

Article

Perceived Economic Values of Cultural Ecosystem Services in Green and Blue Spaces of 98 Urban Wetland Parks in Jiangxi, China

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Abstract: Cultural ecosystem services (CES) of urban wetland parks (UWPs) can be priced according to monetary values. Urban green and blue spaces (UGS and UBS, respectively) provide stands of nature in UWPs, wherein visitors' emotions related to the enjoyment of CES values can be assessed through analyzing the facial expressions of visitors. In this study, a total of 98 UWPs were selected as study stands in Jiangxi, where a total of 1749 photographs showing facial expressions were obtained from Sina Weibo for local visitors experiencing UGS and UBS in 2021. The CES of UBS were evaluated at a widely used price of USD 881 ha⁻¹ yr⁻¹, and those of UGS were evaluated at USD 1583 ha⁻¹ yr⁻¹. The averaged CES values were estimated to be USD 941.26 and 39.54 thousand yr⁻¹ for UGS and UBS per UWP in Jiangxi, respectively. The large number of UGS in an UWP had no relationship with the examined facial expressions; however, areas of UBS and, accordingly, the CES values therein, can both be perceived and exposed as positive emotions. CES in UBS only accounted for lower than 5% of that in a UWP, whereas those in UGS together explained over 95%. Overall, people smiled more when perceiving the values of services in UBS of UWPs than when experiencing UGS.

Keywords: aquatic setting; urban wetland; price of ecosystem function; ecosystem service value; cultural service; human perception



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1. Introduction

1.1. Ecosystem Service in Wetland

Wetlands are land areas that are saturated or flooded with water permanently or seasonally [1]. Wetlands comprise a variety of natural habitat types which can be found inland (marshes, ponds, lakes, fens, rivers, floodplains, and swamps) and in coastal regions (saltwater marshes, estuaries, mangroves, lagoons, and coral reefs), as well as man-made waters (fishponds, rice paddies, and salt pans). Wetlands have ecosystem services in environmental mediation (flood mitigation, climate control, pollution prevention, soil-erosion prevention, biodiversity maintenance, and bio-productivity protection) [2] and wellbeing promotion [3]. The full utilization of ecosystem services is a way for policy making to preserve wetland resources [4,5]. However, the diversity of ecosystem services hinders the activation of wetland functions that highly vary in lakes [2], coasts [6], and croplands [7]. Global wetlands are experiencing a general ecosystem degradation in regions subjected to combined urbanization and climate change [8,9]. The proactive construction of urban wetland parks (UWPs) is an implemented approach to mitigate ecological degradation in natural wetlands and declines in ecosystem services [10,11]. The budget for newly constructed UWPs cannot be excludable from projects that are planned to strengthen wetland services [12,13]. Theoretical evidence needs to be documented to confirm the dose-based enjoyment by stakeholders of UWPs.

1.2. Cultural Ecosystem Service in Wetland

Wetlands can provide not only provision services but also cultural ecosystem services (CES). The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) published an acceptance of CES definition as nonmaterial benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experience [14]. Costanza et al., defined CES as opportunities for non-commercial uses in “aesthetic, artistic, educational, spiritual, and/or scientific values of ecosystems” [15]. Taye et al., summarized CES, including “non-extractive recreation, information and knowledge, spiritual and symbolic, and non-use values” [16]. Wetland CES vary in response to environmental change [3], public support [17], and place-based individual appraisal [18]. Overall, one can define wetland CES as non-commercial uses of green and blue spaces (GBSs) for perceptions of aesthetic, artistic, educational, recreational, and therapeutic functions that can promote well-being.

Wetland CES are perceived by people during visiting experiences in urban green and blue spaces (UGBs). The wish to perceive positive emotions provides a strong motivation to visit a UWP and enjoy its CES [19]. The perceptions of wetland CES can be accounted for by a widely recognized hypothesis that time spent in nature can be good for human health and well-being [20]. As an endorsement of this hypothesis, the stress recovery theory (SRT) asserts that exposure to nature would benefit stress reduction and involve a shift towards a more positively toned emotional state [21]. The attention recovery theory (ART) also declares that exposure to nature can strengthen mental concentration and restoration [22,23]. Evidence-based observations confirm that people can gain perceived improvements in psychological and psychological well-being in urban green space (UGS) [24–27]. An experience in urban blue space (UBS) was also identified to bring mental benefits [28]. Remote sensing findings revealed that the largeness in either the UGS or UBS of wetlands has a positive relationship with perceptions of positive emotions; however, elevation reinforces a negative impact [29]. Regional microclimates can account for the presentation of positive emotions by UWP visitors [30]. The location in a city and plant biodiversity in UGBs plays an important role in eliciting positive emotions [31,32]. These results together suggest that CES in UGB have apparent economic values that can be perceived by visitors as a hint to evoke and expose emotions.

1.3. Economic Evaluation of Cultural Ecosystem Service in Wetland

Ecosystem services can be evaluated to price according to the extent of needs by human beings. However, their values are not comparable with capitals in economic services and manufactured production [15]. This is because material service values are easily identified; however, ecosystem services are non-material products whose values cannot be directly recognized by people. This does not disagree with the fact that the values of ecosystem services are a useful reference for policy making to guide societal resource allocation [33]. A large contribution has been made to the economic valuation of wetland ecosystem services, which have all been used to gauge the dose of ecological degradation and the budget for ecological protection [6,34]. The value of wetland CES can be estimated as the sum totaling values of functions in aesthetic, artistic, educational, recreational, and therapeutic services [14,35]. It was also suggested that wetland CES can be quantified by monetary values equalized to alike services at economic prices [36–38]. A non-monetary method was put forth to meter the magnitude by self-reported place-specific appraisals of participants [39,40]. A recent method employed an integrated valuation of CES based on geographical data and field sampling observations [3,41]. Based on remote evaluation, the monetary values of CES can be mapped to draw spatial distribution in regional wetlands.

1.4. Literature Review and Speculation about Perception of Cultural Ecosystem Service Value in Wetland

The current knowledge about perceived values of ecosystem services in wetlands was mainly obtained through self-reported data collected from surveys. For example, interview

surveys have been reported to be conducted in the Usumacinta floodplain, Southern Mexico [42], Persina Nature Park in Bulgaria [17], Aogu Coastal Wetland [43], and Purbasthali Wetland, West Bengal [44]. Furthermore, perceptions of values in wetland CES were also quantified through analyzing self-reported scores in surveys [45,46]. This methodology was queried by the World Health Organization (WHO)—that reported data can seldomly be 100% reliable [47]. The accuracy to retain intended meanings may also be disturbed by fatigue or societal manner [23]. Inputs of labor and time spent for collecting questionnaires generate solid uncertainties in spatiotemporal evenness of data [48]. The biggest drawback to using self-reported data is that rare questionnaires have been fully validated to test their matching accuracy of the intended meaning of subjects [49]. Regarding how CES values are mostly estimated with inevitable technical errors when being analyzed at a spatiotemporal scale, absolute uncertainties in survey data further strengthen these uncertainties. It is necessary to develop a new and more reliable approach for data collection to quantify perceptual values to a higher and more precise extent.

A perception is an indirect reflection as the resulting conception of according emotions [50]. Evidence is being accumulated to demonstrate that people's perceptions toward experiences in UGSs can be assessed by expressed emotions [51–53]. Facial expressions are a direct reflection of exposed emotions on faces of people who are aware of experiences of the nature [54,55]. This activates a new methodology that has the precision to detect subtle changes in facial emotions, even when unconscious [56–58]. Those who enjoy nature have a general habit of posting photos that show their faces, with subjective intentions to expose emotions and share photos with others through online social network services (SNSs) [59,60]. Facial expressions of online SNS photos were used to quantify perceptions toward the enjoyment of ecosystem services in UGSs [31,52,59,60]. Facial photos were also used to decode perceptual emotions exposed in GBSs of UWPs with varied conditions for microclimate [30] and landscape [29,61]. As biodiversity in nature is the source that people can perceive about their ecosystem services [48,49], it has been determined that this perception can be assessed through facial expressions [32]. Facial expressions can be taken as a novel and reliable approach to assess perceptions about wetland CES value.

1.5. Aim, Objective, and Originality of This Study

In this study, UWPs were taken as study stands in Jiangxi province of China. CES were evaluated in wetland GBSs, where visitors' facial expressions were assessed using photos collected from a SNS platform. We aimed to establish the dose-dependent CES values that evoked perceptions through assessments of facial expression scores. Our objective was to evaluate economic values of CES for GBSs in UWPs of Jiangxi and, subsequently, to detect the possible combination of CES values that can be perceived through exposed emotions by visitors. As mentioned previously, our study has an apparent uniqueness in quantifying the perceived values of CES using facial expression scores, which is more precise and reliable than conventional methodology using data collected from surveys. We hypothesized that values of CES in both green and blue spaces can be perceived as comparable effects on exposed emotions by wetland visitors.

2. Materials and Methods

2.1. Study Area and Sites

In this study, Jiangxi province was selected as the study area, where a total of 98 UWPs are mapped across the administrative regions of nine cities (Figure 1). Their names and locations are presented in Table S1. Jiangxi is located in South China, which is subjected to a subtropical monsoon climate with distinguished seasons and heterogeneous meteorological conditions [62]. Jiangxi has a total population of ~45 million distributed in 11 cities and 100 prefectures in a total terrestrial area of 16.69 million ha. A proportion of 97.7% of the whole area in Jiangxi belongs to the Yangtze River basin; hence, the fresh-water resource has a total length of 18.4 thousand kilometers. Jiangxi has a large watershed of the Gan River running through the largest fresh-water lake of China, called Poyang.

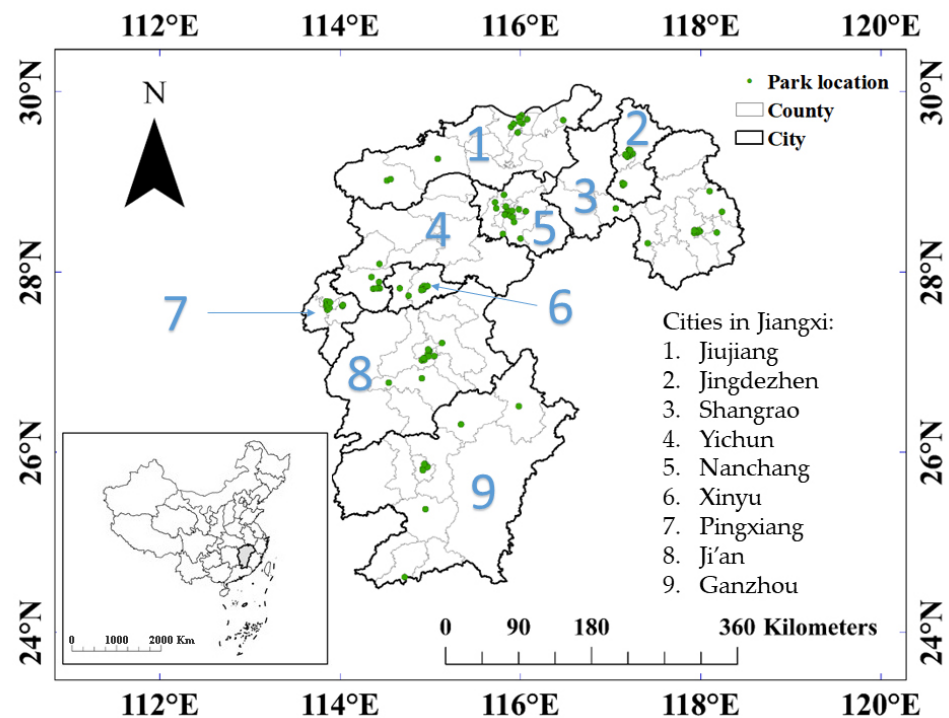


Figure 1. The geographical range of Jiangxi province in China and distributions of UWPs.

UWPs were chosen as study sites according to the following requirements.

Firstly, a chosen UWP had to attract at least 15 people for visits in 2021 who would then post photos showing their faces, with visible expressions. To attract people with such photos is a necessary precondition to recognize their facial expressions and to detect driving effects from landscape and economic valuation.

Secondly, UWPs had to comprise GBSs along or near watersheds. Although coastal UWPs refer to UBS in marine ecosystems [6,63], inland wetlands can also be a combined landscape constructed with GBSs [30,31]. Absences of green or blue spaces in wetlands will result in failure to value their CESs.

Finally, the pool of UWPs had to be projected to a geographical range that covered all administrative regions of cities in Jiangxi. This was required to avoid any bias in the results, which were shaped by some regionally concentrated groups.

2.2. Remote Evaluation of UGB Areas

Landscape metrics were assessed according to GBS areas in UWPs using the ArcGIS software (v10.2) (Eris China, Shanghai, China). We focused on the horizontal planes of green- or blue-colored patches and their embedded regions in UWPs. A total of nine Landsat 8 satellite imageries (30 m resolution) were used as the sources for landscape evaluation. Landsat imageries have been widely used to assess ecosystem services in wetland ecosystems [41]. The green space area was calculated as the largeness (the product of number of grids timing averaged area of every grid) of normalized difference vegetation index (NDVI) by an equation as follows:

$$NDVI = \frac{\text{band 5} - \text{band 4}}{\text{band 5} + \text{band 4}} \quad (1)$$

where band 4 and band 5 are reflections of the wavelengths in red light and near-infrared ray, respectively. The blue space area was calculated as the largeness of normalized difference water index (NDWI) by an equation used for water-enriched cities [64]:

$$\text{NDWI} = \frac{\text{band 3} - \text{SWI1}}{\text{band 3} + \text{SWI1}} \quad (2)$$

where band 3 is the reflection of green light wavelength; SWI1 refers to an abbreviation of short-wave infrared 1 (1.57–1.65 μm) in band 6 [65]. This calculation of NDWI was used to assess regions of water bodies in Nanchang, which is the capital city of Jiangxi province [55]. Thus, we agree that the equation (2) is suitable for the valuation of UBS in UWP of a city with enriched waters. The UWP area was framed according to outlines with references in the Baidu map [66]. UWPs were all built by municipal budgets which comprised more types of patches than just GBSs.

2.3. Economic Evaluation of Cultural Ecosystem Service

In this study, CES in UBS were valued to be USD 881 $\text{ha}^{-1} \text{yr}^{-1}$, which was given at a price by Costanza et al. [15]. The value of UBS in a piece of landscape patch was calculated as the product of area and price. The price was adapted from widely cited studies [67,68]. Costanza et al. [15] evaluated CES in forests to be an average of USD 2 $\text{ha}^{-1} \text{yr}^{-1}$; their results were much lower than those (USD $\sim 1583 \text{ ha}^{-1} \text{yr}^{-1}$) reported by Taye et al. [16], who put forth the price of CES in UGS by summarizing references across a broad range of data sources ($n = 758$). Therein, UGS were referred to as forested lands that can provide CES in non-extractive recreation, information and knowledge, spiritual and symbolic heritage, and non-use values [16]. We adapted this definition for CES in forests and employed its CES value [31,32,69,70].

Previous studies found that areas of UGBs had proportional contributions to perceptions of people exposed to experiences in an UWP [31,71]. Therefore, we need more equations to assess relative contributions of values in CES of UGBs attached to their areas. Additional economic values were calculated as well:

$$\text{BAGA} = \frac{\text{BlueA}}{\text{GreenA}} \quad (3)$$

$$\text{BVGv} = \frac{\text{BlueV}}{\text{GreenV}} \quad (4)$$

$$\text{ParkVpA} = \frac{\text{ParkV}}{\text{ParkA}} \quad (5)$$

$$\text{GreenVpA} = \frac{\text{GreenV}}{\text{ParkA}} \quad (6)$$

$$\text{BlueVpA} = \frac{\text{BlueV}}{\text{ParkA}} \quad (7)$$

where BAGA is the ratio of UBS area to UGS; BlueA, GreenA, and ParkA are areas of UBS, UGS, and UWP, respectively; BVGV is the ratio of CES values of UBS to that of UGS; ParkVpA, GreenVpA, and BlueVpA are the CES for a UWP, UGS, and UBS therein per area of the host UWP, respectively; BlueV, GreenV, and ParkV are CES values for UBS, UGS, and the host UWP, respectively.

2.4. Facial Photo Collection and Analysis

The use of facial photos from human subjects was reviewed by the ethics board committee and approved with reference code ES-ERC-2021-005 on 9 November 2021. All photos were obtained from open Twitter accounts in Sina Weibo, which had been signed by uploaders with immediate awareness about the policy of openness to public. We adhered to the ethical guidelines to protect the privacy of subjects without any release of our results

on facial expressions. Facial photos were collected from targeted places containing UWPs in 2021. The collection of photos was during the time of the COVID-19 pandemic; however, in 2021, the number of newly infected people largely reduced compared with previous numbers. Sina Weibo was employed as the source of facial photos, as it was repeatedly used in previous studies [61,72]. It is a local edition of ‘Twitter’ in China. It is also the largest SNS platform which can attract a large number of social interactions through segments, photos, voices, and notes. People generally posed their facial expressions to expose their intended emotions on their faces and posted the pictures to Sina Weibo.

The photos obtained were first screened for their availability to be further analyzed. Any photo that was used had to contain a face occupying at least 60% of whole area, with all features clearly exposed [30]. This was necessary to match the required accuracy of perceived emotions through face reading from intended sentiments recognized by artificial face reading [58,73]. To ensure the recognition accuracy, photos were rotated to make the nose axis strictly vertical to the horizontal line and cropped to leave only one person’s face in a photo [29,53]. A total of 1749 photos were obtained and screened to meet the required standards. Treated photos were stored on a hard disk and sent to be analyzed for facial expression rates. FireFACE ver. 1.0 software was used to recognize facial expressions and rate scores for exposed happy, sad, and neutral emotions [54,58]. FireFACE employs facial analysis through an online service system instead of the purchase of any off-line copy. Photos need to be prepared under the guidance suggested in this study and sent to the owner of FireFACE. Facial expressions will be analyzed and rated for emotional scores by an order of paid services. The operational panel and process of analysis were shown by Wei et al. [58]. This instrument has been validated to have a reliable accuracy to recognize basic emotions [57,73]. The neutral face was analyzed because the indifferent emotion reflects an indifferent emotion, which accounts for the largest number of emotional counts as a subtle sentiment [56,61]. More details about the coding and training of FireFACE software can be found in former studies [52,54].

A new meter of net positive emotion index (NPE) was calculated for assessing positive emotions without components of exposed sorrow [55,61]:

$$\text{NPE} = \text{HappyS} - \text{SadS} \quad (8)$$

where HappyS is the score of happy emotion exposed on a face and SadS is that of exposed sadness. NPE was calculated for every photo in all UWPs.

2.5. Mapping and Statistical Analysis

To describe the spatial distributions, landscape metrics (GreenA, BlueA, ParkA), CES values (GreenV, BlueV, and ParkV), and emotional scores (happy, sad, neutral, NPE) were mapped in an area of administrative regions where objective UWPs were located evenly along the Gan River (Figure 1). Our chosen UWPs were constructed near branches of watersheds of the Gan River, which was used to outline the geographical range of the study area. The layer boundaries were cropped in ArcGIS to leave objective study area concentrated in the network of waters. Spatial interpolation was used to extend the observed data to all areas; the spatial distribution can reveal gradient changes in every mapped parameter with spatial heterogeneities.

The data from landscape metrics and their CES values followed normal distributions. However, facial expression scores failed to pass the normality test, and raw data were analyzed by one-way analysis of variance (ANOVA) to detect differences in facial emotion scores among UWPs. When significant effects were indicated among different locations, the results were averaged and compared by Duncan test to detect specific difference of scores between pairs of parks [32,53]. Spearman’s correlation was used to detect the raw data relationship between landscape parameters (areas and CES values) and facial expression scores. This reveals the perceptions of people toward experiences in UGBs and CES value in UWPs. Facial expression scores were ranked to make a distribution-free data pool [74],

and were subjected to multivariate linear regression models to detect their responses to joint effects of landscape metrics and values [51,52].

3. Results

3.1. Description of Data

Urban wetland visitors generally showed more smiles than sadness, because happiness was rated to be ~34% in a range of 0.44%–99.37%, whereas sadness was only ~12% (Table 1). A neutral emotion, however, showed an even higher rate of 54% (0.48%–90.97%). The variation in the neutral score had a lower coefficient of variance (CV) than happy and sad scores. In any case, the overall scores across all types of emotions were presented as a positive sentiment according to the averages taken from NPE (22.65%).

Table 1. Basic characteristics of data on facial expressions, landscape metrics, and ecosystem service values in green and blue spaces of UWPs.

Parameters	Maximum	Minimum	Mean	SD ¹	CV ²
Facial expression scores					
Happy (%)	99.37	0.04	34.44	15.49	0.45
Sad (%)	29.00	0.16	11.79	5.27	0.45
Neutral (%)	90.97	0.48	53.77	13.47	0.25
NPE (%)	99.22	−17.62	22.65	18.82	0.83
Landscape metrics					
Green space area (km ²)	328.29	0.00	8.94	42.97	4.81
Blue space area (km ²)	39.03	0.00	0.69	4.10	5.95
Park area (km ²)	355.69	0.03	10.46	46.90	4.48
Ecosystem service value					
GreenV ³ (\$ yr ^{−1} × 10 ³)	34569.16	0.06	941.26	4524.25	4.81
BlueV ⁴ (\$ yr ^{−1} × 10 ³)	2240.49	0.01	39.54	235.25	5.95
ParkV ⁵ (\$ yr ^{−1} × 10 ³)	35169.81	0.11	980.80	4615.55	4.71

¹ SD, standard deviation; ² CV, coefficient of variance; ³ GreenV, value of cultural service in green space ecosystem; ⁴ BlueV, value of cultural service in blue space ecosystem; ⁵ ParkV, value of cultural service in ecosystems of green plus blue spaces in a park.

In UWPs, UGS generally had a larger area (8.94 km²) than UGS (0.69 km²). Their sum was almost equalized to that of the whole part area; however, the area of blue and green spaces was a little smaller than that of a park.

In accordance with the changes in landscape metrics, GreenV was about 30 times higher than that in BlueV, and both were summed to be about the value of an UWP.

3.2. Distribution of Landscape Metrics

The UGS area (GreenA) was generally as low as about 0.05 km² per park in most regions of the study area (Figure 2A). However, two regions showed relatively higher areas of UGS. The larger one was in the northern part of the study area, covering a range from western Nanchang to eastern Jiujiang. The smaller one was located in western Ji'an (Figures 1 and 2A). UGS area (BlueA) was generally larger in the central part of the study area than in other regions. That is, UWPs in Xinyu, southern Yichun, and northern and western regions of Ji'an all showed larger BlueA areas (Figure 2B). The distribution of the park area (ParkA) was nearly the same as that of GreenA (Figure 2C). That is, the larger ParkA was mainly concentrated in the northern part of the study area across regions of Nanchang and eastern Jiujiang. In addition, regions of western Ji'an also showed a larger area for ParkA.

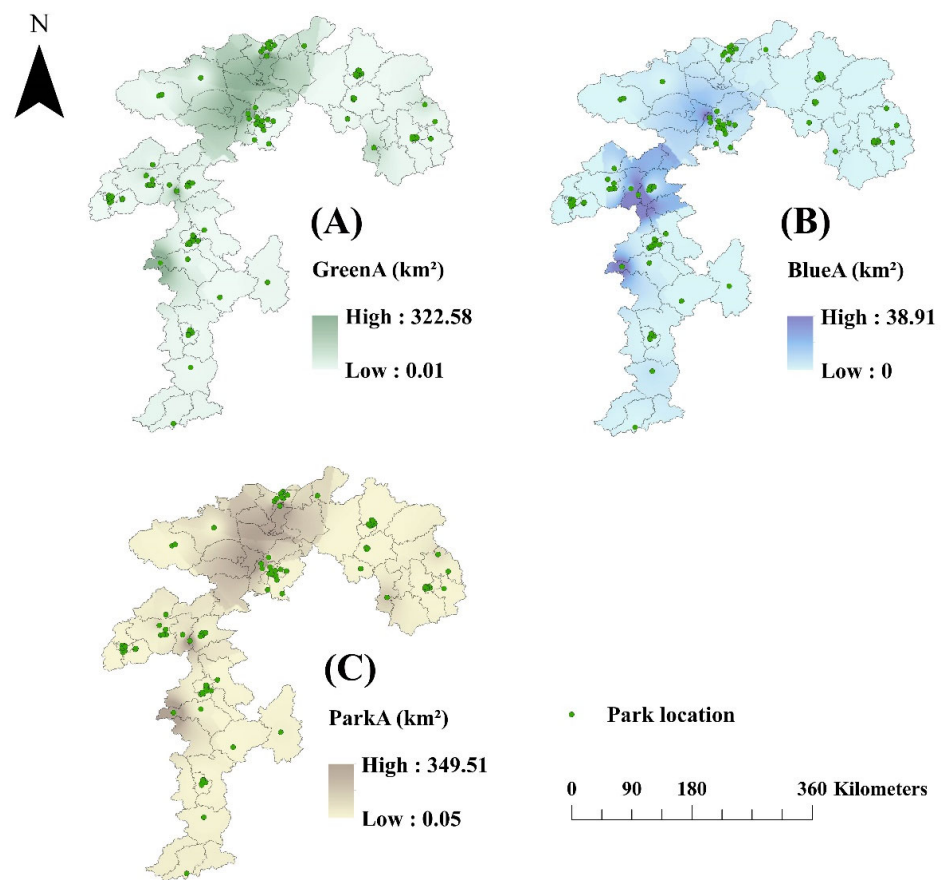


Figure 2. Spatial distributions of areas for urban green spaces (GreenA) (A), urban blue spaces (BlueA) (B), and UWPs (ParkA) (C) in Jiangxi.

3.3. Distributions of CES Values

CES of UGS (GreenV) were evaluated to be higher in the northern part of study area around western Nanchang and northern Jiujiang (Figures 1 and 3A). GreenV was also higher in UGS of western Ji'an. CES of UBS (BlueV) were higher in the central part of the study area containing southern Yichun and most regions in Xinyu (Figure 3B). UBS in some of other scattered places were also evaluated to have higher areas of BlueV, including western regions in Ji'an and central parts of Nanchang. The CES value in UWPs (ParkV) was higher in a northern area across western Nanchang and northern Jiujiang (Figure 3C). In addition, ParkV was also higher in regions of western Ji'an. Specific CES values for each UWP are shown in Table S2.

3.4. Distribution of Facial Expression Scores

The happiness score was higher in extremely northern and southern parts of the study area (Figure 4). In the north, high happiness scores were mainly distributed in Jiujiang, whereas high happiness scores were found in southern Ganzhou (Figures 1 and 4A). In contrast, the sadness score was lower in UWPs with high happiness scores, but higher in the southern part of the study area across Ji'an and Ganzhou (Figure 4B). Neutral scores showed a similar distribution pattern as sad scores, with higher scores found in the eastern part of Jingdezhen and Shangrao (Figure 4C). NPE was distributed following the same distribution pattern of happiness scores (Figure 4D).

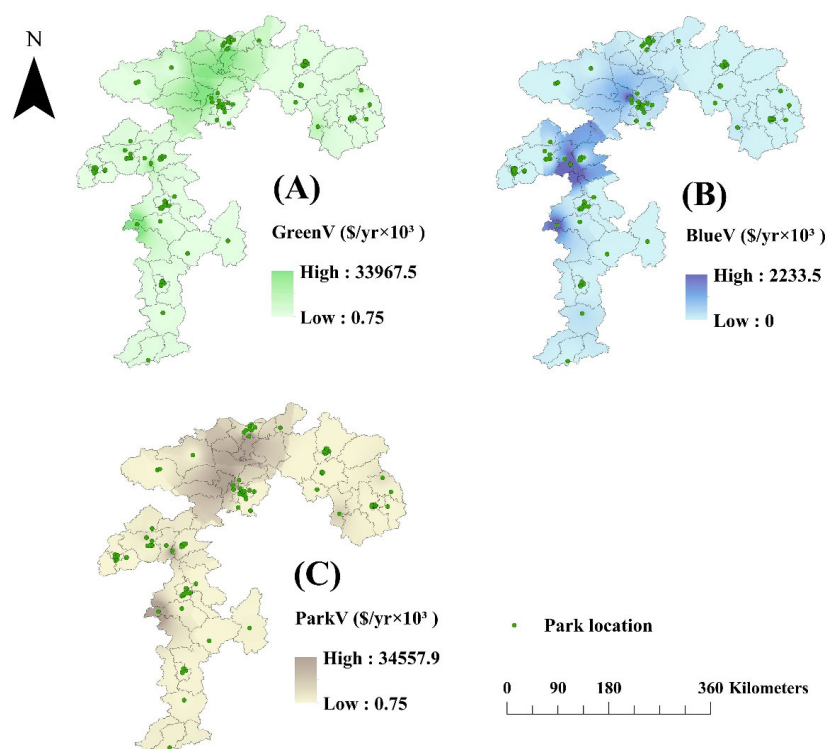


Figure 3. Spatial distributions of cultural ecosystem services' values for urban green spaces (GreenV) (A), urban blue spaces (BlueV) (B), and UWPs (ParkV) (C) in Jiangxi.

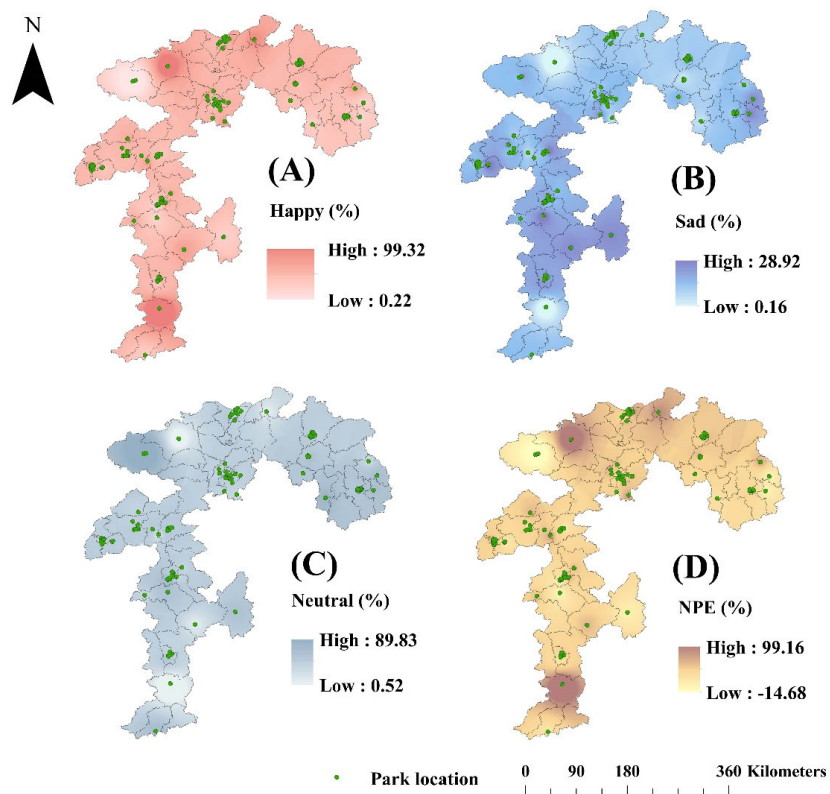


Figure 4. Spatial distributions of happy (A), sad (B), neutral (C), and net positive emotion index (NPE; happy score minus sad score) (D) in Jiangxi.

3.5. Relationship between Landscape CES and Facial Expressions

According to Table 2, GreenA did not show any relationship with facial expression scores. In contrast, BlueA showed positive relationships with happiness scores and NPE; meanwhile, it showed negative relationships with sad and neutral scores. As a result, the relationship between BAGA and facial expression scores in accordance with these findings was briefly described as a positive relationship with happiness scores and a negative relationship with sad and neutral scores. In addition, ParkA also showed a negative relationship with neutral emotion scores, and, in contrast, positive relationships with happy score and NPE.

Table 2. *p* values from Spearman correlations between facial expression scores (happy, sad, and neutral emotions plus NPE of happy minus sad scores) and landscape variables (area and ecosystem service value).

Landscape Variables	Facial Expression Scores			
	Happy	Sad	Neutral	NPE
ParkA ¹	0.1831	−0.0036	−0.2265 ²	0.1417
GreenA ³	0.0671	0.1313	−0.1443	−0.0002
BlueA ⁴	0.2957	−0.2552	−0.2754	0.2971
BAGA ⁵	0.235	−0.2718	−0.2003	0.2542
GreenV ⁶	0.0669	0.1317	−0.1443	−0.0005
BlueV ⁷	0.2961	−0.2549	−0.2759	0.2974
BVGV ⁸	0.2326	−0.2722	−0.1974	0.2525
ParkV ⁹	0.084	0.0782	−0.1416	0.03
ParkVpA ¹⁰	−0.0682	0.1585	0.0168	−0.1182
GreenVpA ¹¹	−0.0877	0.2336	0.0104	−0.1547
BlueVpA ¹²	0.2232	−0.2709	−0.1879	0.2412

¹ ParkA, park area; ² GreenA, green space area; ³ BlueA, blue space area; ⁴ BAGA, the ratio of blue space area to green space area; ⁵ GreenV, service value of ecosystem in green space; ⁶ BlueV, service value of ecosystem in blue space; ⁷ BVGV, the ratio of values in ecosystem services in blue space to green space; ⁸ ParkV, value of ecosystem services in green and blue spaces (GBS) of a park; ⁹ ParkVpA, the ratio of GBS ecosystem service value to host park area; ¹⁰ GreenVpA, the ratio of ecosystem service value in green space to its area; ¹¹ BlueVpA, the ratio of ecosystem service value in blue space to its area. Values in bold font indicate significant correlations.

Again, CES values of GreenA (GreenV) showed no relationship with any emotional scores (Table 2). BlueV showed positive relationships with happy score and NPE, while it had negative relationships with sad and neutral scores. BVGV showed contrastingly positive and negative relationships with happy and sad scores, respectively. The level of GreenV per park area (GreenVpA) showed a uniquely positive relationship with the sad score; the level of BlueV per park area (BlueVpA) had a negative relationship with sad 3.6. Associations of Landscape and CES Values with Facial Expressions

Landscape metrics were found to show no associations with ranked facial expression scores (Table 3). Values of CES in UBS generally showed positive associations with positive emotional scores. The ranked happiness score (RHappy) regressed positively against joint ParkV and BlueVpA scores, and the latter factor showed a higher coefficient of parameter estimate (0.7203) than the former (0.0012). In addition, the ranked sad score (RSad) was regressed negatively against BlueVpA, which was estimated to drive an even stronger force to cope with the presentation of sadness (parameter estimate: −1.0633). Finally, ranked NPE (RNPE) was regressed positively against BlueVpA as a stronger driver (0.8478) than the regression of RHappy.

Table 3. Basic characteristics of data on facial expressions, landscape metrics, and ecosystem service values in GBSs of UWPs.

Dependent Variables	Independent Variables	Parameter Estimate	SE ¹	F	Pr > F
RHappy ²	Intercept	44.7568	3.3337	180.24	<0.0001
	ParkV ³	0.0012	0.0006	4.00	0.0483
	BlueVpA ⁴	0.7203	0.3445	4.37	0.0392
RSad ⁵	Intercept	54.7509	3.2205	289.02	<0.0001
	BlueVpA	−1.0633	0.3394	9.81	0.0023
RNPE ⁶	Intercept	45.3132	3.2800	190.86	<0.0001
	BlueVpA	0.8478	0.3457	6.02	0.0160

¹ SE, standard error; ² RHappy, ranked happy score; ³ ParkV, value of ecosystem services in green and blue spaces (GBS) of a park; ⁴ BlueVpA, the ratio of ecosystem service value in blue space to its area; ⁵ RSad, ranked sad score; ⁶ RNPE, ranked score of net positive emotion index.

4. Discussion

4.1. CES Values of the Nature in UWPs

In this study, CES values in UWPs were calculated by the product of the landscape patch area and the price as published by Costanza et al. [15]. It was indicated to be a synthesis of prices in aesthetic, artistic, educational, spiritual, and scientific values [35], which are all mental stimulators that can be perceived as an activation to pay a visit in an UWP. The ecosystem service price that we employed has been cited 10888 times in Web of Science and 29020 times in Google Scholar up to 17 November 2022. Therefore, it is the most widely accepted definition for CES values in wetlands, which concurs with a recent case study conducted in Xinhua wetland park and Guangyintang National Wetland Park [3]. To concur with the evaluation of CES in UBS, values of CES in UGS were adapted from a definition that was suggested by Taye et al. [16]. It was USD 1583 ha^{−1} yr^{−1} across values in “non-extractive recreation”, “information and knowledge”, and “spiritual and symbolic” services. However, the value for CES in UGS should also contain a commercial evaluation of USD 1438 ha^{−1} yr^{−1} from “non-use values”. We did not add this value to the total of our adapted CES values because the function to provide this value was understood to have an implicit meaning and parts of its relevant functions were suspected to overlap the other parts of values for other types of services. To our knowledge, there is no clear evidence to reveal the explicit services of this function in forest ecosystems [75]. This function was also irrelevant from CES in UGS [3,15]. The comparison between values of UES in UGS and UBS will lose its logistic meaning because the value of UES may be overestimated if the price of “non-use values” is involved.

The value of UES in UWPs of our study was calculated to be about USD 40 thousand yr^{−1}. This value was calculated based on the product of landscape patch area and CES price of USD 881 ha^{−1} yr^{−1} [15]. This was equalized to be about 478% of the value in agricultural wetlands in low income countries and 33% of that in high income countries [7]. Our assessed values of ecosystem functions provide a reference for policy making during the process of planning UBS in UWPs. Our CES values can be comparable with a few findings in other studies. For example, Pan et al., reported a distribution pattern of values in lake-wetland CES at highland of Yunnan-Guizhou Plateau of China [68]. Therein, the value was disclosed as categorical indexes instead of monetary numerics [68]. More studies are needed to quantify the monetary values of CES in wetlands to provide more direct evidence for resource planning.

The CES value in UGS was evaluated to be about USD 0.94 million yr^{−1}, which accounted for over 95% of the total CES value in UWPs. Therefore, CES value in UGS was higher by about 22 times than that in UBS. However, our CES value in UGS was still lower than that estimated in other studies. For example, our CES in UGS was lower by 44% compared with the value (~RMB 234.834 million yr^{−1} from 2000 to 2020) reported in forested lands of Zhejiang province, China [76]. Our value was also lower by 77% than that reported for CES services in the Warddeken Indigenous Protected Area (~USD 29 million yr^{−1}) [77].

The lower value of UGS in our study resulted from at least three reasons. Firstly, our UGS were derived from wetland landscape instead of forest landscape, which would reduce proportion of UBS service in CES components. According to Zhou et al., CES comprised biodiversity perceptions which were unlikely to be higher in water than on forested lands unless swimming to experience an aquatic ecosystem [3]. Secondly, we estimated CES value at the price of the US dollar in 1994 [15]; however, the monetary value has definitely changed in recent years when the CES value was increased accordingly [77]. Finally, the area of UGS was smaller per UWP of Jiangxi than in montane areas per forest park of other places. Overall, evidence for the estimation of CES values in UWPs is still insufficient.

4.2. Spatial Distribution of CES Values in UWPs

We quantified monetary values of CES using prices given at different years, namely 1997 [15] and 2021 [16]. The variation in years will result in a change in monetary values due to continuous inflation. However, this does not affect our results because we did not compare CES values across different years. Instead, the monetary values were compared among different places. The root of the difference in monetary values resulted from different areas of UGS and UBS in UWPs.

As our CES values were estimated by the area of a UWP and its price of functional service, the distribution of CES values in UGS and UBS followed the same patterns of their areas. In more detail, UWPs in northern Jiujiang, central Nanchang, and western Ji'an were estimated to have higher CES values in UGS than adjacent places because of large areas of greened lands. UWPs in these three locations were also estimated to have higher CES values than in other UBSs. These places also attracted visitors who exposed higher scores of positive emotions. CES values in UWPs were not just the sum of values in UGS and UBS, because parks had larger areas of lands free of nature. Large areas from Nanchang to northern Jiujiang and the area around western Ji'an were estimated to have higher CES values in UWPs. These results were not in agreement with the findings of Xie et al. [78]. Ganzhou used to be estimated to have the highest CES value in previous studies; however, its value was estimated to be nearly the lowest in our study. Nanchang and Jiujiang were estimated to have moderate to low levels of CES values among all cities of Jiangxi. These differences resulted from various sources of data for evaluating products. Prices of ecosystem services were derived from yearbooks for different types of lands (farm, forests, water, etc.) [78], which was not as reliable as the employment of the result synthesized from empirical data globally.

4.3. Perceptions of Exposed Facial Expressions toward CES Values

In this study, we collected 1749 photos as the source of data on facial expressions from 98 UWPs in Jiangxi province. These resulted in about 18 photos per park, which also means 18 replicates of data on emotional perceptions toward the CES value of the park. Thus, our park-level pools of data were not powerful compared with some regional studies in a provincial range [54,55,59,60]. However, the power of our data-pool was a reasonable level for a quality study. This is because approximately 20 people were frequently employed in studies testing the effect of experiencing nature on individuals' mental and psychological perceptions [25,58,79–81]. All our data were collected from cities at a provincial scale, which is comparable with the power of the data in studies where the total number of photos is clearly larger than ours [31,32]. In regional studies on facial expressions of people visiting urban parks, the provincial-level data were also reported to be from fewer than 20 people per park [71,72]. Therefore, we admit that the power of our data pool can be improved in another study with more photos documented; however, the current pool of our data in this study remains powerful enough.

We observed happiness scores of about 60% for most UWPs in Jiangxi, and regional places in Jiujiang and Ganzhou showed happiness scores as high as 90%. Our data were collected over a year-long term and were similar to those reported in UWPs of cities in Central China at winter time [82]. In summer, UWPs of Central China showed happiness

scores which were lower by 20% compared with those in our study. In East China, visitors of UWPs also showed lower happiness scores across four seasons of the year [30]. In contrast, the sad score in UWPs of our study (up to ~29%) was much lower than that in previous studies (up to ~50%) [30,82]. Therefore, we can assert that people in UWPs of Jiangxi looked more happier than others visiting the central and eastern parts of China. We surmise that regional climate accounted for the high happiness scores in our study. In detail, temperature, rainfall, and velocity in UWPs were found to have positive contributions to evoke positive emotions in people, whereas air humidity imposes a negative force [30]. Jiangxi is in a subtropical climate with a warmer temperature than central and eastern parts of China. The regional climate along the Gan River can be characterized by enriched rainfall and frequent monsoons. These may all be the factors that can elicit the perception of happiness.

Although UGS accounted for over 95% of UWP area, either their areas or their CES values can be perceived by visitors and reflected in their facial expressions. Our results disagreed with those that repeatedly demonstrated the existence of perceptions toward experiences in UGS with results identifying effects indicated by ART and SRT [83,84]. This type of study usually drew results from questionnaires in scattered local forest parks. The knowledge was challenged by results demonstrating null perceptions of people in UGS both at local [57] and regional/provincial scales [59]. UGS in UWPs of East China were also found to be a failure of expected stimulation [30]. It was hypothesized that UGS may evoke perceptions of people as potential driving effects instead of direct impacts [30,59]. Our results agreed with the findings of Li et al. [30]—that the perceptions of experiences in UWPs were accounted for by time spent in the interaction with aquatic settings but not with green lands. Both the area and CES value in UBS can be perceived by people and expressed as positive emotions. The CES value in UBS per UWP area was also perceived as a driver to elicit positive emotions, whereas that in UGS may just evoke negative emotions. It is not the first time for our study to discover positive effects from experiencing UBS on exposed facial expressions in UWPs [61]. According to components of CES in wetlands, people may perceive more benefits in aesthetic, recreational, and spiritual values during the time in UBS than in UGS [29,72]. In our results, joint findings of CES values in UWPs and UBS per park with a higher coefficient for the latter parameter together suggest that people perceive positive emotions toward the experiences when they can enjoy CES beside waters when CES from experiences in co-existed forests cannot be perceived. This positive effect of CES can be strengthened in larger areas of UBS, which accounted for more enjoyment as a result of a larger UWP, even if this greater largeness looks like more enriched greened lands.

4.4. Limits of This Study

Firstly, the most concerned limit may come from the use of exposed facial expressions as a data source to assess posted emotions towards CES values. One may argue that exposed facial expressions are not as reliable at reflecting intended emotions as those on spontaneous faces [56,57]. The conscious presentation of emotions will amplify the rate of smiles, because people have a general habit of smiling in front of the camera. Evidence is being accumulated to reveal that open facial expressions can be reliable for a study conducted at a large geographical scale [31,32,59]. Repeatedly collected data from one place, along with a high number of places per study, may appear to diminish the impact of the intended presentation of facial emotions. People can deliberately pose their faces to show the intended emotions to different extents when they are aware of the CES that they can enjoy in different locations. People who posted their photos to a SNS platform will rarely be informed that their emotional scores will be used in an academic study. Secondly, the price of ecosystem function can be more precise for wetlands in China if more references can be found about monetary values in CES of local ecosystems. Monetary values can be evaluated by field surveys, and more places of investigations will result in higher accuracies of prices at services. Finally, CES values for UWPs in this study were the sum of those for UGS and UBS. Facilities and utilities in parks can also evoke perceptions towards services

from a combined nature-building landscape ecosystem. This type of study is even more scarce, and we cannot refer to findings with expected relevance. More work is needed to test CES in UWP, preserves, and conservation areas.

5. Conclusions

Our study used remote sensing data to estimate averaged CES values as USD 941.26 and 39.54 thousand yr^{-1} for green and blue spaces per UWP in Jiangxi, respectively. The largeness of UGS in a UWP cannot be perceived by visitors through the observations of exposed facial expressions. However, the area of UBSs and their CES values can be psychological drivers to elicit positive emotions of people. The enjoyment of CES in UWPs of Jiangxi was determined by the perception of CES in UBSs, although their areas only accounted for lower than 5% of the total areas in host parks. Taking wetlands in Jiangxi as an example, high CES values that can be perceived by visitors were distributed in an area across eastern Jiujiang and Nanchang, plus a smaller area in western Ji'an. Overall, our study demonstrates that people can perceive values of CES in GBS of UWPs, but the CES values in UGSs cannot evoke openly positive emotions.

Further work is suggested to confirm our results using our proposed methodology in other types of cities. It would be valuable to repeat our study and confirm results in coastal cities where UGSs in wetland parks are constructed in marine ecosystems, which are very different from inland wetlands of this study. Secondly, the geographical range for data collection of this study can be extended to a larger scale where stronger conclusions can be drawn according to more reliable sets of data. Finally, it is necessary to synthesize current studies and put forth the prices for CES in wetlands. The prices used in this study were widely used globally but, after all, they were proposed according to older records.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/f14020273/s1>, Table S1: List of names and geographical information for UWPs in Jiangxi province, China. Table S2: List of cultural ecosystem service values in green and blue spaces of urban wetland parks in Jiangxi province, China.

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References

1. Urrego, M.R. Wetlands—Key Enablers for a Resilient and Sustainable Recovery. In *Midterm Comprehensive Review of the Implementation of the International Decade for Action, “Water for Sustainable Development”, 2018–2028*; Ramsar: Gland, Switzerland, 2021.
2. Li, T.; Gao, X. Ecosystem Services Valuation of Lakeside Wetland Park beside Chaohu Lake in China. *Water* **2016**, *8*, 301. [\[CrossRef\]](#)
3. Zhou, L.L.; Guan, D.J.; Huang, X.Y.; Yuan, X.Z.; Zhang, M.J. Evaluation of the cultural ecosystem services of wetland park. *Ecol. Indic.* **2020**, *114*, 106286. [\[CrossRef\]](#)
4. Jiang, B.; Wong, C.P.; Chen, Y.Y.; Cui, L.J.; Ouyang, Z.Y. Advancing Wetland Policies Using Ecosystem Services—China’s Way out. *Wetlands* **2015**, *35*, 983–995. [\[CrossRef\]](#)
5. Jiang, B.; Xu, X.B. China needs to incorporate ecosystem services into wetland conservation policies. *Ecosyst. Serv.* **2019**, *37*, 100941. [\[CrossRef\]](#)

6. Sun, B.D.; Cui, L.J.; Li, W.; Kang, X.M.; Pan, X.; Lei, Y.R. A meta-analysis of coastal wetland ecosystem services in Liaoning Province, China. *Estuar. Coast. Shelf Sci.* **2018**, *200*, 349–358. [\[CrossRef\]](#)
7. Eric, A.; Chrystal, M.P.; Erik, A.; Kenneth, B.; Robert, C. Evaluating ecosystem services for agricultural wetlands: A systematic review and meta-analysis. *Wetl. Ecol. Manag.* **2022**, *30*, 1129–1149. [\[CrossRef\]](#)
8. Hu, T.G.; Liu, J.H.; Zheng, G.; Zhang, D.R.; Huang, K.N. Evaluation of historical and future wetland degradation using remote sensing imagery and land use modeling. *Land Degrad. Dev.* **2020**, *31*, 65–80. [\[CrossRef\]](#)
9. Ausseil, A.G.E.; Chadderton, W.L.; Gerbeaux, P.; Stephens, R.T.T.; Leathwick, J.R. Applying systematic conservation planning principles to palustrine and inland saline wetlands of New Zealand. *Freshw. Biol.* **2011**, *56*, 142–161. [\[CrossRef\]](#)
10. Ren, L.Y.; Yue, W.Z.; Li, J.L.; Wu, C.F. Impact of economic development on wetlands in Hangzhou Bay Industrial Belt. *J. Geogr. Sci.* **2010**, *20*, 406–416. [\[CrossRef\]](#)
11. Li, H.; Petric, R.; Alazzawi, Z.; Kauzlarich, J.; Mahmoud, R.H.; McFadden, R.; Perslow, N.; Flores, A.R.; Soufi, H.; Morales, K.; et al. Four Years Continuous Monitoring Reveals Different Effects of Urban Constructed Wetlands on Bats. *Land* **2021**, *10*, 1087. [\[CrossRef\]](#)
12. Lannas, K.S.M.; Turpie, J.K. Valuing the Provisioning Services of Wetlands: Contrasting a Rural Wetland in Lesotho with a Peri-Urban Wetland in South Africa. *Ecol. Soc.* **2009**, *14*, 18. [\[CrossRef\]](#)
13. Dayathilake, D.; Lokupitiya, E.; Wijeratne, V. Estimation of Soil Carbon Stocks of Urban Freshwater Wetlands in the Colombo Ramsar Wetland City and their Potential Role in Climate Change Mitigation. *Wetlands* **2021**, *41*, 29. [\[CrossRef\]](#)
14. IPBES. Cultural Ecosystem Services. Available online: <https://ipbes.net/glossary-tag/cultural-ecosystem-services> (accessed on 18 January 2023).
15. Costanza, R.; d’Arge, R.; de Groot, R.; Farber, S.; Grasso, M.; Hannon, B.; Limburg, K.; Naeem, S.; Oneill, R.V.; Paruelo, J.; et al. The value of the world’s ecosystem services and natural capital. *Nature* **1997**, *387*, 253–260. [\[CrossRef\]](#)
16. Taye, F.A.; Folkersen, M.V.; Fleming, C.M.; Buckwell, A.; Mackey, B.; Diwakar, K.C.; Le, D.; Hasan, S.; Ange, C.S. The economic values of global forest ecosystem services: A meta-analysis. *Ecol. Econ.* **2021**, *189*, 107145. [\[CrossRef\]](#)
17. Scholte, S.S.K.; Todorova, M.; van Teeffelen, A.J.A.; Verburg, P.H. Public Support for Wetland Restoration: What is the Link with Ecosystem Service Values? *Wetlands* **2016**, *36*, 467–481. [\[CrossRef\]](#)
18. Johansson, M.; Pedersen, E.; Weisner, S. Assessing cultural ecosystem services as individuals’ place-based appraisals. *Urban For. Urban Green.* **2019**, *39*, 79–88. [\[CrossRef\]](#)
19. Zadra, J.R.; Clore, G.L. Emotion and perception: The role of affective information. *WIREs Cogn. Sci.* **2011**, *2*, 676–685. [\[CrossRef\]](#)
20. Chomley, F. *Nature for Health and Wellbeing—A Review of the Evidence*; Royal Botanic Gardens Victoria: Melbourne, VIC, Australia, 2021.
21. Ulrich, R.S.; Simons, R.F.; Losito, B.D.; Fiorito, E.; Miles, M.A.; Zelson, M. Stress recovery during exposure to natural and urban environments. *J. Environ. Psychol.* **1991**, *11*, 201–230. [\[CrossRef\]](#)
22. Ohly, H.; White, M.P.; Wheeler, B.W.; Bethel, A.; Ukoumunne, O.C.; Nikolaou, V.; Garside, R. Attention Restoration Theory: A systematic review of the attention restoration potential of exposure to natural environments. *J. Toxicol. Environ. Health Part B* **2016**, *19*, 305–343. [\[CrossRef\]](#)
23. Kaplan, R.; Kaplan, S. *The Experience of Nature: A Psychological Perspective*; Cambridge University Press: New York, NY, USA, 1989.
24. Guan, H.; Wei, H.; He, X.; Ren, Z.; An, B. The tree-species-specific effect of forest bathing on perceived anxiety alleviation of young-adults in urban forests. *Ann. For. Res.* **2017**, *60*, 327–341. [\[CrossRef\]](#)
25. Zhou, C.W.; Yan, L.B.; Yu, L.F.; Wei, H.X.; Guan, H.M.; Shang, C.F.; Chen, F.Y.; Bao, J.Z. Effect of Short-term Forest Bathing in Urban Parks on Perceived Anxiety of Young-adults: A Pilot Study in Guiyang, Southwest China. *Chin. Geogr. Sci.* **2019**, *29*, 139–150. [\[CrossRef\]](#)
26. An, B.Y.; Wang, D.; Liu, X.J.; Guan, H.M.; Wei, H.X.; Ren, Z.B. The effect of environmental factors in urban forests on blood pressure and heart rate in university students. *J. For. Res.* **2019**, *24*, 27–34. [\[CrossRef\]](#)
27. Zhang, J.G.; Liu, Y.H.; Zhou, S.; Cheng, Y.Y.; Zhao, B. Do various dimensions of exposure metrics affect biopsychosocial pathways linking green spaces to mental health? A cross-sectional study in Nanjing, China. *Landsc. Urban Plan.* **2022**, *226*, 104494. [\[CrossRef\]](#)
28. White, M.P.; Elliott, L.R.; Gascon, M.; Roberts, B.; Fleming, L.E. Blue space, health and well-being: A narrative overview and synthesis of potential benefits. *Environ. Res.* **2020**, *191*, 110169. [\[CrossRef\]](#) [\[PubMed\]](#)
29. Li, H.; Peng, J.; Jiao, Y.; Ai, S. Experiencing Urban Green and Blue Spaces in Urban Wetlands as a Nature-Based Solution to Promote Positive Emotions. *Forests* **2022**, *13*, 473. [\[CrossRef\]](#)
30. Li, H.; Wang, X.; Wei, H.; Xia, T.; Liu, M.; Ai, S. Geographical Distribution and Driving Meteorological Forces of Facial Expressions of Visitors in Urban Wetland Parks in Eastern China. *Front. Earth Sci.* **2022**, *10*, 781204. [\[CrossRef\]](#)
31. Wei, H.; Hauer, R.J.; Sun, Y.; Meng, L.; Guo, P. Emotional perceptions of people exposed to green and blue spaces in forest parks of cities at rapid urbanization regions of East China. *Urban For. Urban Green.* **2022**, *78*, 127772. [\[CrossRef\]](#)
32. Wei, H.; Zhang, J.; Xu, Z.; Hui, T.; Guo, P.; Sun, Y. The association between plant diversity and perceived emotions for visitors in urban forests: A pilot study across 49 parks in China. *Urban For. Urban Green.* **2022**, *73*, 127613. [\[CrossRef\]](#)
33. Pearce, D. *Economic Values and the Natural World. Travel & Tourism Analyst*; The MIT Press: Cambridge, UK, 1993.
34. Zhao, H.; Zhang, H.L.; Wang, F.Q.; Kang, P.P.; Lu, S.B. Service value of wetland ecosystem in Sanmenxia Reservoir area. *Glob. Nest J.* **2020**, *22*, 463–470.

35. Millennium Ecosystem Assessment. *Ecosystems and Human Well-Being: Synthesis*; World Resources Institute: Washington, DC, USA, 2005.
36. Thevs, N.; Beckmann, V.; Akimalieva, A.; Köbbing, J.F.; Nurtazin, S.; Hirschelmann, S.; Piechottka, T.; Salmurzauli, R.; Baibagysov, A. Assessment of ecosystem services of the wetlands in the Ili River Delta, Kazakhstan. *Environ. Earth Sci.* **2016**, *76*, 30. [CrossRef]
37. Sumarga, E.; Hein, L.; Edens, B.; Suwarno, A. Mapping monetary values of ecosystem services in support of developing ecosystem accounts. *Ecosyst. Serv.* **2015**, *12*, 71–83. [CrossRef]
38. Ghermandi, A.; Fichtman, E. Cultural ecosystem services of multifunctional constructed treatment wetlands and waste stabilization ponds: Time to enter the mainstream? *Ecol. Eng.* **2015**, *84*, 615–623. [CrossRef]
39. Ondiek, R.A.; Kitaka, N.; Oduor, S.O. Assessment of provisioning and cultural ecosystem services in natural wetlands and rice fields in Kano floodplain, Kenya. *Ecosyst. Serv.* **2016**, *21*, 166–173. [CrossRef]
40. Brown, G. The relationship between social values for ecosystem services and global land cover: An empirical analysis. *Ecosyst. Serv.* **2013**, *5*, 58–68. [CrossRef]
41. Jones, T.G.; Ratsimba, H.R.; Ravaoarinorotsihoarana, L.; Cripps, G.; Bey, A. Ecological Variability and Carbon Stock Estimates of Mangrove Ecosystems in Northwestern Madagascar. *Forests* **2014**, *5*, 177–205. [CrossRef]
42. Camacho-Valdez, V.; Saenz-Arroyo, A.; Ghermandi, A.; Navarrete-Gutierrez, D.A.; Rodiles-Hernandez, R. Spatial analysis, local people's perception and economic valuation of wetland ecosystem services in the Usumacinta floodplain, Southern Mexico. *PeerJ* **2020**, *8*, e8395. [CrossRef] [PubMed]
43. Lee, M.T.; Liu, J.M.; Borazon, E.Q. Evaluating the Effect of Perceived Value of Ecosystem Services on Tourists' Behavioral Intentions for Aogu Coastal Wetland. *Sustainability* **2020**, *12*, 6214. [CrossRef]
44. Mandal, M.H.; Roy, A.; Siddique, G. Spatial dynamics in people-wetland association: An assessment of rural dependency on ecosystem services extended by Purbasthali Wetland, West Bengal. *Environ. Dev. Sustain.* **2020**, *23*, 10831–10852. [CrossRef]
45. Clarke, B.; Thet, A.K.; Sandhu, H.; Dittmann, S. Integrating Cultural Ecosystem Services valuation into coastal wetlands restoration: A case study from South Australia. *Environ. Sci. Policy* **2021**, *116*, 220–229. [CrossRef]
46. Pedersen, E.; Weisner, S.E.B.; Johansson, M. Wetland areas' direct contributions to residents' well-being entitle them to high cultural ecosystem values. *Sci. Total. Environ.* **2019**, *646*, 1315–1326. [CrossRef]
47. WHO. *A User's Guide to the Self Reporting Questionnaire (SRQ)*; World Health Organization, Division of Mental Health: Geneva, Switzerland, 1994; p. 81.
48. Pihel, J.; Sang, A.O.; Hagerhall, C.; Nyström, M. Expert and novice group differences in eye movements when assessing biodiversity of harvested forests. *For. Policy Econ.* **2015**, *56*, 20–26. [CrossRef]
49. Aert, R.; Honnay, O.; Van Nieuwenhuyse, A. Biodiversity and human health: Mechanisms and evidence of the positive health effects of diversity in nature and green spaces. *Br. Med. Bull.* **2018**, *127*, 5–22. [CrossRef] [PubMed]
50. Deonna, J.A. Emotion, Perception and Perspective. *Dialectica* **2006**, *60*, 29–46. [CrossRef]
51. Wei, H.; Hauer, R.J.; Chen, X.; He, X. Facial Expressions of Visitors in Forests along the Urbanization Gradient: What Can We Learn from Selfies on Social Networking Services? *Forests* **2019**, *10*, 1049. [CrossRef]
52. Wei, H.; Hauer, R.J.; Zhai, X. The Relationship between the Facial Expression of People in University Campus and Host-City Variables. *Appl. Sci.* **2020**, *10*, 1474. [CrossRef]
53. Liu, P.; Liu, M.; Xia, T.; Wang, Y.; Wei, H. Can Urban Forest Settings Evoke Positive Emotion? Evidence on Facial Expressions and Detection of Driving Factors. *Sustainability* **2021**, *13*, 8687. [CrossRef]
54. Huang, S.; Zhu, J.; Zhai, K.; Wang, Y.; Wei, H.; Xu, Z.; Gu, X. Do Emotional Perceptions of Visible Greeneries Rely on the Largeness of Green Space? A Verification in Nanchang, China. *Forests* **2022**, *13*, 1192. [CrossRef]
55. Chen, C.; Guo, P. Can Indoor Residents Perceive Green and Blue Spaces in Communities as Posted Sentiments? A Verification in Nanchang. *Forests* **2022**, *13*, 1421. [CrossRef]
56. Wei, H.; Hauer, R.J.; Guo, S. Daytime dynamic of spontaneous expressions of pedestrians in an urban forest park. *Urban For. Urban Green.* **2021**, *65*, 127326. [CrossRef]
57. Wei, H.; Hauer, R.J.; He, X. A forest experience does not always evoke positive emotion: A pilot study on unconscious facial expressions using the face reading technology. *For. Policy Econ.* **2021**, *123*, 102365. [CrossRef]
58. Wei, H.; Ma, B.; Hauer, R.J.; Liu, C.; Chen, X.; He, X. Relationship between environmental factors and facial expressions of visitors during the urban forest experience. *Urban For. Urban Green.* **2020**, *53*, 126699. [CrossRef]
59. Mao, B.; Liang, F.; Li, Z.; Zheng, W. Microclimates Potentially Shape Spatial Distribution of Facial Expressions for Urban Forest Visitors: A Regional Study of 30 Parks in North China. *Sustainability* **2022**, *14*, 1648. [CrossRef]
60. Yu, F.; Deng, J.; Ding, X.; Ma, H. Interpolated Stand Properties of Urban Forest Parks Account for Posted Facial Expressions of Visitors. *Sustainability* **2022**, *14*, 3817. [CrossRef]
61. Liu, P.; Liu, M.; Xia, T.; Wang, Y.; Guo, P. The Relationship between Landscape Metrics and Facial Expressions in 18 Urban Forest Parks of Northern China. *Forests* **2021**, *12*, 1619. [CrossRef]
62. People's Government of Jiangxi Province. A brief Description of Jiangxi. Available online: <http://www.jiangxi.gov.cn/col/col471/index.html> (accessed on 10 August 2022). (In Chinese)
63. White, M.P.; Weeks, A.; Hooper, T.; Bleakley, L.; Cracknell, D.; Lovell, R.; Jefferson, R.L. Marine wildlife as an important component of coastal visits: The role of perceived biodiversity and species behaviour. *Mar. Policy* **2017**, *78*, 80–89. [CrossRef]

64. Sekertekin, A.; Abdikan, S.; Marangoz, A.M. The acquisition of impervious surface area from LANDSAT 8 satellite sensor data using urban indices: A comparative analysis. *Environ. Monit. Assess.* **2018**, *190*, 381. [CrossRef] [PubMed]
65. Estoque, R.C.; Murayama, Y. Classification and change detection of built-up lands from Landsat-7 ETM+ and Landsat-8 OLI/TIRS imageries: A comparative assessment of various spectral indices. *Ecol. Indic.* **2015**, *56*, 205–217. [CrossRef]
66. Baidu Map. Baidu Map in Jiangxi. Available online: <https://ditu.baidu.com/> (accessed on 17 November 2022).
67. Borma, L.S.; Costa, M.H.; da Rocha, H.R.; Arieira, J.; Nascimento, N.C.C.; Jaramillo-Giraldo, C.; Ambrosio, G.; Carneiro, R.G.; Venzon, M.; Neto, A.F.; et al. Beyond Carbon: The Contributions of South American Tropical Humid and Subhumid Forests to Ecosystem Services. *Rev. Geophys.* **2022**, *60*, e2021RG000766. [CrossRef]
68. Pan, J.F.; Ma, Y.W.; Cai, S.Q.; Chen, Y.; Chen, Y.M. Distribution patterns of lake-wetland cultural ecosystem services in highland. *Environ. Dev.* **2022**, *44*, 100754. [CrossRef]
69. Ribeiro, M.P.; de Mello, K.; Valente, R.A. How can forest fragments support protected areas connectivity in an urban landscape in Brazil? *Urban For. Urban Green.* **2022**, *74*, 127683. [CrossRef]
70. Rydberg, D.; Falck, J. Urban forestry in Sweden from a silvicultural perspective: A review. *Landsc. Urban Plan.* **2000**, *47*, 1–18. [CrossRef]
71. Zhang, J.; Yang, Z.; Sun, Y.; Xu, Z.; Hui, T.; Guo, P. Experiencing urban forests for mitigation of negative emotions of people exposed to seasonal PM^{2.5} in Northeast China. *J. For. Res.* **2023**, *in press*. [CrossRef]
72. Zhang, J.; Yang, Z.; Chen, Z.; Guo, M.; Guo, P. Optimizing Urban Forest Landscape for Better Perceptions of Positive Emotions. *Forests* **2021**, *12*, 1691. [CrossRef]
73. Guan, H.M.; Wei, H.X.; Hauer, R.J.; Liu, P. Facial expressions of Asian people exposed to constructed urban forests: Accuracy validation and variation assessment. *PLoS ONE* **2021**, *16*, e0253141. [CrossRef] [PubMed]
74. Conover, W.J.; Iman, R.L. Rank transformations as a bridge between parametric and nonparametric statistics. *Am. Stat.* **1981**, *35*, 124–129.
75. Sherrouse, B.C.; Semmens, D.J.; Clement, J.M. An application of Social Values for Ecosystem Services (SolVES) to three national forests in Colorado and Wyoming. *Ecol. Indic.* **2014**, *36*, 68–79. [CrossRef]
76. Wang, N.; Xu, C.; Kong, F. Value Realization and Optimization Path of Forest Ecological Products—Case Study from Zhejiang Province, China. *Int. J. Environ. Res. Public Health* **2022**, *19*, 7538. [CrossRef]
77. Coyne, C.; Williams, G.; Sangha, K.K. Assessing the Value of Ecosystem Services from an Indigenous Estate: Warddeken Indigenous Protected Area, Australia. *Front. Environ. Sci.* **2022**, *10*, 845178. [CrossRef]
78. Xie, H.L.; Li, Z.; Xu, Y. Study on the Coupling and Coordination Relationship between Gross Ecosystem Product (GEP) and Regional Economic System: A Case Study of Jiangxi Province. *Land* **2022**, *11*, 1540. [CrossRef]
79. Park, B.-J.; Furuya, K.; Kasetani, T.; Takayama, N.; Kagawa, T.; Miyazaki, Y. Relationship between psychological responses and physical environments in forest settings. *Landsc. Urban Plan.* **2011**, *102*, 24–32. [CrossRef]
80. Chen, H.-T.; Yu, C.-P.; Lee, H.-Y. The Effects of Forest Bathing on Stress Recovery: Evidence from Middle-Aged Females of Taiwan. *Forests* **2018**, *9*, 403. [CrossRef]
81. Bielinis, E.; Takayama, N.; Boiko, S.; Omelan, A.; Bielinis, L. The effect of winter forest bathing on psychological relaxation of young Polish adults. *Urban For. Urban Green.* **2018**, *29*, 276–283. [CrossRef]
82. Li, Y.J.; Sun, Y.X.; Zhao, Y.; Wang, Y.; Cheng, S.P. Mapping seasonal sentiments of people visiting blue spaces in urban wetlands: A pilot study on inland cities of China. *Front. Ecol. Evol.* **2022**, *10*, 969538. [CrossRef]
83. Liu, Q.; Wang, X.; Liu, J.; Zhang, G.; An, C.; Liu, Y.; Fan, X.; Hu, Y.; Zhang, H. The Relationship between the Restorative Perception of the Environment and the Physiological and Psychological Effects of Different Types of Forests on University Students. *Int. J. Environ. Res. Public Health* **2021**, *18*, 12224. [CrossRef]
84. Shin, W.S.; Yeoun, P.S.; Yoo, R.W.; Shin, C.S. Forest experience and psychological health benefits: The state of the art and future prospect in Korea. *Environ. Health Prev. Med.* **2009**, *15*, 38–47. [CrossRef] [PubMed]

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