THE VALUATION OF ECOSYSTEM CULTURAL SERVICES IN GEP ACCOUNTING: A CASE OF KHOVD PROVINCE

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Abstract: Ecosystem economic valuation is an effective way to measure and understand the significance of the benefits people receive from ecosystems. The Gross Ecosystem Product (GEP) concept seeks to employ specific indicators for quantifying the economic value of all ecosystem products and services. GEP is the total value of final ecosystem goods and services supplied to human well-being in a region annually. It can be measured in terms of biophysical value and monetary value. This study aimed to examine the usage of the travel cost method in Mongolia for the first time and introduced new knowledge for ecosystem valuation. The GEP was calculated at the provincial level, and a framework was customized for the unique economic and ecological situations of Khovd province. The findings revealed that the total GEP in Khovd province ranged from 110040.7 million dollars to 113650.2 million dollars in 2015 and 2020, respectively. Among the different components of GEP, the value of ecosystem cultural services shared a tiny proportion, accounting for 0.00356% and 0.0033% in both 2015 and 2020.
Keywords: Mongolia, travel cost method, GEP accounting, Khovd, ecosystem valuation

GEP ТООЦООЛОЛ ДАХЬ ЭКОСИСТЕМИЙН СОЁЛЫН ҮЙЛЧИЛГЭЭНИЙ ҮНЭ ЦЭНИЙГ ТООЦОХ НЬ: ХОВД АЙМГИЙН ЖИШЭЭН ДЭЭР

Хураангуй: Экосистемээс хүртэж буй үр ашгийг хэмжих, ач холбогдлыг ойлгох үр дүнтэй арга зам бол экосистемийн эдийн засгийн үнэлгээг хийх үйл явц юм. Экосистемийн нийт бүтээгдэхүүн (GEP) хэмээх ойлголт нь экосистемийн бүх бараа, үйлчигээний эдийн засгийн үнэлгээг тодорхойлох тусгай үзүүлэлтүүдийг ашигладаг. GEP нь хүний сайн сайхан байдлыг хангадаг тухайн бүс нутгийн экосиситемийн бараа, үйличлгээний нийт үнэ цэн бөгөөд тоо хэмжээ, тэдгээрийн мөнгөн дүнгээр илэрхийлэгдэнэ. Энэхүү судалгаагараа Монгол улсад экосистемийн үнэлгээний талаархи шинэ мэдлэгийг танилцуулж, мөн аяллын зардлын аргыг кейс судалгаанд анх удаа ашиглахыг зорилоо. Ингэхдээ Ховд аймгийн экологи, эдийн засгийн нөхцөл байдалд тохирсон GEP тооцооллын загвар хүрээг тодорхойлсон. Ховд аймгийн экосистемийн нийт бүтээгдэхүүн нь 2015 онд 110040.7 сая доллар, 2020 онд 113650.2 сая доллар гэж тооцогдсон. Соёлын үйлчилгээний үнэ цэн нь 2015 онд нийт экосистемийн бүтээгдэхүүний ердөө 0.00356%, харин 2020 онд 0.0033%-ийг тус тус эзэлжээ.

Түлхүүр үг: Монгол, аяллын зардлын арга, GEP тооцоолол, Ховд, экосистемийн үнэлгээ

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1. INTRODUCTION

Ecosystems encompass natural assets such as freshwater, oceans, forests, deserts, grasslands, wetlands, pasture etc. The ecosystem not only provides abundant material products for human life such as food, drinking water, wood, and medicine and others, but also supplies essential services for human survival and development including regulating the climate, releasing oxygen, fixing carbon dioxide, conserving water sources, windbreak and sand fixation, and more.

According to International Valuation Standards (IVS, 2020), a "valuation" refers to the act or process of determining an estimate of the value of an asset or liability by applying IVS. Robert Costanza became the pioneer in estimating the global value of ecosystem services, bringing newfound attention to the field of ecosystem valuation in 1997. He defined "valuation" as the evaluation of how a specific object or action contributes to achieving a particular objective, regardless of whether that contribution is fully recognized by the individual involved (Costanza, 2000). The evaluation of ecosystem services is rooted in the three primary aims of efficiency, fairness, and sustainability, as delineated by Costanza and Folke in 1997 and reiterated by Costanza in 2000. This requires comprehending their individual standing in the current or prospective societal framework.

An efficient way to gauge the relationships between ecosystem resources and people is through "ecosystem valuation." The services that the biosphere and its ecosystems give have always been essential to humanity. Numerous advantages provided by these ecosystems are essential to human welfare (MA, 2003). Subsequently, the World Bank recognized that the advantages provided by natural ecosystems are generally known but not entirely understood. As a sign of the United Nation's view of the "System of Environmental-Economic Accounting (SEEA) Core Framework" as a measure of similar importance to the System of National Accounts, the United Nations Statistical Commission affirmed it. Using the SEEA framework in 2012, nations have used it to carry out a variety of ecosystem accounting and evaluation procedures.

In February 2013, China launched the GEP accounting project, which measured the final output value of a certain regional ecosystem for economic and other human activities in a specific period. It provides an important reference for quantifying the ability of natural resources to provide ecosystem service and their contribution to human well-being. In the same year, China first proposed exploring the compilation of a Natural resource balance sheet (NRBS) and proposed auditing advancing leaders for eco-environmental responsibility (Song et al., 2019).

Ouyang and Zhu first proposed the idea of the GEP in 2013 (Jiang et al., 2021). Many ecological initiatives were carried out between 1997 and 2017, which resulted in a significant expansion of forest, grassland, and wetland ecosystems and a notable decrease in the area of bare land ecosystems (Yang et al., 2023). China's efforts to create an ecological civilization have advanced significantly.

GEP is not without theoretical flaws (Lu et al., 2019). GEP is delineated as the cumulative value of final products and services offered by the ecosystem for the betterment of human well-being and societal advancement within a defined timeframe. This primarily encompasses the value of ecosystem material products, regulatory services, and cultural services. Chinese scholars Ouyang and her colleagues contended that the gross domestic product (GDP) inadequately captured the role of nature in economic activities and human well-being. As a response, they devised a measurement criterion for the gross ecosystem product (GEP) and concurrently established an indicator system along with an accounting method (Ouyang et al., 2021). By employing GEP accounting, we can enhance our comprehension of the ecological interconnections among regions and grasp the worth of both the supply and regulatory services provided by each ecosystem. Simultaneously, GEP accounting can facilitate the positive feedback loop of safeguarding, restoring, and managing ecosystems more effectively (Yang et al., 2023; Ouyang et al., 2021).

In their presentation of the framework development and implementation of China's Gross Economic-Ecological Product accounting, Guoxia Ma et al. (2020) computed GEEP using the GDP of the economy while taking ecological benefit and ecological harm into consideration.

In September 2020, the first version of the technical guideline on Gross Ecosystem Product (GEP) was issued by The Chinese Academy of Environmental Planning and Research Center for Eco-Environmental Sciences. GEP has been applied to many regions and counties of China and various ecosystems.

The primary goal of this paper is to assess the value of cultural ecosystem services in Khovd Province for selected years, with estimates derived using GEP accounting. Cultural ecosystem services are expected to be evaluated using an enhanced methodology based on GEP accounting, which can provide a more accurate determination of the monetary value of this sector. Therefore, our research aims to apply GEP accounting and establish an appropriate framework in Mongolia and our chosen case study for the first time. Drawing on the study results regarding the valuation of ecosystem goods and services, this research explores the concept and significance of GEP. Additionally, this study brings several innovative contributions to the field. First, it will use comprehensive valuation methods, combining both market and non-market approaches to capture the full spectrum of ecosystem services. Second, it will bridge the gap between academic research and policy applications by offering concrete strategies for integrating GEP into Mongolia's governance. Thirdly, it analyzes the categories of ecosystem goods and services and their accounting methods, aiming to provide a reference for developing an evaluation mechanism. This mechanism would reflect ecosystems' contributions to human well-being and the effectiveness and benefits of ecosystem protection. The study aims to contribute to the literature on ecosystem service valuation in Mongolia, as well as to inform regional planning and tourism policy.

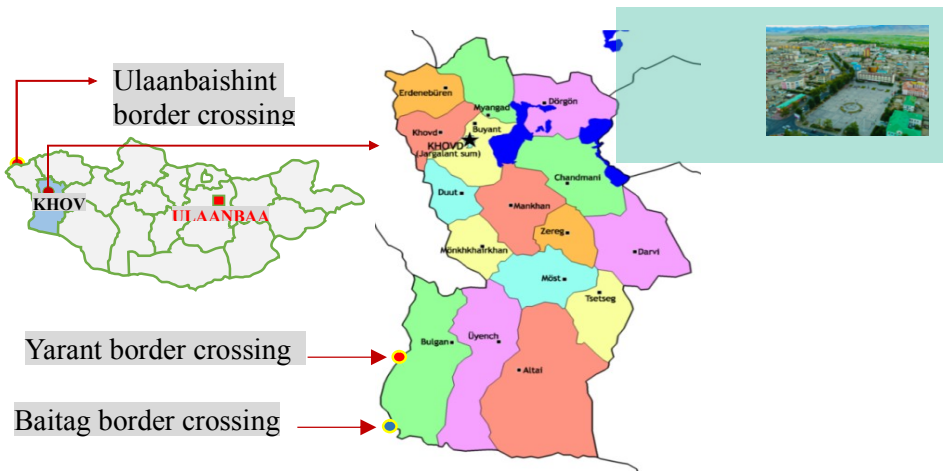
2. METHODOLOGY

2.1. Study area

Jargalant, the administrative center of Khovd province in the Western Region of Mongolia, is 1,470 km from the capital, Ulaanbaatar. Khovd province, which includes a central administrative area and 16 main counties, referred to as soums, is located in the far west of Mongolia (90°40'~94°18'E, 45°00'~48°55'N), with a total area of 76000 km2 and a total population of about 88974 in 2020 (31081 in Jargalant province center, 42684in 16 counties), on the West and South-West Khovd province bordering with the People's Republic of China, on North-West with Bayan-Olgii province, on North with Uws province, on North-East with Zawkhan province and on East with Gobi-Altai province. Khovd province encompasses the Great Lake Basin in the northeast, the Central Mongolian Altai in the northwest and central regions, and the Dzungarian Gobi in the south. The case study area has a wide variety of ecosystems, including forests, steppes, wild rivers, lakes, deserts, snow-capped mountains and abundant wildlife. Twenty percent of the territory is semi-desert and steppe. The highest point of the territory is the Munkhkhairkhan peak height of 4204 m above sea level, and the lowest point is the Altain-Bor-Tsonj depression, whose altitude is 1,126 m above sea level.

According to government resolution and agreements with its neighboring countries (Russia and China), Mongolia officially has 44 border points. One of them belongs to Khovd province, named "Bulgan- Takashiken with China" international permanent border. Khovd province has two international border crossings, Yarant and Baitag, which connect to Xinjiang in China. Khovd city, the provincial administrative center, is located 310 km along the main road from the Ulaanbaishint border crossing (to Russia) and 400 km from Yarant (Figure.1).

Figure 1. Map of Khovd province



Source: Khovd ILPP feasibility study, 2021

2.2 The Travel cost method and its application in GEP Accounting

2.2.1 GEP Accounting Method

Building on previous studies, a GEP accounting system has been developed to reflect the specific ecological conditions of the selected area (Fan et al., 2023; Ouyang et al., 2020; Han et al., 2020; Liao et al., 2019; Wang et al., 2017; Yu et al., 2020; Bukvareva et al., 2021; Hein et al., 2020; Jiang et al., 2021; Warnell et al., 2020; Zou et al., 2020). The selection of GEP indicators was guided by frameworks from case studies in IMAR, Arxan, Dalian, and Qinghai, as these regions share key ecosystem characteristics with the study area.

The calculations using Equations (1–5) were conducted by the GEP technical guidelines (1.0 version), ensuring standardization, accuracy, and reliability. Equation (1) outlines the components of GEP, which quantifies the economic value of ecosystem services.

$$GEP=EPS+ERS+ETS \quad (1)$$

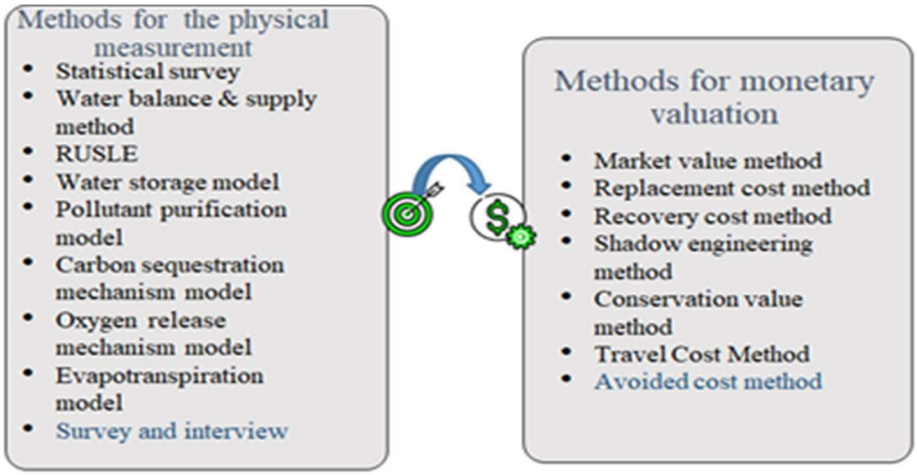
Value of material service (EPS), it should be noted that of the three primary ecosystem services, the material service category should be defined in greater detail, as it more effectively reflects the economic benefits of a selected area compared to the other two service categories in Mongolia. As Equation (1), material services mainly include agricultural crop production, animal husbandry production, ecological energy, water supply, fishery and aquatic production, forestry production, and others.

$$ERS=FM+SR+WP+AP+CS+OS+WR+CR+PM \quad (2)$$

As Equation (2), ERS was defined as the accounting framework for GEP in the Inner Mongolia Autonomous Region (Fan et al., al 2023). It was used as an indicator of regulating services in Mongolia, which mainly includes soil conservation (SR), water purification (WP), air purification (AP), carbon sequestration (CS), oxygen supply (OS), water retention (WR), climate regulation (CR) and flood storage (FM). Because Mongolia is a landlocked country, the value of coastal protection is not involved. ETS, cultural services mainly include ecotourism values.

The GEP is accounted for using biophysical quantities and valuing several ecosystem services. Specifically, the value of material services is mainly assessed using the direct market price technique, the value of regulating services is primarily determined by the replacement cost method, shadow engineering method, and other methods (Figure.2). The value of cultural services is gauged using the individual travel cost method. Units are calculated in millions of dollars.

Figure 2. Methods in the GEP accounting



Source: Developed by the researcher based on the technical guideline on GEP (1.0 version)

Our study utilized the logic chain suggested in the System of Environmental Economic Ecosystem Accounting (SEEA EA): Version 5, White Cover Publication (UNSD, 2021) to establish a standardized framework for describing and evaluating data on specific ecosystem services. This framework aids in clarifying ecosystem flows and the monetary valuation of ecosystem services and assets. The framework and chart of ecosystem service flows are illustrated in Figure 3.

Figure 3. Ecosystem service flows in GEP accounting for Khovd province

Source: Created by the researcher using OpenAI platform (free version)

2.2.2 Travel Cost Method

This approach is known as the travel cost method. To estimate cultural services, it is necessary to select an appropriate valuation method that complies with the technical guidelines on Gross Ecosystem Product. Travel cost method (TCM) can be divided into three types: the individual travel cost method (ITCM), the zonal travel cost method (ZTCM), and the random utility model (RUM). If both ITCM and ZTCM were applied in this study, these two methods would have enabled a comparative analysis of the resulting data. This data

provides insights into the number of visits at varying price levels and allows for the evaluation of travel behavior in response to potential changes in the area and its quality. Such an approach aids in developing the utility and demand functions.

As income levels and opportunities for entertainment increase, the demand for both domestic and international travel in Mongolia is expanding. This trend has made the application of the zonal travel cost method (ZTCM) more feasible. Since travel and time costs increase with distance, it is necessary to define a set of zones surrounding the site. By applying the ZTCM to assess visitors' willingness to pay (WTP) for improved environmental services at the chosen site, it becomes possible to determine the economic and environmental contributions of recreational areas, as well as the relationship between travel costs and visitor numbers. However, several challenges emerged during our analysis while attempting to apply the ZTCM to this site. Although the site can be divided into travel zones, there is a lack of official and secondary data regarding the number of visitors in each zone, and there is limited literature on the use of this method in Mongolia. The ZTCM primarily depends on secondary data related to tourist flow and zonal distribution at a recreational site. Given the limited availability of reliable secondary data and the aforementioned challenges, the individual travel cost method (TCM) proves to be more appropriate for valuing the selected site in this case. The travel cost for each region was calculated based on these assumptions, and Table.1 presents the values for the other parameters utilized.

Table 1. GEP accounting in Khovd province, by thousand US dollar (2015 to 2020)

Parameter	Value
TC_j- Travel cost	USD
T_j- Spending time	Day/individual
W_j- Opportunity cost	USD/day
C_j (including $C_{tc,j}$; $C_{lc,j}$; $C_{ef,j}$)- Average travel cost (including transportation cost, lodging cost, food expenses and entrance fee)	USD/ individual
N_j	Number of tourists, by country

Equations 3, 4, and 5 refer to accounting for the value of leisure tourism.

$$ETS = \sum_{i=1}^{j} N_i * TC_i \quad (3)$$

$$C_i = C_{tc,i} + C_{ae,i} + C_{ef,i} + C_{fe} \quad (4)$$

$$TC_i = T_i * W_i + C_i \quad (5)$$

2.3 Data acquisition

Socioeconomic, hydrological, meteorological, agricultural, cultural, and environmental data were obtained from publicly accessible official statistics provided by provincial and government agencies. Additionally, information regarding the biophysical and economic aspects of

ecosystem services was collected from official data sources and relevant literature. Furthermore, to gather data appropriate for evaluating the GEP accounting indicators for Khovd province, we used primary data and conducted surveys. Therefore, we had to carry out various multidisciplinary surveys and evaluation methods to address the data gaps necessary for our calculations.

3. RESULTS AND FINDINGS

3.1 GEP values and changes

Despite the pandemic in 2020, Khovd province's GEP that year was 110,041.0 million dollars, reflecting a 12.5% increase since 2015 (Table 2). Value of ecosystem regulating services comprised 99.6% of the total GEP. The value of material service was accounted for 0.389%. Nonmaterial (cultural) services value accounted for only 0.0035% of GEP and were solely represented by ecotourism, estimated using individual travel cost methods. Due to the pandemic lockdown, foreign tourists rarely visited Khovd province, while the number of domestic tourists increased. The changes in the Gross Ecosystem Product (GEP) of Khovd province from 2015 to 2020 can be explained by changes in supply, demand, and other influences like the impact of pandemic shocks on the utilization of ecosystem services.

Table 2. GEP accounting in Khovd province, by thousand US dollar (2015 to 2020)

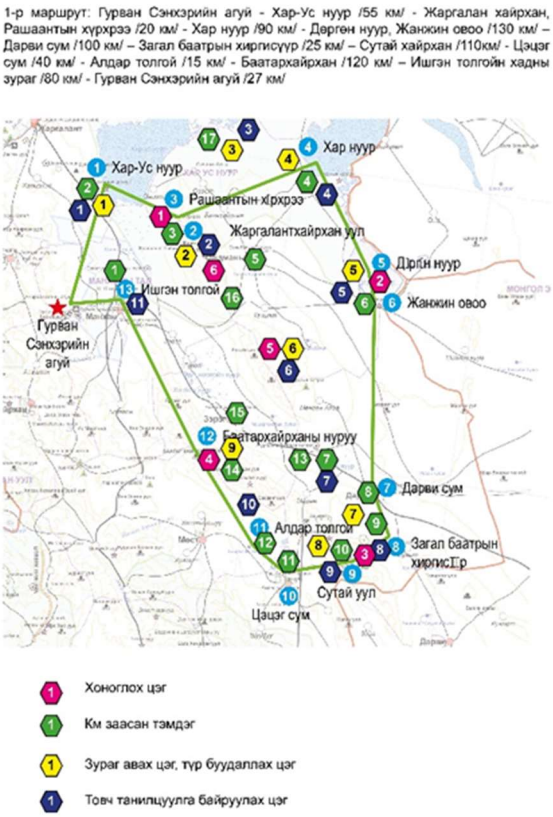
Types of service	Category of ecosystem services	Accounting items	2015		2020		2015-2020 (current price, not inflation-adjusted)	
			Monetary value	Percent of total value	Monetary value	Percent of total value	Amount of change	Percent change
Material services	Production of ecosystem goods	Agricultural crop production	12111.13	0.0120%	14310.58	0.0126%	2199.45	18.16%
		Animal husbandry production	285374.21	0.2824%	322576.50	0.2838%	37202.29	13.04%
		Fishery production	23.62	0.0000%	51.98	0.0000%	28.37	120.13%
		Forestry production	580.82	0.0006%	3.44	0.0000%	-577.38	-99.41%
		Others	151.76	0.0002%	48.50	0.0000%	-103.27	-68.05%
	Water supply	Water use in agricultural irrigation	3142.08	0.0031%	5795.42	0.0051%	2653.34	84.45%
		Water use in households	3942.60	0.0039%	4633.59	0.0041%	690.99	17.53%
		Water use in industry	57227.84	0.0566%	83071.45	0.0731%	25843.61	45.16%
	Ecological Energy	Hydropower	507.62	0.0005%	833.37	0.0007%	325.75	64.17%
		Coal	27139.98	0.0269%	40881.37	0.0360%	13741.39	50.63%
		Households used biogas	2881.90	0.0029%	4829.38	0.0042%	1947.47	67.58%
Regulating services	Flood mitigation	Flood control and storage	37024031.75	36.6427%	40248451.46	35.4143%	3224419.71	8.71%
	Soil retention	Retained soil, N, and P	740825.99	0.7332%	819117.86	0.7207%	78291.87	10.57%
	Water purification	Purification (COD, NH-N, TP)	52469252.43	51.9288%	57368072.56	50.4777%	4898820.14	9.34%
	Air purification	Purification (SO_2, NO_x, PM)	72669.50	0.0719%	671238.15	0.5906%	598568.65	823.69%
	Carbon fixation&	Carbon sequestration & Oxygen supply	147253.59	0.1457%	2851833.92	2.5093%	2704580.33	1836.68%

	Oxygen supply							
	Water conservation	Water retention	1828875.29	1.8100%	1665390.66	1.4654%	-163484.63	-8.94%
	Climate regulation	Evaporation &Transpiration	8361191.48	8.2751%	9545313.17	8.3989%	1184121.69	14.16%
Non-material services	Cultural services	Ecotourism	3518.34	0.0035%	3768.88	0.0033%	250.54	7.12%
Grand total			101040701.93	100%	113650222.25	100%	12609520.32	12.48%

3.2 Value of Cultural Services

In 2020, the government of Khovd approved '"Gurvan Senkher" and its sub-programs, including five travel routes, funded by the World Bank. Figure.4 describes these 5 routines.

Figure.4 Travelling routines in Khovd province



Source: Internal report of Environmental and Tourism Department of Khovd province, 2020

Since the lengths of these five routes are nearly the same, Route-I was selected for estimating travel costs. Opportunity cost was estimated based on the average monthly income across a total of 12 countries, including Mongolia. This was calculated by determining the average net income after taxes and multiplying the net salaries by the duration of travel time. For domestic tourists, who typically travel during their summer vacation, the opportunity cost is considered to be zero.

Although cultural services accounted for only a small proportion of the GEP in 2015 and 2020, Khovd province should implement measures to promote tourism as part of its strategy to diversify an economy that is heavily dependent on its export-oriented mining sector. Overall, the value of cultural services has demonstrated a gradual increase from 2015 to 2020. In 2015, the value of cultural services in Khovd was estimated at $3,518 thousand, and in

2020, it was $3,769 thousand. During this period, the number of domestic tourists saw its average annual growth, while the number of foreign tourists significantly declined due to the COVID-19 pandemic. Despite the pandemic, interest in tourism among Mongolian citizens remained strong, driven by the expansion of paved roads and a growing interest in the country's historical landmarks. This trend is expected to accelerate in the future. However, it is difficult to assert that the infrastructure at tourist sites has been fully developed. The round-trip travel cost for a domestic tourist (TCi) in the Khovd area ranged from $188 to $198, while the round-trip travel cost for foreign tourists ranged from $442 to $2,313 in the selected years.

4. DISCUSSIONS

4.1 Application of GEP accounting and Policy implication

GEP is the total monetary value of ecosystem products and services for human welfare and sustainable development, which can be used as an important policy tool in the assessment of green ecosystem development and regional economy (Fan et al., 2023; Ouyang et al., 2020; Lu, 2019; Yu et al., 2020; Wang et al., 2017; Zou et al., 2020; Han et al., 2020; Liao et al., 2019; Song et al., 2020). Implementing GEP accounting in Mongolia requires an integrated approach considering ecological, economic, and policy factors. GEP quantifies the monetary value of ecosystem services, which can help Mongolia incorporate natural capital into its national and regional development strategies.

Mongolia has historically employed a geographical-genetically classification system similar to those used in Russia and the Inner Mongolia Autonomous Region of China. This system categorizes natural landscapes and ecosystems based on geographical and genetic factors, including climate, topography, soil composition, and vegetation types. This plays a vital role in ecosystem valuation. Expected benefits of the first GEP Framework in Mongolia include policy and economic, environmental, and social benefits. By implementing GEP accounting, policymakers can better understand and incorporate ecosystem contributions into economic planning, leading to sustainable development.

In certain years, the GEP significantly exceeds the GDP, with overall GEP/GDP ratios of 814.8 and 390.3, respectively. This indicates that GDP is not an ideal metric for national accounts in developing countries, particularly in rural areas.

Researchers in this field view and use the GEP/GDP index as a statistical and accounting tool to analyze the growth of the cases. This index enhances the socio-economic-natural evaluation system by incorporating a measure of nature's contribution to humanity, which is currently lacking (Jiang et al., 2021). In Mongolia, GDP growth and GDP per capita are frequently used together to inform decision-making and analyze economic growth and human development at both the sectorial and municipal levels. Evaluating both GEP and GDP together, enabling the simultaneous use of these indices, is essential for fostering integrated economic development and environmental protection.

4.2 The Travel Cost Method and Uncertainty statement

There were some uncertainties around the accounting procedures, indicators, and scope during the study.

It was essential to determine the value of non-material services for non-market resources at the provincial level. There are challenges with valuing environmental amenities that do not have a direct cost, such as free-entry recreational sites. One way to estimate their value is by collecting data on the travel costs incurred to access these sites. Given the scarcity of reliable secondary data and the aforementioned issues, the individual TCM is more suitable for valuing the selected site in our case. This method allows for the assessment of travel behavior in response to potential changes in the area and its quality, which can then be used to develop the utility and demand function. Despite cultural services accounting for only a small portion of the GEP in 2015 and 2020 respectively, Mongolia plans to take measures to promote tourism as part of its efforts to diversify an economy that is heavily reliant on its export-oriented mining sector.

5. CONCLUSIONS

Evaluation of the ecosystem can speed up the recognition and realization of ecological product value. This study was the first complex research on the economic valuation of the ecosystem in Mongolia. GEP accounting enhances our understanding of the ecological connections between regions and helps assess the value of ecosystem services, including ecological product supply and regulatory functions. To achieve the primary goals of this study, we introduced new knowledge and developed the first framework for GEP in Mongolia. Moreover, to precisely identify new secondary indicators for ecosystem material products, we introduced or replaced certain primary products derived from agricultural ecosystems, such as tea, mushrooms, and medicinal herbs, with new indicators. Given the presence of wild white mushrooms and onions in the high mountain zone, we chose data from our primary survey instead of relying on official data. During the study, the valuation of ecosystem regulating services highlighted their critical role in maintaining ecological balance and supporting sustainable development. Unfortunately, there was no advanced research, models, full data or technical guidelines for data on some regulating service indicators in Mongolia. The travel cost method was applied to calculate ecosystem non-material services for the first time in Mongolia.

6. SUGGESTIONS

Applying GEP accounting as a decision-making tool is an effective approach to fostering sustainable development and boosting regional economic growth. We proposed three suggestions for applying GEP accounting in Mongolia.

First, GEP can be widely employed for both planning and assessment, including evaluating government policies and performance, as well as guiding land use and infrastructure development. Thus, it should be reflected in future national programs and regional planning.

Therefore, to develop the tourism sector, attract more tourists, and increase average tourist costs, the valuation of cultural ecosystem services should be systematically estimated and integrated into the long-term policy documents of regional planning. To more effectively implement regional development policies, these documents should cohere and focus on "environmental amenity" through it.

Secondly, it should strengthen regional and national ecological monitoring systems to incorporate the indicators and parameters required for GEP accounting. It helps enhance theoretical and methodological research on the economic valuation of the ecosystem in Mongolia. At last, it should actively carry out pilot projects for GEP accounting and ecosystem economic valuation in different ecological geographic regions across the country.

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