Ecosystems in Books: Evaluating the Inspirational Service of the Weser River in Germany

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Abstract: Attempts at assessing the monetary value of cultural ecosystem services has proven challenging due to their non-material and non-market characteristics. Innovative methods are needed to fill this methodological gap. In this paper, a novel approach is developed for evaluating the inspirational service, one type of valuable cultural service, of a specific ecosystem embodied in published books. Taking the Weser River in Germany as an example, a breadth of evidence found in 19 books shows the strong inspiration of the river to people living around it who create plenty of literary and artistic works that represent different faces of the river, such as novels, poems, folklore and paintings. Based on the prices of these books and the estimated number of persons who have read these books, the total value of the inspirational service provided by the Weser River is calculated as 168,499 € from 1980 to 2019, leading to the annual value of 5616.63 €/year and the unit value of 0.24 €/ha/year with the water surface area of 23,123 ha and the period of 30 years. The advantages and shortcomings of this approach are discussed, and suggestions for the improvement and further research are made.

Keywords: cultural ecosystem services; valuation; river ecosystem; literature

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1. Introduction

Ecosystems provide a wide range of direct and indirect services including provisioning, regulating, and cultural services, which are important for human life, health, and well-being [1]. Cultural ecosystem services (CES) are defined as “the nonmaterial benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences” [1], including: cultural identity, cultural heritage, spiritual service, inspirational service, aesthetic service, as well as recreation and tourism [2]. In general, valuation of ecosystem services is inevitable because many decisions on ecosystems involve trade-offs among their services that affect human wellbeing differently; thus, the explicit assessment of ecosystem services' value can help society to make better decisions regarding trade-offs [3]. Owing to non-material and non-market characteristics as well as the issue of value plurality, the assessment of CES, particularly the monetary valuation, has proven more challenging than that of provisioning and regulating services, thus requiring a totally different set of tools [4,5].

The monetary valuation of recreation and tourism has attracted the most attention because of well-established non-market valuation techniques [6–8]. Moreover, a number of indicators [9] and non-economic approaches [10] have been developed to overcome the difficulties in assessing CES. Scholars have increasingly focused on the subject perceptions of tourists [11], stakeholders [12], aboriginal people [13] or local residents [14]. This approach is often combined with public participatory GIS [15,16] or geo-tagged photographs from social media [17,18]. These approaches are often time-consuming and depend highly on the reactions of participants.

Human cultures are always influenced and shaped by the natural ecosystems, while humankind always influences and shapes its environment to enhance the availability of these services [2]. As with provisioning and regulating services, CES must demonstrate a certain relationship between ecosystems in the biophysical domain and human needs in the social domain [19]. There is an increasing consensus that ecosystems cannot deliver benefits to people by themselves without incorporating human inputs [3,19,20]. In comparison to provisioning and regulating services, CES may depend less on ecosystems but more on humans. This means that obtaining benefits of CES probably leave discernible manifestations in the physical landscape or in the human society, e.g., artificial constructions [21], stories [14], popular songs [22], photographs [23], and education programs [24].

Inspirational service is an important type of CES. Natural ecosystems inspire an almost unlimited amount of cultural and artistic expressions; such representations of ecosystems consciously or subconsciously remind us of our connections with nature and shape our views and appreciation of the represented ecosystems [2]. Five types of inspirational service can be distinguished: verbal arts including poems, fiction, essays and folklore—Henry Thoreau’s “Walden” is a famous example; performing arts including music, song, dance, drama and opera—Johann Strauss Jr.’s “The Blue Danube Waltz” and Peter Tchaikovsky’s “Swan Lake Ballet” are famous examples; fine arts including paintings, sculptures and crafts—Claude Monet’s Water Lilies and Camille Corot’s Souvenir de Mortefontaine are famous examples; design and fashion including home furnishing and clothing; and media in general, including radio, video, television, film, advertising, photography and websites [2].

Although the number of research pieces on CES has rapidly increased in recent years [25,26], the inspirational service has still been understudied in comparison to other types of CES, such as the aesthetic service [27], the educational service [28], the sense of place [29], the spiritual service [30], and cultural heritage [31]. Coscieme [22] made the first effort to estimate the inspirational value of different ecosystems reflected by popular songs. Hiron et al. [32] considered bird species as a source of inspiration for poetry. Katayama and Baba [33] measured the inspirational service embodied in Japanese children’s songs.

As early in the late 1990s, river ecosystems have been recognized as a natural capital that could be assigned economic value for their multiple services such as wildlife habitat, electric power, and transportation [34]. Rivers also provide valuable inspirational service and have become one of the most represented ecosystem types because their constant flow is often associated with the irreversible passing of time or the conformity of society [22,33]. Following the direction developed by Coscieme [22] but different from the consideration of unspecific ecosystems in popular songs, we attempt to develop a novel approach for evaluating the inspirational service provided by a specific river ecosystem that is artistically represented in published books and take the Weser River in Germany as an example to show how this approach works and what the inspirational value of this river is.

2. Materials and Methods

2.1. Study Area

The Weser River is the only large river that lies entirely within German national territory. The history of human activities along the Weser can be dated back to the first four centuries. The Weser region flourished since Charlemagne conquered this region when a number of important settlements began to arise by reason of military or ecclesial relevance. In the eighth century, this river was given the name Weser [35,36]. The river is an important lifeline that provides not only food (such as fish) but also drinking and processing water. It also serves as wastewater disposal and an important transportation route. For the sake of better navigability, people began early to reconstruct and improve the waterway by means of hydro-engineering interventions. Moreover, the river plays an outstanding role for recreational activities due to its diversified and attractive landscapes. Meanwhile, the terrifying and destructive effects of floods also accompanied the human history [35,36]. All of these facts indicate the intensive and longtime interactions between humans and the Weser.

With an overall length of 453 km, the Weser River mainstream forms at Hannoversch Münden by the confluence of the rivers Werra and Fulda, flows in the northern direction through the Central Upland Ranges and the North German Plain, and empties into the North Sea. The water surface area of the river is 23,123 ha. Currently, there are around 1.5 million residents living along the Weser River, distributed in 66 municipalities or cities in 16 districts of four federal states (Figure 1).

Figure 1. The geographical location of the Weser River in Germany.

2.2. Methods

Our searching strategy was based on the so-called “snowball approach”; i.e., a small number of books that are highly relevant were selected, then the references or citations in the selected books were looked for by thoroughly reading them. The online searching system of the Göttingen State and University Library (<https://opac.sub.uni-goettingen.de>) was used on 6 June 2021. The keyword “Weser” in the title plus the keyword “geography” in the topic were searched, and only books were considered for the results. This search led to a total of 22 books, from which two books were selected as “seeds” according to their relevance and availability, i.e., “Die Weser: vom Thüringer Wald bis zur Nordsee” [37] and “Die Weser: 1800–2000” [38]. Based on both the books, more books were found by the citations and references in them. Thus, 19 books were chosen for further analysis (Table 1). We then searched for evidence that reflects the inspiration of the Weser by intensively reading the selected books. Since the books were written in German, we translated relevant contents into English (Tables 2 and 3).

Table 1. Selected books about the Weser (in alphabetical order of author names).

Author	Year	Title	Price (in Euros)	Number of Persons Who Borrowed from Göttingen
Albrecht, Thorsten; Strack, Anton Wilhelm [39]	1997	Malerische Reise durch das Weserbergland: Anton Wilhelm Strack, Hofmaler und Professor für Zeichenkunst in Bückeburg (1758–1829)	12.00	36
Below, Manfred [37]	2011	Die Weser. Vom Thüringer Wald bis zur Nordsee	38.00	81
Braun, Georg; Hogenberg, Franz; Novellanus, Simon [40]	1978	Beschreibung und Contrafactur der vornembster Stät der Welt	220.00	26
Braun, Hans-Georg; Eckoldt, Martin; Rohde, H. [36]	1998	Flüsse und Kanäle. Die Geschichte der deutschen Wasserstrassen	42.57	38
Engel, August [41]	1990	Weserbuch. Ein erklärender Begleiter auf der Weserreise mit Berücksichtigung der Fulda von Kassel ab	15.00	40
Ferdinand; Micus, Franz Joseph [42]	1844	Denkmale des Landes Paderborn	22.09	11
Hoffmann von Fallersleben, August Heinrich [43]	1974	Gedichte und Lieder	12.90	13
Kastler, José [44]	2000	Die Weser. Einfluss in Europa. Aufbruch in die Neuzeit	9.75	41
Küster, Bernd [38]	1999	Die Weser: 1800–2000	12.00	76
Löbe, Karl [35]	1969	Das Weserbuch. Roman eines Flusses	5.90	45
Marbach, Gotthard Oswald [45]	1841	Deutsche Lieder zu Schutz und Trutz	19.90	23
Merian, Matthaeus [46]	1984	Topographia Westphaliae	14.90	8
Merian, Matthaeus [47]	2005	Topographia Saxoniae Inferioris	28.80	9
Merian, Matthaeus [48]	2012	Topographia Braunschweig und Lüneburg	13.90	5
Musculus, Johann Conrad; Eckhardt, Albrecht [49]	1985	Der Deichatlas des Johann Conrad Musculus von 1625/26	65.00	10
Paetow, Karl [50]	1974	Die schönsten Wesersagen	15.61	67
Raabe, Wilhelm [51]	1968	Der heilige Born	6.59	61
Rogge, Alma [52]	1958	An Deich und Strom. Ausgewählte Erzählungen	5.00	43
von Dingelstedt, Franz [53]	1972	Das Wesertal von Münden bis Minden	4.08	48

Table 2. Folklores about the Weser, in order from upstream to downstream (translated from [50]).

Number	Place	Legend	Excerpt about the Weser
1	Hann. Münden	Robber knights on the Bramburg	They (the knights) clamped a chain across the water flow of the Weser, and if a ship sailed downstream, a bell rang on the castle.
2	Höxter	The first airmail, the giant's game in Höxter and the white woman	This (blood) flowed into the river and dyed the green Weser wave completely red.
3	Pegestorf	Giants in the Weser Uplands and the stone mill	Thereupon he (the giant) piled up the water mill on the rocky bank of the Weser and gave it the name "stone mill".
4	Lippe	The king of the Kötterberg	They (the two sisters) packed the baby boy and threw him into the Weser. The two sisters took the (second) baby boy away likewise and threw him into the Weser. The two evils threw the baby girl also into the Weser. The king's children walked back to the Weser where the fisherman father held them gladly in his arms.
5	Fürstenberg	The battle for the manufacturing secretes of Fürstenberg's china	On the morning of 8 July he (son-in-law of Benkraff) had secretly put up with his sister and let the ferryman in Boffzen row across the WeserThis time they crossed the Weser in the village Wehrden.
6	Grohnde	The Trumpeter of Grohnde on the floating ice sheets	When in winter days all standing water, the pools and ponds are already under hard ice sheet, then the flowing Weser still defends itself with its pounding of waves against the deathly rigidity of frostWhen the Trumpeter stepped from the warm room into the bright moonlight, he felt as if a mild wind was blowing. Or should that only be his heated blood? He hurried through the streets, came to the towpath, and looked over the Weser. A light flashed on the other side in Grohnde. Ah, in the hours of merriment, the Weser had come to life again. The thawing wind had licked the ice cover, the urgent flow had broken it into large slabs and driven the ambulant mass crashing to the North Sea.
7	Emmerthal	The mariners of the Weser and the cat of Hajen	When in those days a Weser ship with full load, . . . , went downward on the Weser, then eight men (called Hüossen) were probably necessary to conduct this ark (called Weserbock).
8	Hameln	The Pied Piper of Hameln	And thus he (the Pied Piper) led them (rats and mice) to the Weser, where he gathered up his clothes and stepped into the water, and all the animals followed him, entering the water and drowning."
9	Hameln	The bell chain of Uetzenburg	The robbers also disturbed the ship traffic on the Weser.
10	Rinteln	The giant king and his daughter	Thus he (the knight) lifted her (the daughter of the giant king) on his warhorse, and they rushed to the Weser, where the ships already await them. The wind swelled the sails, the current accelerated the trip, and the fleet fled downstream to the island on which the castle of victor rose.

Table 2. Cont.

Number	Place	Legend	Excerpt about the Weser
11	Porta Westfalica	How did the Westphalian Gorge arise?	In old times . . . the Weser had to force its water through the valley of Wallücke in the Wiehen Hills. Then it crossed the devil's mind that he wanted to bring the people in the whole Weser valley under his thumb. . . . He carried huge boulders from the southern hill over here and dammed up the ravine of Wallücke. The accumulating water mass had now no more outflow and impounded before the mountains, rose and spread out, submerged the villages and the hills, and formed a huge lakeBecause lightning came down, split the mountain with terrible thunderclap and opened a gaping ravine, through which the water could flow out again like the smoke in the chimney. Slowly the hills rose from the floods again like islands, the fields and houses emerged, and the Weser returned to its bed. But its water flew henceforth northward through the new notch, and thus the Westphalian Gorge arose.
12	Vlotho	The lords of Vlotho on the Amtshausberg	The merchant quickly pulled himself together, and both fled secretly through dark corridors down the Castle Hill to the Weser, where a little ship lay hidden in the reeds. At dawn the lovers rowed along the bank to their hometown. The current drifted them inexorably forward.
13	Petershagen	The shepherd of Petershagen	A shepherd was grazing his herd on a green meadow near the Weser between Petershagen and Windheim. The sun sank and the moon came up with its stars, and the shepherd was still sitting on the bank hill by the river. There he was watching something on the river, floating closer, light as a feather in the wind. And shortly he saw a figure in the moonlight standing there on a drifting shell in the water.
14	Bremen	How was the Theisenrad Dike saved?	What would Bremen probably be without its river of fate, the powerful Weser? This river is like a charitable giant, who took people's burden on its back and advance them according to their will. He has increased the wealth of the commercial city in centuries. But from time to time it becomes a rebel from the faithful servant. Then the unpredictable water mass swells its body and grabbed with mighty arms at goods and chattels of people, as if he wanted reclaim what he has once given in good mood. The Bremers have providently drawn boundaries for it (the Weser) in quiet days, high dikes, behind which they can then wait, until the aggressive river has composed itself and returned to its bed. The most important of all these dikes is the Theisenrad Dike. It must not break, otherwise the flood would have happened to the beautiful city. The Bremers know this well, so they hold special safeguards at this pointAs the gnawing water continued to rise and the whole protective wall was in danger, the guards let the bells of all towers ring. There ran the crowds of Bremers, men, women, children, and saw the whole mess: a large hole was torn in the dike. The surge forced itself into the rift and washed away the edges. The wild waves weltered already gurgling, moaning against the houses. In vain the workmen plunge the whole truckloads of timber, soil, stones and junk into the gaping hole. The torrential floods carried away everything, and the misfortune became only worse. In this emergency Bremers recalled the old promise, and a terrible word got around. First quiet, then louder people grumbled: "A person must in the Wall, or we all sink. Hey, councilors, give us the victim!"
15	Lemwerder	The dike breaching in Altenesch	The people in the whole region of Stedingen have defied and embanked the Weser. So it happened once again that the water of the Weser ascended threateningly to the dike crowns.

Table 3. Literary works about the Weser, in the order from upstream to downstream.

Number	Place	Genre	Author	Excerpts about the Weser
1	Hann. Münden	Poem	Carl Natemann	Where Werra and Fulda kiss They must atone their names, And here begins by this kiss German up to the sea the Weser River. (translated from [37])
2	Höxter	Poem	Hoffmann von Fallersleben	How beautiful on the mountains, how beautiful in the (Weser) valley! O Corvey, I greet you many thousand times. (translated from [43])
3	Holzminden	Novel	Wilhelm Raabe	The young, just flowering leaf buds of the low shrubs are hung with dewdrops. Some early white and yellow flowers shine weakly from the beds in the dusky night. The old river (Weser) rustles and grumbles under the wall of the garden. Leaning on the parapet against the river, the Monika Fichtner stands and looks out dreamily shyly over the mirror of the Weser, in which the stars and the great comet contemplate their a thousand times refracted image. (translated from [51])
4	Porta Westfalica	Poem	August Engel	Now turn! The river (Weser) moves through the gorge, And before him lies the bleak reality, And a hope fades after another, And all remained in the early days; Then he battles his way through various miseries, Until he goes down to the vast sea. (translated from [41])
5	Bremen	Novel	Alma Rogge	She saw the drifting clouds in the sky, felt the force of the river (Weser), heard the water swoosh and paid attention to every bird cry. (translated from [52])
6	The whole river	Prose	Franz von Dingelstedt	... , where the Weser flows, mid through beautiful, though not large mountain forms, over friendly, but not rich villages, without steamships and without three-master, but often fraught with an ark hanging a colorful pennant, on which blithe people sit and look out or sing out over the blue water toward the blue mountains. (translated from [53])
7	The whole river	Poem	Franz von Dingelstedt	So the Weser bobs childishly up By mountains comfortably surrounded, And in dreamful course comes Through green meadow flowing down. So it winds with quiet foot Downstream to the distant sea, And reflects with loquacious greetings The gentle peace of banks. (translated from [53])
8	The whole river	Poem	Mar von Schenkendorf	So close to the highly glad land, Where the earth tyrant's blood drank, And after disengaged slave band, The Roman yoke to the ground sank. Hear, o Weser, our greetings, They should come jubilantly to you, With full earnestness and calm dignity, You, river of freedom, to the ocean flow. (translated from [45])

For evaluating the inspirational service of the Weser River, the prices of selected books and the number of persons who ever read these books were taken into account. The prices of the selected books were taken from Amazon (<https://www.amazon.de>) and eBay (<https://www.ebay.de> (accessed on 15 December 2020)); the lowest price of each book was adopted. The data for the accurate number of persons who have read these books and the printing copies of one book is not available. Hence, we estimated the number of persons who have read these books in two steps. First, the number of persons who borrowed these books from the Göttingen State and University Library from 1980 to 2019 was obtained through contact with the colleague of the library. Then, considering that those books often have multiple editions and reprints, and that people can borrow them from other libraries, buy them from bookstores or download them in digital forms, the number of persons who borrowed those books from Göttingen was multiplied by a conservative factor of 10 (Table 1). Thus, the inspirational service value of the Weser River is calculated by the following formula:

$$V = \frac{\sum_{i=1}^{19} P_i \times N_i \times 10}{A \times Y} \quad (1)$$

where V denotes the inspirational value in Euros/ha/year, P_i is the price of book i , and N_i is the number of persons who borrowed book i from Göttingen, A denotes the surface area of the river, and Y denotes years.

3. Results

3.1. Evidences on the Inspirational Service of the Weser River

The evidence we found are classified into three main classes—folklore, literary works, and artistic works. In each class, the evidence is arranged in order from upstream to downstream of the river. The Weser plays an essential role in the regional folklore. There are a number of folklore tales that represent the diverse faces of the Weser along the river (Table 2). The Weser was deemed a natural obstacle and a traffic way (number 1, 5, 7, 9, 10, 12), a source of hydropower (number 3), a fatal threat because of floods (number 14, 15), and a huge sink that collected various unusual items such as blood (number 2), babies (number 4), and rats (number 8). Moreover, the flowing water as the visual feature of the Weser gave people wonderful imaginations, describing it as floating ice (number 6), a drifting shell (number 13), and a battle between water and hills (number 11). The last example is strong evidence of the inspirational service provided by the Weser because it reflects people's imagination on the river per se according to its morphology and landscape.

Except for folklore, a number of literary works reflect the inspiration of the Weser (Table 3). Natemann likened the forming of the Weser to a kiss of two rivers (number 1), von Fallersleben praised the beauty of the Weser valley (number 2), Engel also praised the scene when the Weser passes the Westphalian Gorge (number 4), Raabe meticulously delineated a garden near the river and the stars reflected in the Weser as a mirror (number 3), Rogge (number 5) and von Dingelstedt (number 6) described their view of mountains, villages, the sky and the water when travelling on the river, von Dingelstedt (number 7) and von Schenkendorf (number 8) wrote poems to express their feelings of the river.

Paintings are another form of artistic reflection of the Weser (Table 4). The Weser is a momentous part of the cities where the river flows through; thus, it was often drawn in the most conspicuous place of the paintings (number 1–8, 10–16). The landscape of the Westphalian Gorge where the Weser passes not only inspired the creation of a folklore and a poem, but also a painting (number 9). The beautiful Weser Valley provided great inspiration for creating two excellent paintings of panorama (number 17, 18). The inspiration of the Weser was more obviously embodied in the imagination of the Weser Valley (number 19), which was not the delineation of the scenery that actually existed, and in the two paintings where the Weser was given the shape of human beings (number 20, 21).

Table 4. Paintings about the Weser, in order from upstream to downstream.

Number	Place	Artistic Works
1	Hann. Münden	<p>(scanned from [40])</p>
2	Fürstenberg	<p>(scanned from [48])</p>
3	Holzminen	<p>(scanned from [48])</p>
4	Höxter	<p>(scanned from [44])</p>

Table 4. Cont.

Number	Place	Artistic Works
5	Polle	<p>(scanned from [48])</p>
6	Hameln	<p>(scanned from [39])</p>
7	Hessisch Oldendorf	<p>(scanned from [46])</p>
8	Rinteln	<p>(scanned from [44])</p>
9	Porta Westfalica	<p>(scanned from [39])</p>

Table 4. Cont.

Number	Place	Artistic Works
10	Minden	<p>(scanned from [46])</p>
11	Petershagen	<p>(scanned from [47])</p>
12	Stolzenau	<p>(scanned from [47])</p>
13	Nienburg (Weser)	<p>(scanned from [47])</p>
14	Drakenburg	<p>(scanned from [48])</p>

Table 4. Cont.

Number	Place	Artistic Works
15	Hoya	<p>(scanned from [46])</p>
16	Bremen	<p>(scanned from [44])</p>
17		<p>(scanned from [39])</p>
18		<p>(scanned from [39])</p>
19	The Weser Valley	<p>(scanned from [44])</p>

Table 4. Cont.

Number	Place	Artistic Works
20	Personification of the river	<p>(scanned from [49])</p>
21		<p>(scanned from [42])</p>

3.2. The Inspirational Service Value of the Weser River

According to the method described above, the number of persons who borrowed these 19 books from the library of University Göttingen in the period of 1980 to 2019 is 681, so the total number of persons who have read those books is estimated as 6810. Hence, the total value of the inspirational service provided by the Weser River is calculated as 168,499 €, leading to the annual value of 5616.63 €/year and the unit value of 0.24 €/ha/year with the water surface area of 23,123 ha and the period of 30 years.

4. Discussion

Bieling and Plieninger [21] proposed the assumption that making use of CES leaves discernible marks on the physical landscape and developed an approach for analyzing correlations between visible manifestations of CES in a field walk-based landscape and landscape features or ecosystem service bundles. Bieling [14] expanded the assumption that making use of CES also leaves traces in the social society like stories, which revealed rich evidence regarding connections to identity, heritage, inspiration, aesthetic and recreation. Furthermore, Figueroa-Alfaro and Tang [23] developed an approach for identifying aesthetic value in non-monetary terms by geo-tagged photographs in social media. A step

forward, Hutcheson et al. [24] considered educational programs as the educational service of the Hudson River and estimated their economic value (11,500 \$/year) based on the travel cost method; Coscieme [22] estimated the inspirational value (6.78 million \$/year) of rivers in popular music by the product of the number of songs inspired by rivers, the average price for downloading a song, and the number of times downloaded. Since all river ecosystems in general terms were taken into account, the quantity of rivers that provide inspirational services was unknown; thus, the value of a single river cannot be calculated.

In summary, this approach searches for diverse manifestations both in physical and social domains that represent cultural services provided by different ecosystems to humans, and further evaluates cultural services in monetary terms if the manifestations imply market characteristics. Following this direction, we considered folklores, literary works and artistic works published in books as the inspirational service of a specific ecosystem, the Weser River in Germany as an example, and evaluated the inspirational value based on the market price of relevant books. Compared to the value 11,500 \$/year of the educational service of the Hudson River [24], the value 5616.63 €/year of the inspirational service of the Weser River in our study is in the same order.

The approach we developed has the following advantages. It can be used to find a variety of literary or artistic works that represent the inspirational service provided by a certain ecosystem; it focuses on a specific ecosystem, making the assessment of ecosystem services more interactive and complete, and it can be easily applied to all ecosystem types. On the other side, this approach also has several limitations. First, due to the problem of data availability, the precision of the result depends significantly on the critical estimation of the number of persons who have read the selected books. Second, there could potentially be a huge amount of works inspired by the Weser River; our selection of books is far from being exhaustive. Third, only writings and paintings in the form of published books have been taken into account without the consideration of other forms of inspirational service such as music, media, fine arts, etc., thus leading to underestimation of the value.

Future research can be considered from the following perspectives. The first one is the data issue. A more precise number of persons who have read a certain book would lead to a more accurate result. If the data for the yearly number of persons who read a certain book is available, even the year-by-year changes in the inspirational value can be calculated. An empirical estimate on the inspirational value, other than the market price of books used in this study, can be developed by calculating human inputs for reading certain books such as travel costs for acquiring the books or time spent on reading. Since the inspiration of a certain ecosystem may be embodied in any kind of works, a more systematic search strategy should be used to cover as many relevant references as possible. Moreover, more kinds of manifestations of other CES should be identified for further analysis, such as the sense of place, also understood as cultural identity, which can possibly be represented by municipal coats of arms in a European context.

5. Conclusions

Ecosystems provide multiple valuable cultural services to people. Due to the uniqueness of CES in comparison to provisioning and regulating services, there has long been a methodological gap for the assessment of CES. In this paper, we made an effort to develop an approach for evaluating inspirational service in monetary terms, which consists of two steps: searching for published books that include literary and artistic works inspired by a specific ecosystem, and estimating the economic value based on the market prices of books. Taking the Weser River in Germany as an example, we found a breadth of evidence in 19 books, showing that people living around the Weser are intensely inspired by the river and thus create plenty of folklore, poems, novels and paintings that represent different facets of the river. Based on the prices of these books and the estimated number of persons who have read these books, the total value of the inspirational service provided by the Weser River is calculated as 168,499 € from 1980 to 2019. Taking the water surface area of 23,123 ha and the period of 30 years into account, the annual value is 5616.63 €/year

and the unit value is 0.24 €/ha/year. This approach has obvious advantages but also has potential limitations which need to be improved in future research. This approach provides a feasible way for capturing the inspirational benefit people obtain from ecosystems and can be applied to other specific ecosystems over the world.

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