://www.diva-portal.org/smash/get/diva2:700575/FULLTEXT01.pdf.
17. Sesana E, Gagnon AS, Bonazza A, Hughes JJ. An integrated approach for assessing the vulnerability of World Heritage Sites to climate change impacts. J Cult Herit. 2020;41:211–24. https://doi.org/10.1016/j.culher.2019.06.013.
18. Sabbioni C, Cassar M, Brimblecombe P, Lefevre RA. Vulnerability of cultural heritage to climate change. https://www.coe.int/t/dg4/majorhazards/activites/2009/Ravello15-16may09/Ravello_APCAT2008_44_Sabbioni-Jan09_EN.pdf.
19. Dastgerdi AS, Sargolini M, Pierantoni I. Climate change challenges to existing cultural heritage policy. Sustainability. 2019;11:5227. https://doi.org/10.3390/su11195227.

20. Kim H-E. Changing climate, changing culture: adding the climate change dimension to the protection of intangible cultural heritage. Int J Cult Prop. 2011;18:259–90. https://doi.org/10.1017/S094073911100021X.
21. ICOMOS-ICCROM. ICOMOS-ICCROM Guidance on post-disaster and post-conflict recovery and reconstruction for heritage places of cultural significance and world heritage cultural properties. ICCROM (Regional Off. Sharjah) ICOMOS (International Counc. Monum. Sites). 2023.
22. UNESCO. UNESCO guidelines for assessing learning facilities in the context of disaster risk reduction and climate change adaptation, volume 1: Introduction to learning facilities assessment and to the VISUS methodology. 2019.
23. Fatorić S, Biesbroek R. Adapting cultural heritage to climate change impacts in the Netherlands: barriers, interdependencies, and strategies for overcoming them. Clim Change. 2020;162:301–20. https://doi.org/10.1007/s10584-020-02831-1.
24. Sesana E, Gagnon A, Bertolin C, Hughes J. Adapting cultural heritage to climate change risks: perspectives of cultural heritage experts in Europe. Geosciences. 2018;8:305. https://doi.org/10.3390/geosciences8080305.
25. Sesana E, Bertolin C, Gagnon A, Hughes J. Mitigating climate change in the cultural built heritage sector. Climate. 2019;7:90. https://doi.org/10.3390/cli7070090.
26. Phillips H. Adaptation to climate change at UK world heritage sites: progress and challenges. Hist Environ Policy Pract. 2014;5:288–99. https://doi.org/10.1179/1756750514Z.00000000062.
27. Cassar M, Pender R. The impact of climate change on cultural heritage: evidence and response. In: ICOM Committee for Conservation: 14th Triennial Meeting The Hague, Preprints (Vol. 2, pp. 610–616). James & James. 2005.
28. Bertolin C. Preservation of cultural heritage and resources threatened by climate change. Geosciences. 2019;9:250. https://doi.org/10.3390/geosciences9060250.
29. UN. The 17 goals. https://sdgs.un.org/goals.
30. Nocca F. The role of cultural heritage in sustainable development: multidimensional indicators as decision-making tool. Sustainability. 2017;9:1882. https://doi.org/10.3390/su9101882.
31. Halkos GE. Interconnectedness of Natural Capital, Social Capital, Produced Capital, and Cultural Heritage in Sustainable Development. In: EAERE 2023 28th Annual Conference. 29 June, Limassol, Cyprus. 2023.
32. Nijkamp P. Economic valuation of cultural heritage. In: Licciardi G, Amirtahmasebi R, editors. The economics of Uniqueness: investing in historic citry cores and cultural heritage assets for sustainable development. Washington: The World Bank; 2012. p. 75–106.
33. Dasgupta P. The Economics of Biodiversity: The Dasgupta Review. https://assets.publishing.service.gov.uk/media/602e92b2e90e07660f807b47/The_Economics_of_Biodiversity_The_Dasgupta_Review_Full_Report.pdf.
34. Riganti P, Throsby D. Editors' introduction: recent developments in urban heritage valuation: concepts, methods and policy application. City Cult Soc. 2021;26:100414. https://doi.org/10.1016/j.ccs.2021.100414.
35. Bellandi M, Campus D, Carraro A, Santini E. Accumulation of cultural capital at the intersection of socio-demographic features and productive specializations. J Cult Econ. 2020;44:1–34. https://doi.org/10.1007/s10824-019-09348-1.
36. Rudokas K, Landauskas M, Viliūnienė O, Gražulevičiūtė-Vileniškė I. Hedonic analysis of housing prices and development in Kaunas: heritage aspect. Environ Res Eng Manag. 2019;75:15–27. https://doi.org/10.5755/j01.erem.75.2.22823.
37. del Hoyo JJG, de Madariaga CJ, Espino DC. Approximation of the value of an asset inscribed on the list of intangible cultural heritage of UNESCO: estimation of a hedonic price model for the Fiesta of the Patios in Cordoba. Sci Ann Econ Bus. 2019;66:5–23.
38. Amar J, Tyvimaa T. World heritage designation and residential property values: the case of Old Rauma, Finland. In: 28th Annual European Real Estate Society Conference. European Real Estate Society. 2022.
39. Lazrak F, Nijkamp P, Rietveld P, Rouwendal J. The market value of cultural heritage in urban areas: an application of spatial hedonic pricing. J Geogr Syst. 2014;16:89–114. https://doi.org/10.1007/s10109-013-0188-1.
40. Bedate A, Herrero LC, Sanz JÁ. Economic valuation of the cultural heritage: application to four case studies in Spain. J Cult Herit. 2004;5:101–11. https://doi.org/10.1016/j.culher.2003.04.002.
41. Poor PJ, Smith JM. Travel cost analysis of a cultural heritage site: the case of historic St. Mary's City of Maryland. J Cult Econ. 2004;28:217–29. https://doi.org/10.1023/B:JCEC.0000038020.51631.55.
42. Merciu F-C, Petrişor A-I, Merciu G-L. Economic valuation of cultural heritage using the travel cost method: the historical centre of the municipality of Bucharest as a case study. Heritage. 2021;4:2356–76. https://doi.org/10.3390/heritage4030133.
43. Ulibarri CA, Ulibarri VC. Benefit-transfer valuation of a cultural heritage site: the Petroglyph National Monument. Environ Dev Econ. 2010;15:39–57.
44. Báez-Montenegro A, Bedate AM, Herrero LC, Sanz JÁ. Inhabitants' willingness to pay for cultural heritage: a case study in Valdivia, Chile, using contingent valuation. J Appl Econ. 2012;15:235–58. https://doi.org/10.1016/S1514-0326(12)60011-7.
45. Báez A, Herrero LC. Using contingent valuation and cost-benefit analysis to design a policy for restoring cultural heritage. J Cult Herit. 2012;13:235–45. https://doi.org/10.1016/j.culher.2010.12.005.
46. Tourkolias C, Skiada T, Mirasgedis S, Diakoulaki D. Application of the travel cost method for the valuation of the Poseidon temple in Sounio. Greece J Cult Herit. 2015;16:567–74. https://doi.org/10.1016/j.culher.2014.09.011.
47. Giannakopoulou S, Xypolitakou E, Damigos D, Kaliampakos D. How visitors value traditional built environment? Evidence from a contingent valuation survey. J Cult Herit. 2017;24:157–64. https://doi.org/10.1016/j.culher.2016.11.004.
48. Kopsidas O, Batzias FA. Improvement of urban environment and preservation of cultural heritage through experimental economics by a modified contingent valuation method (CVM). SSRN Electron J. 2019. https://doi.org/10.2139/ssrn.3501396.
49. Torres-Ortega S, Pérez-Álvarez R, Díaz-Simal P, de Luis-Ruiz J, Piña-García F. Economic valuation of cultural heritage: application of travel cost method to the national museum and research center of Altamira. Sustainability. 2018;10:2550. https://doi.org/10.3390/su10072550.
50. Suer S, Sadik G. Economic valuation of the cultural heritahe tourism using the zonal travel cost method: a case study of Pergamon ancient city. Int J Contemp Econ Adm Sci. 2020;1X:415–31. https://doi.org/10.5281/zenodo.4429891.
51. Throsby D. Cultural capital. J Cult Econ. 1999;23:3–12. https://doi.org/10.1023/A:1007543313370.
52. Throsby D. Economics and culture. Cambridge University Press; 2000.
53. Throsby D. Heritage economics: a conceptual framework. In: Licciardi G, Amirtahmasebi R, editors. The economics of uniqueness: investing in historic citry cores and cultural heritage assets for sustainable development. Washington, DC: The World Bank; 2012. p. 45–74.
54. Glass GV. Primary, secondary, and meta-analysis of research. Educ Res. 1976;5:3. https://doi.org/10.2307/1174772.

55. Smith VK, Pattanayak SK. Is meta-analysis a Noah's ark for non-market valuation? Environ Resour Econ. 2002;22:271–96. https://doi.org/10.1023/A:1015567316109.
56. Rosenberger RS, Stanley TD. Measurement, generalization, and publication: sources of error in benefit transfers and their management. Ecol Econ. 2006;60:372–8. https://doi.org/10.1016/j.ecolecon.2006.03.018.
57. Heckman JJ. Sample selection bias as a specification error. Econometrica. 1979;47:153. https://doi.org/10.2307/1912352.
58. Dümcke C, Gnedovsky M. The social and economic value of cultural heritage: literature review. Eur Expert Netw Cult. 2013.
59. Statista. Statistics, Forecasts, and Reports, https://www.statista.com.
60. Statistics Times. Demographics, https://statisticstimes.com.
61. Eurostat. Eurostat data, https://ec.europa.eu/eurostat.
62. CEIC. Delivering critical insight on global markets through economic and alternative data, https://www.ceicdata.com/en.
63. Trading Economics. Indicators, https://tradingeconomics.com.
64. USCB. Data & Maps, https://www.census.gov.
65. Worldometer. World Population, https://www.worldometers.info.
66. UNESCO. Data, https://uis.unesco.org.
67. Halkos GE, Chioatto E, Devves S, Koundouri P, Landis C, Plataniotis A. The Interconnectedness of Natural Capital, Social Capital, and Cultural Heritage in Sustainable Development, https://resources.unsdsn.org/transforming-our-world-interdisciplinary-insights-on-the-sustainable-development-goals.
68. Laplante B, Meisner CM, Wang H. Environment as cultural heritage: the Armenian Diaspora's Willingness-to-Pay to Protect Armenia's Lake Sevan. 2005.
69. Lo AY, Jim CY. Protest response and willingness to pay for culturally significant urban trees: implications for Contingent Valuation Method. Ecol Econ. 2015;114:58–66. https://doi.org/10.1016/j.ecolecon.2015.03.012.
70. Nguyen M-H, Nguyen TLA, Nguyen T, Reynaud A, Simioni M, Hoang V-N. Economic analysis of choices among differing measures to manage coastal erosion in Hoi An (a UNESCO World Heritage Site). Econ Anal Policy. 2021;70:529–43. https://doi.org/10.1016/j.eap.2021.04.006.
71. Nguyen LA, Nguyen M-H, Hoang V-N, Reynaud A, Simioni M, Wilson C. Tourists' preferences and willingness to pay for protecting a World Heritage site from coastal erosion in Vietnam. Environ Dev Sustain. 2023. https://doi.org/10.1007/s10668-023-03773-1.