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RESEARCH ARTICLE

IMPORTANCE OF NATURAL RESOURCE ACCOUNTING IN INDIA : A CASE STUDY ON THE MINERAL AND ENERGY RESOURCES

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Abstract

Natural resource accounting is a crucial framework for evaluating the economic and environmental dimensions of a region's resource utilization. This case study delves into the crucial field of natural resource accounting in India, with a specific focus on the management of mineral and energy resources. The study underscores the fundamental axiom that "Measurement of a resource leads to its better management." Through data collection, resource valuation, stock and flow analysis, sustainability assessment, and environmental impact evaluation, the paper reveals insights into the sustainable management of these invaluable assets.India's burgeoning demand for mineral and energy resources, driven by rapid economic growth, necessitates an informed approach to resource management. Natural resource accounting serves as a key tool in this regard. By quantifying these resources, assessing their value, marketing them and considering their economic, environmental, and social impacts, this study advocates for a more informed decision-making process.The study emphasizes how the data and analysis derived from natural resource accounting facilitate the formulation of effective policies. These policies encompass resource extraction quotas, taxation, conservation measures, and environmental regulations, all of which are vital in ensuring responsible resource management.Furthermore, the study acknowledges the significant environmental repercussions of mineral and energy resource extraction. It underscores the importance of accounting for environmental costs and damages, thereby advancing policies aimed at responsible resource management and environmental conservation.A critical aspect addressed in this case study is the assessment of resource sustainability. Understanding whether resources are being extracted at a rate that is sustainable in the long term is paramount. It also underscores the need for policies that promote sustainable resource management and conservation.Transparency and public awareness are another focal point of the study. The availability of information regarding the status and utilization of mineral and energy resources can lead to more responsible resource management practices and enhanced accountability among stakeholders.Finally, this study emphasizes the economic planning and revenue generation potential of natural resource

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accounting. By grasping the value and availability of mineral and energy resources, governments can allocate resources for development projects, infrastructure, and social welfare programs more effectively.In conclusion, natural resource accounting is a vital tool for sustainable resource management in India. By quantifying and assessing these resources while considering their economic, environmental, and social implications, the government and stakeholders can make more informed decisions and work towards responsible resource management. The study highlights the potential for responsible management of mineral and energy resources in India, benefiting both the present and future generations while safeguarding its natural heritage.

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Introduction:-

Natural Resource Accounting (NRA), is an accounting framework to compile data relating to natural resources,of our country in a way to prepare India to achieve the Sustainable Development Goals (SDG) set by the United Nations(UN) by 2030. It will help us in making decisions not only about further usage of thesenatural resources but also for ascertaining the sustainability of these for future generations. It can also play an important role in assessing the environmental impact of the projects beingundertaken, be it by the Government, Private, or through Public-Private Partnership models.

The study on environmental economicsreveals that the words Natural Resource Accounting (NRA) and Environmental Accounting are interchangeable. It defines in particular “double entry bookkeeping" of environmental action (Peskin and Lutz, 1990) in one way, on the other ,it is a system that takes into account the environmental aspects of socialdevelopment, unlike traditional accounting.

Background

Natural resources are essential to every nation for its economic growth because of their inherent importance. There has been a negative impact of late on the environment as a result of therampant overexploitation of natural resources. The idea of Natural resource accounting (NRA) has evolved over a period, to capture the intricate relationship between the environment and the development of a nation's economy.

The United Nations (UN) in its conference on Human Environment 1970, where the connection between Economic Growth and Environmental Degradation has been initially discussed, marked the beginning of the NRA. The UN’s-Brundtland Commission (1987) proposed the notion of a close connection between environmental concerns and economic activity. This was then followed by environmentalaccounting at the Rio - Earth Summit (1992). The International Standards for the Compilation of Natural Accounts werepublished by the UN in 1993 and continued thereafter.

Brief Literature Review

Natural resource accounting is critical for gauging national well-being and its sustainable development. The method of calculating the Gross Domestic Product (GDP) of nation has some constraints (Pettman&Herath, 2005). The nation's long-term development in general, is dependent on both private and public participation, involving natural resource protection (Ashok et al.,2019). One of these is the evaluation of environmental performance, to consider when deciding Commercial success.Hence one needs to have an expert team for environmental accounting practices.

A novel term i.e., Green Gross Domestic Product can be utilized by policymakers to analyze sustainable development with the help of environmental accounting (Rounaghi, 2019). The existing methods for assessing national income are impractical because they underestimate the amount of natural resource usage .As a result, a framework that evaluates the natural capital losses and an appropriate level of sustainability in India is required (Gundimeda et al., 2006). The biggest disadvantage of calculating GDP is that it does not take into account the environmental impact.

The disadvantage of determining GDP can be overcome by having a framework for natural resource accounting.For this goal, to achieve, one needs to have an interdisciplinary framework based on the collaboration of the accounting practices with economic streams is required (Okafor, 2012). Overall business performance should be measured not only in terms of return on investment but also in terms of natural resource consumption and its contribution to micro and macroeconomic aspects of sustainable development (Bardy&Massaro., 2013). The institutionalization of the environmental accounting process, increases accountability for the use of natural resources, which contributes to the country's long-term growth (La Notte& Burritt, 1999).

Water is a natural resource. Accountability for its consumption is a contentious issue, and stakeholders agree that there is a need for a standardized method of accounting and disclosure of natural resources, such as GPWA (General Purpose Water Accounting) in Australia (Tello et al., 2016). Environmental accounting for biodiversity management is only successful when it is supported by a well-organized information system for biodiversity protection. To do so, there must be strong research and practice support in a specific environment (Feger&Mermet, 2017).

Poor management and control of natural resource consumption have a detrimental impact on a country's assessment of sustainable development, which has an indirect impact on the overall growth of the economy (Bassey et al., 2020).An attempt must be made to change the methodologies used to calculate national income by taking valuation features of natural resource accounting into consideration (Common, 1991).

The study of international standards, such as Global Reporting Initiatives and Sustainability Reporting Standards, is required for developing regulations for the adoption of natural resource accounting frameworks (Parameshwar&Abhishek, 2020; Shivalingegowda et al., 2019)

Research Objectives:-

The primary objectives of this paper is (a) to investigate how accounting for natural resources affects economic growth , in the context of Mineral and Energy resources of India, to address.

(b)To evaluate some crucial challenges impeding the exploitation of Mineral and Energy resources of our country.

Sustainable development

In the 1980s, the idea of Sustainable Development (SD) gained popularity and was accepted as a suitable development method by most nations. It acknowledges that the current patterns of resource consumption are unsustainable and that some safer modes of development are required. With the release of the Brundtland Report, SDs gained significant attention. According to The United Nations Conference on Environment and Development (**UNCED**) (1987), these aid in development, that satisfies current wants without jeopardizing the ability of future generations to satiate their own needs of the country.

Sustainable development was defined in Agenda 21 as "development that does not damage or destroy the ecological, economic, or social basis on which continued development depends."

Weak and robust sustainability are two significant categories of sustainability. Ecosystem loss under weak sustainability is not a significant issue as long as society's overall savings rate is high enough to make up for the loss of natural capital and provide sustainable welfare routes. On the other side, Robust sustainability contends that present-day levels of natural capital should be maintained for future generations. Uncertainty and irreversibility are two elements that encourage great sustainability. Because there is anambiguity, on the impossiblility to substitute man-made capital for natural resources, because we do not know how they work. Additional environmental resources have the property of irreversibility, making it impossible to remedy errors once they have been committed. These two characteristics ought to increase human caution when it comes to destroying natural capital (Pearce and Turner 1990).

Sustainable Development Goals set by U.N.

The SDGs, as an aspirational obligation of global leaders, lay forth a broad and outstanding plan that includes socioeconomic-environmental vistas of all-inclusive societal success. The SDGs are a global arrangement of 17 Goals and 169 sub-theme targets to help coordinate and smooth out improvement operations for the greater achievement of all-round human prosperity by 2030.

A number of such general goals, along with area-specific aims, directly address the health of a country's natural resources. The following are SDG set : Land cover/Land use accounts; Ecosystem service supply and use accounts; SEEA-Water, Waste Accounts; Material Flow account; Environment Expenditure accounts,Ecosystem condition account; Biodiversity accounts and SEEA-EA Extent accounts .Index Baseline Report (2018) enumerated the achievements of Indian states by including relevant index scores with a multi-stage application of gathering raw data, handling missing data, creating qualifiable targets, normalizing data sets, and getting composite index scores.

Although there is variety among states in achieving the desired goals, the quantification of the aims and their associated performance is an eye-opener for a trackable roadmap in natural resource accounting. While NRA is centered on the asset repository, which includes biota, subsurface assets, water, and land with their aquatic and terrestrial ecosystems, The mandated and well-defined accounting of these aspects would significantly contribute to accomplishing overlapping and monitorable SDGs.

The interdependence between NRA implementation and proper quantification and goal-orientation of SDGwith sub-topical targets may be useful in the advanced stages of developing an accounting framework .Willers (1994) states that sustainable development is one of the most insidious and manipulable ideas to emerge in decades and that because the multifaceted, global offensive to sell it is essentially unopposed.It is perceived as something of an axiom by the people, which has grossly exceeded the bonds of reasonableness, which is ancestral to a host of environmental and social ills.

Implementation strategy

The System of Economic and Environmental Accounting - Central Framework (SEEA - CF), the most recent framework for resource accounting to be acknowledged and adopted internationally, was adopted by the UN in March 2012. The following are thefour stages of the implementationprocedurethattheSEEA-CFrecommended

1. Asset Account for individual assets in physical & monetary terms showing stock changes.
2. Supply & use tables in physical and monetary terms showing the flow of inputs, products, and residuals.
3. A sequence of economic accounts highlighting depletion-adjusted economic aggregates,
4. Functional accounts which record transactions and other information about economic activities undertaken for environmental purposes.

International Association of Supreme Audit Institutions (INTOSAI-1953)an autonomous, independent and non-political organization that provides an institutional framework for Supreme Audit Institutions, where in C&AG of India is a member. The C&AG has a Constitutional mandate under Article 150 to advise on forms of accounts in India and Section 23 of C&AG's Act- Guidelines for General Principles for GovtAccounting. This created the Government Accounting Standard Advisory Board (GASAB)whichcame out with a concept paper on NRA of India (2020).It recommended that they assist States of our country in preparing NRA.This Board prepared the formats, with the help of state units; prepared the Natural Resource Accounts for 40 Major Minerals; 63 Minor Minerals and 4 Fossil fuels. Thesehave been broadly discussed here in this paper envisaged three-term specific actions over a span of 10 years (2020-30) – that covers with SDGs set by the UN General Assembly.

Short term goals

1. Preparation of Asset Accounts on Mineral and Energy resources in ourstates.
2. Initiation and preparation of disclosure statement on revenues and expenditures related to NRA (2019-20 to 2021-22)

Midterm goals

1. Preparation of National Asset Accounts on mineral and energy resources.
2. Preparation of Asset accounts with respect to other three resources namely water, land, and forest resources in the states.

Preparation of functional accounts recording transactions and other information about economic activities undertaken for environmental purposes. (2022-23 to 2024-25).

Long term goals

1. Supply and use tables in physical and monetary terms showing the flow of inputs, products, and residuals; and
2. Preparation of the economic accounts highlighting depletion-adjusted economic aggregates. (2025-26 onwards)

3. Resources suggested to be covered as per SEEA: seven resources covered vizMineral, Energy Resources;Land&Soil Resources, Timber Resources, Aquatic Resources, Water Resources and Biological Resources.

Mineral Resources Accounting

"The term'mineral' refers to a class of natural substances with definite chemical compositions and, in most cases, a distinctive crystal structure, but it also includes rocks formed by these substances." (CSO, 2018 p.4.1). Minerals are mined and converted into specific commercial applications. Minerals are divided into three types: fuel, metallic, and non-metallic. The goal of creating a physical account of resources is to learn about the availability of a specific resource. This also aids in marketing these in right way. Mineral resources must be used responsibly because their supply is limited in the environment. Mineral resources are taken and employed for economic activity, but they cannot be replenished in human time.

Before establishing the physical asset account, it is necessary to classify the current stock of resources because extracting them is not economically viable. For this classification, two standard methods are available: McKelvey Box and The United Nations Framework Classification (UNFC). The Indian government has been using the UNFC approach since 2003.

The UNFC classifies stocks based on three criteria: economic viability, geological understanding, and feasibility studies. Reserves and residual resources are the two types of resources. The reserve is the portion of a resource that can be economically harvested using a country's present technology, socio-political variables, and so on. The remainders of the resources are classified as residual resources.

National Mineral Prospects

Minerals are significant natural resources because they are limited and non-renewable. They are crucial raw materials for many fundamental industries and a significant resource for development. Mineral extraction has been practiced in India since the days of the Harappa civilization. The abundance of minerals in the form of plentiful rich deposits made it particularly beneficial to the expansion and development of India's mining sector.

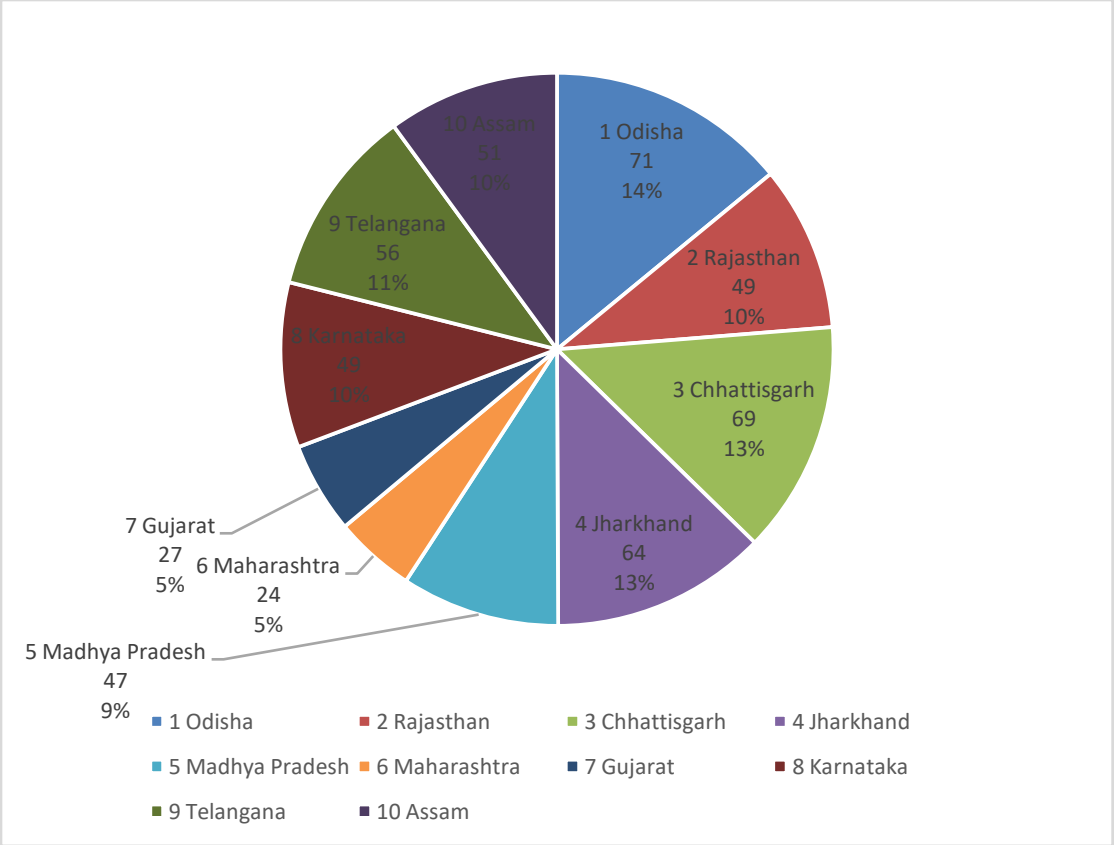
The country has abundant metallic and non-metallic mineral resources. The mining industry is a significant part of the Indian economy. Since independence, there has been a significant increase in both quantity and value of mineral production. India produces up to 95 minerals, including fuel, metallic, non-metallic, atomic, and minor minerals.

Importance of mining sector for States

Receipts from Mineral and Energy resources are collected and retained by the State Governments while those arising out of extraction of petroleum products in ocean beds and those extracted from UTs accrue to the Union Government. These are mainly marketed in India, and some are reported also .State-wise receipts (Finance Accounts) from Petroleum and Mining Receipts and percentage to total non - tax receipts of the state 2020-21 as follows in table-1.

Table 1:- Petroleum and mining receipts (2020-21):

Sl. No	State	Petroleum and Mining Receipts and percentage to total non-tax receipts of the State[7] 2020-21	
		(₹ in crore)	*Per cent*
1.	Odisha	13,919	71.32
2.	Rajasthan	6,764	49.54
3.	Chhattisgarh	4,976	69.72
4.	Jharkhand	4,896	64.73
5.	Madhya Pradesh	4,284	47.28
6.	Maharashtra	3,950	24.75
7.	Gujarat	2,897	27.61
8.	Karnataka	3,881	49.16
9.	Telangana	3,457	56.67
10.	Assam	1,489	51.35



Name of the Mineral	**No of states involved**	**Opening Balance (1st April 2020) In million tones**	**Closing Balance (31stMarch2021) In million tones**
Lime stone	23	86,533.38	87,388.75
Iron Ore	11	6,659.37	6,835.70
Magnesite	4	314.81	314.74
Bauxite	9	434.92	440.29
Copper Ore	3	155.58	153.25
Manganese	9	100.21	112.49
Rock Phosphate	2	80.34	79.47
Silver	1	74.67	74.67
Chromite	3	68.88	66.1
Lead Zinc ore	1	34.88	28.73
Talc	1	15	15
Nickel,Cobalt,	1	13.31	18.69
Chromium,bearing Magnetite			
Siliceous earth	1	4.23	4.21
Silimanite	2	0.84	0.82
TOTAL		**94490.42**	**95532.91**

Thus, the table shows that receipts for the years 2020-2021 was more than 13,919crore in Odisha. Though some States registered a dip in receipts during 2020- 21, which was mainly attributable to the COVID19 restrictions.

Mineral And Energy Resources Covered Across The Country

The state governments possess mineral and energy resources in their borders, hencewere asked to prioritize the resources for the first version of Asset Accounts and then gradually add the remaining resources in later years.Asset Accounts in the States were prepared with mineral and energy resources as prioritized by the respective State Governments.A total of 107 mineral and energy resources were identified viz:-

Table 2:- Asset Account Of Major Minerals.

MAJOR MINERALS	MINOR MINERALS	FOSSIL FUELS
40	63	4

1. Few Major Minerals areLimestone, Iron Ore, Magnesite, Bauxite,Copper Ore, Manganese, Rock Phosphate,Silver, Chromite, Lead Zinc Ore, Tale, Nickel-Cobalt- Chromium bearing Magnetite, Siliceousearth, Silimanite etc.
2. Few Minor Minerals:Marble, Barytes, China clay, Dolomite,Feldspar, Laterite, Silica Sand, Quartz,Quartziteetc.
3. Fossil Fuels: Oil; Gas, Coal & Lignite:

Asset Account Of Major Minerals

In India, minerals are broadly classified into major minerals (non-minor) and minor minerals.The overall position of stock and flow of major minerals is given below in table 2 in millions tonnes

Thus at the end of March 2021,the stock of significant major minerals in the States stood at 87,388.75 million tones ofLimestone; 6,835.70 million tones of Iron Ore;314.74 million tones of Magnesite;440.29 million tones of Bauxite; 153.25 million tones of Copper Ore; 112.49 million tones of Manganese; 79.47 million tones of Rock Phosphate; 74.67 million tones of Silver; 66.1 million tones of Chromite; 28.73 million tones of Lead Zinc Ore; 15 million tones of Tale;18.69 million tones of Nickel-Cobalt- Chromium bearing Magnetite; 4.21 million tones of Siliceous earth; 0.82 million tones ofSilimanite .

Asset Account Of Minor Minerals

Minor minerals are those which are controlled and auctioned/sold otherwise, royalties levied and also collected by the State Governments.

The overall State-wise position of stock and flow of significant minor minerals commencing with the opening stock, additions and extractions during the year, and closing stock at the end of the year 2020-21 are depicted through the following table 3

Table 3:- Asset Account Of Minor Minerals.

S.NO	Name of Mineral	No of states involved	Opening Balance 1st apr 2020 In million tonnes	Closing Balance 31st March 2021 In million tonnes
1	Marble	4	548.22	559.3
2	Barytes	4	50.69	49.47
3	China clay	6	440.05	435.59
4	Dolomite	11	2,399.23	2,393.15
5	Feldspar	5	159.06	161.83
6	Laterite	6	32.69	28.21
7	Silica Sand	8	1,288.74	1,289.40
8	Quartz	8	91.82	94.54
9	Quartzite	7	63.99	76.69
	TOTAL		**5074.49**	**5088.18**

Thus, at the end of March 2021, the stock of significant minor minerals in the States stood at 2,393.15 million tones of dolomite, 1,289.40 million tones of silica sand, 559.30 million tones of marble, 435.59 million tones of china clay, 76.69 million tones of quartzite, 49.47 million tones ofbarytes, 28.21 million tons of laterite and others.

Asset Account Of Fossil Fuels

Researchers at the Geological Survey of Denmark and Greenland have shared alarming findings. They suggest that even if the world were to completely stop using fossil fuels today, the continuous melting of zombie ice in

Greenland could still lead to a global sea level rise of at least 27 cm or 10 inches on average, results in submergence of cultivable land into ocean.

During the course of the study, all four fossil fuels were covered in all 28 states and J&K for the year 2020-21. The entire state position of stock and flow of fossil fuels beginning with opening stock additions and extractions during the year and ending stock at the end of 2020-21 are as below in table 4

Table 4:- Asset Account Of Fossil Fuels.

S.NO	Name of the Mineral	No of states involved	Opening balance(1st april 2020)	Closing Balance (31st March 2021)
1	Coal	14	1,03,017.95 million tonnes	1,05,035.91 million tonnes
2	Lignite	4	7951.31 million tonnes	7902.68million tonnes
3	Crudeoil/Petroleum	7	916.26 million tonnes	904 million tonnes
4	Natural Gas	7	3,05,539.73 million cum	3,01,577.85 million cum

Thus, at the end of March 2021, the stock of fossil fuels in the States stood at 1,05,035.91 million tonnes of coal, 7,902.68 million tonnes of lignite, 904 million tonnes of crude oil and 3,01,577.85 million cum of natural gas. The stock have been captured as on 1 April 2020, (additions and reductions during the year) The closing stock as on 31 March 2021.

NRA has deep inter-linkage to sustainable development; and 10 of the 17 goals (Sustainable Development Goals or commonly known as the SDGs, 2030) are directly or indirectly related to the management of natural resources and their accounting. The government of India is a signatory to the UN General Assembly resolution on the adoption of SDGs titled, “transforming our world; the 2030 agenda for sustainable development”. Thus, it becomes an obligation for GOI to develop standards of resource accounting.

NRA intends to capture the intimate interplay between various components of the natural environment and the economy. It can connect to other datasets to provide invaluable information on the larger picture connecting the environment with the economy. Thus, even from an economic point of view, NRA is important for India.Further, NRA helps to quantify the adverse impact on the environment due to economic development and aid sustainable growth. This makes NRA more relevant in present times.

Conclusion:-

The world is riding on unprecedented development, it is imperative that we keep our historic relation with nature in harmony. Accounting for natural resources will definitely aid both economical and ethical perspectives of life on Earth. For example, accounting for forest wealth has a number of useful policy benefits, including the provision of a framework for analyzing and presenting detailed and diverse data in a manner which supports economically informed policy choices and marketability of natural resources.

In India, the NRA looks to be in its early stages, with many authorities working together to formalise it. Although a variety of initiatives, both global and nationallevel , have been undertaken by stakeholders. The successful implementation of NRA in India requires the accurate preparation of natural asset accounts, interchangeability of physical and monetary resources, economic accounting of resource depletion, functional accounting of environmentally significant events, and planned resolution of related issues with short, mid, and long-term goals.

Deliberations at all levels, along with a coordinated effort to develop NRA standards in line with best global practices in India, have greatly increased stakeholder awareness. Stricter monitoring of country-specific SDGs and their alignment with an amended NRA framework would surely pave the way for a collective focus not only on sustainable development but also on quantifying and accounting for it.

References:-

1. Perrings, C., Vincent, J. R. (Eds.). (2003). "Natural Resource Accounting and Economic Development: Theory and Practice."
2. Ahmad, Y. J., et al. (Eds.). (1989). "Environmental Accounting for Sustainable Development."
3. El Serafy, S. (1989). "The proper calculation of income from depletable natural resources."
4. Hannon, B. M. (1991). "Accounting in Ecological Systems."

5. Haripriya, G. S. (2000). "Integrating forest resources into the system of national accounts in Maharashtra."
6. Ashok, K., et al. (2019). "Private and Public Participation in Natural Resource Protection: Implications for Long-Term National Development."
7. Rounaghi, M. (2019). "Green Gross Domestic Product: A Novel Approach for Analyzing Sustainable Development through Environmental Accounting."
8. Gundimeda, H., et al. (2006). "Natural Capital Losses and Sustainability: An Evaluation Framework for India."
9. Okafor, F. (2012). "Interdisciplinary Framework for Natural Resource Accounting: Collaboration of Accounting Practices with Economic Streams."
10. Bardy, R., &Massaro, M. (2013). "Measuring Business Performance Beyond ROI: Incorporating Natural Resource Consumption for Sustainable Development."
11. La Notte, A., & Burritt, R. (1999). "Institutionalization of Environmental Accounting: Enhancing Accountability for Natural Resource Use and Long-Term Growth."
12. Tello, E., et al. (2016). "Standardizing Water Resource Accounting: Insights from General Purpose Water Accounting (GPWA) in Australia."
13. Feger, C., &Mermet, L. (2017). "Environmental Accounting for Biodiversity Management: The Importance of Information Systems and Research Support."
14. Bassey, E., et al. (2020). "Impact of Poor Natural Resource Consumption Management on Sustainable Development: Implications for Economic Growth."
15. Parameshwar, H. P., &Abhishek, K. (2020). "Developing Regulations for Natural Resource Accounting: Insights from Global Reporting Initiatives and Sustainability Reporting Standards."