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# **Carbon Accounting: Valuation, Challenges and Public Involvement**

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*Abstract- Increasing climate change is a matter of global concern and this is the right time that all the government and nongovernment organizations, firms, investment groups have to assess their GHG emissions through carbon accounting that reflects its carbon efficiency and exposure to risk. All the heavy emitters have to involve environment friendly techniques for carbon accounting at every step starting from processing to product supply chain. They have to assess the causes and factors responsible and apply new methodologies and approaches in calculating carbon numbers and preparing annual carbon budgets. The implementation of carbon legislation and GHG protocol standards, can act as a viable instrument in global carbon management. Moreover, public awareness and training related to GHG emission and reduction and creditability of carbon accounting can play a significant role in environmental carbon sustainability.*

*Key words: global climate change, carbon management, carbon accounting*

## **I. CARBON ACCOUNTING: GLOBAL STATUS & EFFORTS**

The climate change has shown adverse impact worldwide, and raised an alarm to global policy makers to approach for a low-carbon emission and climate externalities fitted for environmental economic analysis [1]. According to recent information China followed by USA, European Union and India including six others, are among the top emitters constituting nearly 70% of total global GHG emission [2]. In the present circumstances carbon management science requires managing the cost-benefits of policy and investigation mechanisms, and ensuring actual greenhouse gas emissions reductions that should be practically implicated by policymakers [3]. The large emitters across the world should develop a mutual working environment including auditors and technical accounting experts, to harmonise accounting practices. They have to establish new working groups, networks and projects in collaboration with new organizations, to keep knowledge and updation of new developments on emissions trading accounting [4]. In the present global scenario the business managers should design a strategy for minimizing greenhouse gas emissions mainly in the area of business supply chain that are the core zones that impact emissions. The pinpoint area includes facility location, transportation modes, and distribution policies, including framing of nonlinear mathematical model that should analyse traditional logistic and carbon emission costs resulting from transportation activities [5].

Several organizations across the world have started adopting certification standards for carbon accounting sustainability [6]. The corporate sector requires information about the impact of climate change policies through carbon accounting as in present time there is no uniform financial accounting treatment for emission allowances [4]. The quantification of the carbon number should be a part of any organization's capital investment accounts. The empirics on the calculative carbon emissions number will become a visible actor in the newly arising carbon market, and its presentation acts like a boundary object and their enrolled allies adopts aesthetic appeal in management accounting system designs [7]. Therefore, carbon accounting should be defined properly to be used in academics to process the research query, by legislators to restrict obligatory and voluntary accounting and by professionals to establish carbon accounting in companies [8]. There should be special emphasis on academic research on carbon accounting, as this is an excellent time of expansion and exploration of carbon account policy [4].

## **II. CARBON BALANCING: VALUATION AND CHALLENGES**

The GHG accounting of any organisation requires selection of issues and questions mainly the determination of boundaries and ownership of greenhouse emissions; operational boundaries and greenhouse emissions accounting of contractors; and challenges of measuring and accounting for GHG emissions and further more research in methodologies[9]. In the coming years most of the companies requires reporting carbon emissions and will likely be faced with emission-reduction regulations, as many countries adopt carbon reducing policies in form of carbon legislation like carbon tax, cap and trade (an absolute limit on emissions and buying and selling of allowances to emit greenhouse gases) etc [10]. The firms have taken interest in this process and an increase in

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demand for the audit services and a growth in the development of accreditation programs among audit bodies has also increased. These audit-body faces challenge in complying with the multitude of GHG reporting and accreditation requirements. For a quality GHG auditing standards the accreditation bodies expressed the need for greater harmonization i.e. regional and national climate change programs should be linked successfully such that carbon measured in one country is the same as the carbon measured in another, and importance of training on GHG reporting and auditing. Further to facilitate this harmonization requires discussion on this subject within existing international platforms, training, guidance and case studies and the development of Multilateral Recognition Arrangements (MRAs) of accreditation providers [6].

The carbon markets which are created by governments and other institutions, has possibilities for modifying their working, including all financial accounting parameters [4]. The anthropogenic induced global climate change (GCC) raises question on the accountability of firms for financial and non-financial performance. In various countries the Governments responded to GCC by creating of markets in which carbon may be traded, effecting financial outcomes for firms in the longer term. There are various problems associated with the valuation of pollution and their identification. A deeper analysis of the risks and uncertainties arising from GCC initiates a debate of non-financial accounting necessary for democratic accountability and carbon status [11]. In most part of the world companies are free to choose their preferred carbon accounting method for emission allowances with advantages and disadvantages. The companies can choose the accounting method that is easiest and simplest suiting their business. Among the disadvantages the companies spend a great deal of time and resources evaluating different accounting models for emission allowances to satisfy different regulators, parent companies, and auditors [4]. The use of a structured overview of methods as the scope of carbon accounting practices is expanding so the new methods such as input-output assisted hybrid accounting, for corporate decision-makers environmental management should distinguish physical and monetary approaches for carbon accounting [12].

### III. APPROACHES FOR NEW TECHNIQUES IN CARBON MANAGEMENT

The impacts of GHG and increasing climate change require holistic approach in preventing and minimizing the negative impacts of these phenomena. There is a need of new information to provide guidance on use of the existing accounting approaches like scientific, political, economic and corporate, for transparency, relevancy and properly interlinked in policy or strategic decision-making in governments, firms, institute and other working sectors [11]. World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD) has convinced businesses, nongovernmental organizations (NGOs), governments, and taken initiative in launching GHG protocol 1998 that contains accounting and reporting standards. The organization should adopt these standards for quantification of indirect emissions that are considered the largest sources of GHG emissions globally, like the generation and consumption of electricity, steam, heat, or cooling (termed as “scope 2”) that will beneficial at corporate, project and product level. The carbon management accounting approaches concentrating on products and the organization has become possible with potential impact in making it leaner, and more efficient in terms of performance measurement and external communication [13]. Energy analysis and climate change effects, as some feedstocks for bioenergy are already attractive from monetary as well as climate change point of view, can also play a significant role in carbon management [14].

Several new methods has emerged to determine CO<sub>2</sub> emissions during supply chains process of an individual products of firms for calculating carbon labels on products which shows increasing public interest for protection and climate-friendly consumption. Here the important criteria for inclusion are the input of the product life path and to balance the emission during supply chain and to pass the data to next stage. This system of data input directly from the trading partner at any stage make the computation easier [15]. The advances in trade technology and reduction agreements depend on evaluating a set of methodologies for dealing with GHG emission uncertainty that should be acceptable to all parties. Standard methods from the actuarial sciences including a cost, or value, should be assigned to changes in GHG emissions and provide an approach to this valuation and also address issues related to reducing uncertainty [16]. The use of computer simulation in cost optimization evaluating road and rail transportation modes along with total cost of emissions and stocks that should ensure a quality customer service should be preferred [5].

The new financial markets and carbon markets have provoked a dilemma for both the cost-effectiveness of both finance and climate action as the one has isolated, quantified and circulated diverse types of uncertainty involving a sudden change in liquidity and the other one identified global warming solutions with minimization in an abstract pool of tradable pollution rights and connecting them with ‘offsets’ prepared by quantitative techniques, and ceasing historical pathways for less fossil fuel dependence and combating the climate problem [17]. The carbon management can be carried with two basic approaches i.e. un-sustainable and sustainable improvements which play a significant role in corporate functioning such as production, distribution, acquirement, product supply chain, innovation, communication, and marketing [11]. Carbon accounting system must be based on calculation that

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is accurate, consistent over space and time, and incorporates data uncertainty, and to overcome this stress there is need of framing the evolution of carbon accounting that can produce powerful implications for addressing present challenges in carbon accounting [3]. Further, carbon management accounting also support in decision-making, to comply with regulations, better organize energy and material flows for reducing effects and motivating in enhancing eco-efficiency, innovation and legitimacy of the product [11].

### IV. CARBON ACCOUNTING AND PUBLIC LEARNING

The environmental-economic accounting requires special attention on awareness of work for natural capital at the global level. The measurement of progress needs technical and accounting aspects of the new international statistical standards. This type of accounting also not provide a complete basis for assessment of sustainable development, thus there is a need of new approaches for the assessment of environmental sustainability. The academic community should be better utilized with strong potentiality in the area of land and ecosystem accounting. The organization of information between environmental and economic issues and compilation of data provide a broader base of information for public policy and other decisions and can influence social, economic and environmental outcomes [18]. Environmental investigation by companies has become significant for carbon emission reporting as the heavier industrial polluters have shown variations in carbon emissions in asset allocation decisions. This process is governed by exclusion of carbon emissions for generating firm value; methodologies involved in calculating, measuring and reporting carbon emissions; the appropriate spot of reporting; and the quantum of data generated [19].

Social and environmental accounting (SEA) researcher has varied scope for carbon accounting especially market-enabling, physical and political forms along with to collaborate with professionals and practitioners of other field. There should be encouragement for carbon accounting, attracting new researches for greater interdisciplinary cooperation and mutual learning, offering numerous opportunities for involvement with practice and education [20]. Carbon financial accounting is in its formative stages thus there is a need to investigate new accounting rules and practices and a proper platform for discussion and debate on this issue [4]. There is a need of lifecycle analyses that covers the emissions and sequestration from production to end-of-life management. The special concern should be on a searching a sensible general accounting framework that is generally acceptable; proper accounting and correct valuation of carbon released in the atmosphere; and to understand the implications of carbon accounting and potential management strategies [12].

In conclusion, in the present global scenario every country requires carbon measurement using international standards; assess GHG emission associated with the company, firm or organisation, their products, service or event and their reduction strategies. The use of credible carbon credits that are validated, verified and registered with carbon accounting standard under any countries government regulations can be the best option of carbon management.

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