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Sustainable Development from the Green Accounting Perspective

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Derived from international interests to carry out actions that benefit from obtaining sustainable development, the accounting discipline decides to collaborate through green accounting. The present work shows green accounting as the object to study due to the considerable efforts that are being made worldwide to achieve sustainability globally, to achieve harmony between economic, social and natural resources. It is exposed to environmental accounting as a means of support that can contribute to the companies that practice it putting more emphasis on sustainable development. It shows the quantitative and qualitative methodology that will be used to determine if comprehensive accounting is the mechanism that can help an oil service organisations and technology achieve a clean development in the environment. The paper shows the data gaps. This study provides the methodology and data types which can help in improving the green accounting system of the state, as well as the country, to help in sustainable development oriented policy formulations.

Key words: *Environmental deterioration, Kurdistan Region, comprehensive accounting, financial and social balance.*

Introduction

The planet Earth and its environment, in which we find fauna, flora, air, soil, water in its different forms and resources and with which human beings have survived since creation. However, at present there are no longer all those unlimited resources, because the planet has a quite significant environmental crisis (Hamed, et al. 2013). These environmental problems are evidenced to a large extent by high pollution, which is a product, among other aspects, of the increasing degradation and deforestation, the emission of gases, the greenhouse effect, among many other factors.

Undoubtedly, this problem stands as a threat to the existence of future generations and constitutes a challenge to be overcome by contemporary society. For this reason, it is necessary to improve our actions in the face of the environmental problems that currently exist, if we want the use of these resources to be postponed for the entire existence of humanity.

Taking into account the environmental problem, academic initiatives have emerged that seek to study the origins of these situations and in this sense generate contributions that tend to minimise it. Consequently, Green Accounting arises as a need to measure, control, quantify, analyse, propose and report the damages that are done to the environment and thus be able to take preventive and corrective actions for cases that arise.

With data that we can infer from the above, it is considered that public accountants should not be indifferent to this worrying environmental situation. Take for proper registration and presentation. Therefore, it cannot be pretended that a public accountant, unaware of accounting processes in environmental matters, assumes roles that society demands and for which they are not prepared. In relation to the training that public accountants must have regarding environmental aspects, it has been stated that within the disciplines that accountants must see in the course of their academy, it is fundamentally necessary to include the socio-environmental approach so that this form complements the traditional approach, that is, the economic-financial one, both in matters of the accounting and complementary areas. In order to obtain a very complete education with the objective of broadening knowledge, increasing the skills of the accounting professional and increasing the degree of competence in which they can create social responsibility with the environment in which they will perform, for which it is important to have adequate training in values.

However, it is pertinent to comment that green accounting has been increasingly strengthened in the business environment and is on the agenda within the accounting research agenda due to the fact that recently companies have realised that the environmental is incorporated directly into the resources exploited by the economic unit to exercise its productive function.

That said, it is appropriate to state that industrial companies are those that generate the greatest impact on the environment, specifically because of the high degree of pollution they generate. As for commercial and service companies, Villegas (2010) expresses that they must create value and generate benefits for their owners and shareholders. In addition, they have to fulfil their legal obligations and, likewise, with social objectives, to contribute to the welfare of society, which is intertwined with the environment. Therefore, it is the companies, mainly, that the calls to take actions are aimed at so they may take care of their surroundings.

Green accounting is a management tool for decision-making that is developed based on the analysis made by the public accountants (Aybars, et al. 2010). Knowing this, it is intended to provide the reader with an approach to Green Accounting and reveal the current state in which it is in Iraq. Thus, the aim isto constitute an instrument of study primarily for public accountants and training professionals who wish to deepen this academic line.

In Iraq the efforts made in favour of the environment are very few. According to Iraq National Oil Company, the economic effort registered in favour of the environment during 2012 was almost six times less than the damage caused, since the total costs for depletion and degradation were $ 985,064 million and environmental protection expenditures were $ 143,066 million with an environmental deficit of $ 841,998 million. In that same year Iraq National Oil Company registered 125 overexploited aquifers of 653 that exist in our country having an increase of 5.4% over the previous year, the land degradation showed an average annual growth rate of 0.3% during the period from 2003 to 2012. Thus it was observed that the loss of land caused by soil erosion was of the order of 1,256 million tons during 2012, the amount equivalent to the volume of land necessary to cover with a layer of 2 meters high, an extension of land similar to the surface of the Federal District. And so an immense list of environmental problems in Iraq can be made, sustainable development in one of its objectives that has to carry out actions by those involved to prevent all types of environmental problems (Alan, 2012).

However, to achieve the satisfaction mentioned in terms of sustainable development requires not only a new era of economic growth for nations, but also for the equitable and just contribution by individuals And economic entities, who hold the actions and resources necessary to sustain this growth. This has led companies to seriously consider a development strategy focused on the well-being of medium term including people, natural resources and the economy, favouring productivity and growth without destroying the environment. Derived from this interest on the part of companies is to seek improvements in the field of accounting. Thus green accounting is born, as mentioned during the approach in response to businesses need to contribute to sustainability (USEPA,1995). To better understand the term, let us observe that accounting has been found in our lives for many years. This is due to the need that humans have always had to control and quantify the information related to economic operations that has been generating throughout history.Over time accounting was expanding its study and dividing into branches for better understanding, application and improvement in companies. For this to workgovernments had to become more involved through their institutions responsible for creating, issuing laws and accounting regulations that allow companies to integrate sustainable development into their accounting and indicate the way in which they should do so. Therefore it is intended for green accounting as the means to connect natural, social and economic resources with accounting. Accounting is a technique that is used to record operations that economically affect an entity and that systematically and structurally

produces financial information. Operations that affect an entity economically include transactions, internal transformations and other events (Price, 2018).

As you can see, accounting is a technique that is used to record and from it emanates financial information, that is, valuable information that must be interpreted to make decisions. The object of this study is that green accounting or environmental accounting is applicable to both public and private companies.. This accounting is due to the need of companies and individuals to have the techniques that allow them to measure or quantify those economic events that affect the entity and that have a direct relationship with the environment, to provide relevant, reliable, timely, understandable, objective and complete information to the users of the information (Basak, 2007).

Statement of the Problem

Previoulsy great changes have been observed in several aspects in business life that have led to economic growth, but at the same time social quality has deteriorated in the population, and there have beennegative effects on the environment worldwide. Social and environmental issues have been left aside for many years, as it was thought that natural resources would be unlimited and that they would never be scarce. Security has been lost in various aspects, trust, happiness and values that were considered important. Problems have arisen such as the irrational use of the natural environment, pollution, the environmental crisis created by economic development, the contempt for natural resources and the environment in the face of human's insatiable and uncontrolled consumerism. All of the above has led to small and large companies not having an entrepreneurial culture that contributes to the improvement of living standards, protection and care for the environment. Their concerns have been the generation of profits and expansion regardless of whether they fulfil their objective, they cause damage to the environment (Michael , 2002).

Today the global economy is pressing governments to determine initiatives so that large and small companies no longer have only economic goals, but also pursue the environmental and social objective. It is necessary to move from financial growth that are only quantitative terms to a qualitative increase that entails a balanced relationship between economic, social and environmental aspects; market pressures, achieve sustainable development for convenience (Amin , 2017). From the willingness to contribute and support all the aforementioned, the accounting field decided to contribute “Green Accounting” in response to the business need to contribute to sustainability. Green accounting is presented as an area of accounting that aims to generate, analyse and use financial and non-financial information, with the purpose of providing public and environmental policies of economic entities and thus build a sustainable company. However, due to the lack of knowledge about the green accounting process in Iraq, there is still much to do in its application and other related ideas to make it known and

applicable by companies in Iraq to contribute to achieve sustainable development. In addition to the lack of knowledge on the subject, the lack of control and vigilance that companies have on the use of the environment is added.

It is necessary to emphasise that accounting is an economic discipline from which a great variety of specialised phases have been derived, some of these are: management, commercial, banking, oil, hotel, government, health, industrial, accounting, agricultural, fiscal and in this case: green accounting or also called environmental accounting. In this sense, the economic reality of an organisation is they must analyse, in addition to what profitability means to the company, the scope that its economic activity can have in the environment where it operates. Thus constituting an instrument that can favour change, insofar as it is annexing new perspectives such as the environmental to the accounting year. In this way, green accounting has been gradually incorporated into the accounting year, thus achieving entry into the group of accounting issues with greater interest to investigate (Michael, 2002; Nemerow, 2009).

Research Question

- How can green accounting help to achieve sustainable development?

General Objectives

Analyse green accounting in a service company based on national and international organisations that regulate accounting, in order to identify if it provides relevant information that serves as support to achieve sustainable development.

Specific objectives

- Analyse whether it is feasible to implement green accounting in Iraq as a support tool to help achieve sustainable development.
- Determine whether environmental accounting provides the necessary and relevant information that can help companies achieve sustainable development.
- Verify if comprehensive accounting is in accordance with regulations established at national and international level that regulate environmental accounting.

Hypothesis

Green accounting provides relevant information that helps support sustainable development.

Justification

In Iraq, green accounting has not flourished due to the lack of knowledge on the subject. There are very few companies that apply it because the content is not mastered. Therefore the importance of this research is to perform an analysis on what encompasses environmental and comprehensive accounting, providing relevant information that allows the following:

- To companies and the community to know at what level the actions of companies harm or favour social groups in their environment, through indicators established by green accounting itself.
- Facilitate optimal management of resources and establishment of preventive strategies in economic, social and environmental.
- Assist managers in their decision-making process and in the consolidation of policies and objectives that contribute to achieving sustainable development.
- Identify strategic opportunities that can add value to the company.

In general, it can be expressed that the importance of research is that it is considered convenient and significant to analyse green accounting to identify whether it is a means or support tool that can contribute to achieving environmental sustainability. It is essential to know the cost-benefit of implementing eco-efficient solutions that allow companies to be globally competitive and reduce risks to their environment.

Methodology Approach

Data collection, analysis and integration of quantitative and qualitative data will beinterpreted. The review of documents, articles and the phenomenon to be deepened, accounting in the field of sustainable development will be carried out.

Scope of the Investigation

The scope of the research will be descriptive-explanatory, the phenomena studied and their components are considered. The data found on green accounting in sustainable development will be described and then it will be explained how it contributes to achieving sustainable development.

Method

Deductive Method: Research topics will be addressed, usually to the particular, so that they can be easily understood.

Design of the Investigation

Design is the plan or strategy that will be developed to obtain the information that is required in the investigation. The design that will be applied will be the non-experimental, transversal, and descriptive.

Non-experimental design is defined as the research that will be carried out without deliberately manipulating the variables. In this design the phenomena are observed as they occur in their natural context, and then analysed.

The transactional or cross-sectional research design that will be applied consists of data collection. Its purpose is to describe the variables and analyse their incidence and interrelation at a given time.

The descriptive design that will be applied in the work, aims to investigate the event and the values in which the variables are manifested.

Analysis techniques
The Following Techniques will be applied

- Documentary analysis.- This technique will allow to know, understand, analyse and interpret each of the standards, magazines, texts, books, internet articles and other documentary sources.
- Data reconciliation.- The data of some authors will be reconciled with other sources, so that they are taken into account.
- Tabulation of tables with quantities and percentages.- The quantitative information will be ordered in tables indicating concepts, quantities, percentages and other details useful for research.

Results and Discussion

Accounting for Air and Water Resources*:* Case Study of Industries in Kurdistan Region The manufacturing industries in Iraq, Kurdistan region mainly comprise of petroleum products, chemicals and chemical products, food products, textiles, electrical equipment and non-metallic mineral products. Apart from these, some other important industries are engineering, automobiles, pharmaceuticals etc. The Kurdistan region in Iraq and the cities in particular are facing environmental problems such as solid waste management, air pollution, water pollution, pollution due to automobiles, cement industry and oil refineries (Abbas, et al. 2018).

The accounting of resources with respect to the industrial sector of the Kurdistan region is being done taking into account two vital resources – water and air. The industrial green accounting will be a valuable economic tool as it has the potential to provide an insight into the impact of industrial activities on the environment and their subsequent effect on human welfare. This could contribute to major decisions which have to be taken to check environmental degradation and redesign resource use in an appropriate manner and, therefore, help in managing sustainable development. In this connection, it must be remembered that the methodology of accounting varies from resource to resource. Following the various approaches suggested for natural resource accounting, we have developed water accounting in a manner that is consistent with SEEAW (UN 2003, 2006). United Nation Statistical Division (2006) contributed significantly in preparing the Integrated Environmental and Economic Accounting for Water Resources (SEEAW). Garg, Amit, Bhattacharya, Sumana, Shukla, P.R., Dadhwal, V.K., have estimated for 1990 and 1995 the inventory of greenhouse gases CO_2, CH_4 and N_2O for India at a national and sub-regional district level. They have pointed out that the district level estimates are important for improving the national inventories as well as for developing sound mitigation strategies at manageable smaller scales. Therefore, this paper is unique in its attempt to provide a framework to account for resources specifically considering a particular sector of the economy – the industrial sector.

Water Account: The accounting of the industrial water resource has been done with reference to some of the components of UN's SEEAW(2006) which has been taken as a satellite system of SNA based on the SEEA-2003 framework (UN et al. 2003) which are as follows:

Supply and Use Tables in Physical Units: This category consists of physical supply and use tables which provide information on the volumes of water exchanged between the environment and the economy (abstractions and returns) i.e. the industry in this case and within the economy (supply and use within the economy) as well as the emissions by industry. From the demand side, water use in the Kurdistan Region can be categorised into – domestic use of water, industrial use of water, demand for water for the energy sector, water demand for forests in Kurdistan region and last, but most important, water for agriculture or irrigational water demand (Table 1). Thus we understood from Table 1 that industrial water demand which was 2.47% of the total in 2001 increased to 4.11% in 2011. The detailed district-wise industrial water demand of the Kurdistan region was taken and a more detailed analysis was carried out based on industry-wise demand as in table 2.

However, lack of data in the case of 2000-01 and also unavailability of data for 2010-11 do not allow a proper analysis of the changing water demand of the different industries. With rising industrial production, water demand is expected to rise (USDSD. 2001).

Table 1: Sector-wise Water Use for Kurdistan Region, 2001 and 2011

Sectors	**Water Use 2001 (in mcm)**	**Percentage of Total 2001**	**Water Use 2011 (in mcm)**	**Percentage of Total 2011**
Domestic	1980.83	1.88	2270.98	2.02
Forest	23447.95	22.27	23447.95	20.88
Agriculture	73671	69.96	73671	65.6
Energy	3600	3.42	8300	7.39
Industry	2600	2.47	4610	4.11
Total	**105299.8**	**100**	**112299.9**	**100**

Source: Calculated on basis of the information available based on Water Resource and its Quality

Table 2: Detailed Industry-wise Water Demand and Use

Industry	**Unit of Production**	Minimum water demand (cubic meters per unit)	Minimum water demand (cubic meters per unit)	Production in WB in 2000-1	Water use in 2000-01(mcm)
Automobile	Vehicle	40	40	NA	NA
Distillery	Kilo-litre Alcohol	122	170	29400	4.29
Fertilizer	Tone	80	200	NA	NA
Leather	100 kg (tanned)	4	4	NA	NA
Paper	Tone	200	400	NA	NA
Straw Board	Tone	75	100	NA	NA
Petroleum Refinery	ton (crude)	200	250	NA	NA
Steel	Tone	200	250	3142000	706.95
Textile	100 kg (goods)	6	14	20434	0.2

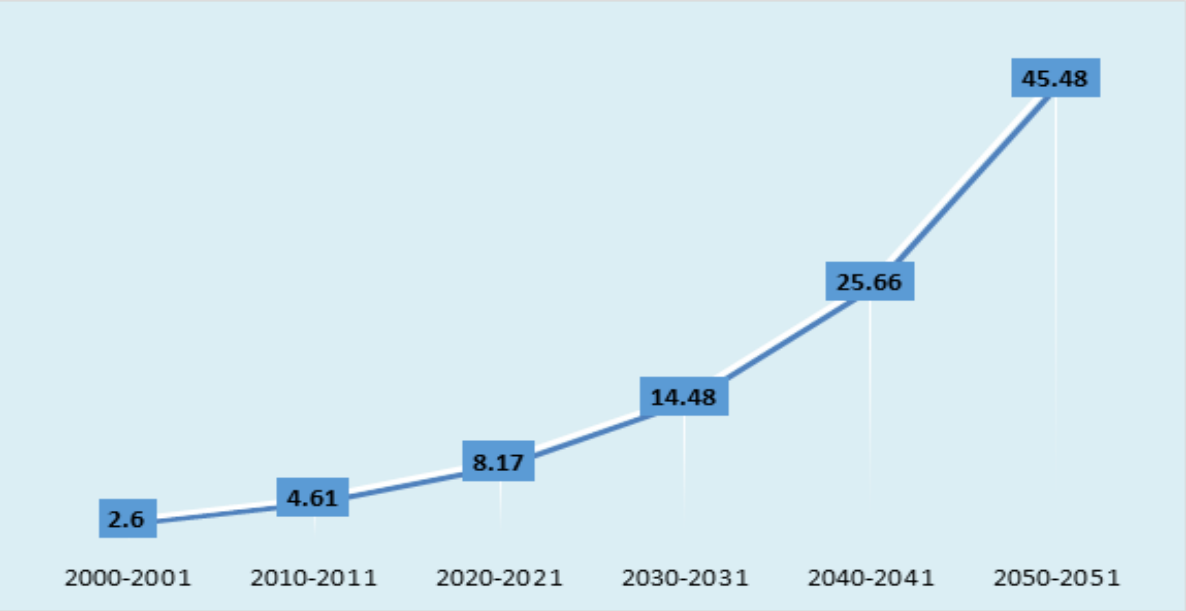
Fig.1 shows the projected annual water demand of the industries. Therefore, yearly data for industries should be collected by district to have proper assessment and appropriate planning. In addition to this, collection of supply information (both surface and ground water) to the industries will enable us to have the actual level of use based on availability and whether policy interventions are required for more efficient system of operation. Moreover, data on sector-wise waste water generation are not available. Therefore, calculation is based on personal

communication with the Kurdistan Region Pollution Control Board as to the approximate waste water generation as a percentage of total water use. We have taken the water demand of the different sectors in the previous chapter as a proxy of water use though we know that the entire water demand cannot be meted as there is a deficit in water supply. We have taken the industrial sector that generates 80% of the water used as waste water. Table 3 shows the approximate discharge of waste water based on whatever information is available. But these are mere approximate estimates and actual estimates are needed for actions such as installations of waste water treatment plants. These are also very important if environmental service and payment for environmental service becomes a policy issue and incentives can be designed to drive sustainable development action (USEPA. 1995).

Table 3: Sector-wise Discharge of Waste Water

Industry	Total Water Use(in mcm)	Waste Water Generation(in mcm)
Year 2001	2600	2080
Year 2011	4610	3688

Figure 1. Estimated Annual Water Demand for Industries Based on the Data



Hybrid and Economic Accounts

The hybrid accounts bring in together the supply and use tables with the economic accounts. The name hybrid originates from the combination of different types of units of measures in the same category of accounts. The hybrid account helps to decide upon possible trade-offs that may be entertained for efficient water utilisation and to ensure optimum possible outcome with regard to the water resource (Gomez, 2010). This account is also necessary for implementing

polluter's pay principle as the users in most cases do not bear the full cost of water being supplied to them and are generally borne by the government. Hybrid account or hybrid supply use table try to interlink the physical and monetary information related to water. However, monetary information with regard to a resource which is almost treated as a "free good" is difficult to obtain specially in our state. We have tried to collate whatever small information is available to gather some information with regards to hybrid account. For industries, the pollution control board information was sourced, the total quantity of water purchased by different industries and the value associated with that quantity of purchase. It was observed that that for the year 1994-95, the quantity of water purchased is 11032 million litres i.e. 11.03 mcm. But for 2001-02, water demand is 2600 mcm, thus the cost of water for the Industrial sector is US$ 8Million. Thus the following water table is formed which has both the physical as well as monetary account within it (Table 4). The total volumes of water used in the industries were known and divided by their corresponding production level, to get the water productivity of the respective industries. But, the problem with this type of productivity calculation is that different commodities are measured in different units and, therefore, it is difficult to compare across industries. While discussing the accounting practices taken up in different countries, we have mentioned that water intensity which is the reverse of water productivity, is important for policy intervention. This is with regards to industrial location in water-scarce regions and where there is competition among various industries, water can be allocated based on necessity and relevance of the economy and in less intensive use.

Table 4: Hybrid Account 2001 having Water Demand as well as Value

Sectors	**Industry**
Water Use (mcm)	2600
Money value of water (Rs'000)	8805821
Gross capital formation	NA

Water Quality Accounts

The quality accounts are generally the asset accounts which try to account for the change in the quality of the stock of water over the period of consideration. Quality account plays a vital role with respect to accounting of environmental resources of industry as the pollution load will take into account the environmental regulation and compare them with the pollution loads corresponding to natural assimilative capacity of environmental media. The physical quality account needs to reflect both the quality of water that is being used by industries, the waste water quality and the place of discharge and whether there is any possibility of treatment.

In the natural resource accounting for the Kurdistan region for the Sectors Air and Water (Abbas, et al. 2018), it was found that an attempt was made to account for the quality of

emission water of the most water intensive industry – the paper and pulp industry. The place of waste water discharge, quality of untreated and treated water and water quality index for the effluents both before and after treatment was shown. The abatement cost was also calculated along with a tax rate and it was found that if the tax rate is imposed on all the firms then this will induce firms to take low waste technology in the production process. This has serious policy implications that if proper information is made available, then a small tax will induce the firms to take up treatment of waste water and low waste technology. This will hold true for all industries. Therefore, the situation calls for appropriate data collection and sharing among all the stakeholders that can improve the conditions of environmental resource for a more sustainable future.

Air Quality Accounts

In the case of another important resource – air, the quality of air has also deteriorated sharply over the last few decades. Rapid industrial development, sharp increase in the automobile fleet and huge combustion of fossil fuels have aggravated the situation of air pollution. The major air pollutants include suspended particulate matter (total and respirable), sulphur dioxide (SO_2), hydrocarbons (HC), nitrogen oxides (NO_x), carbon monoxide(CO), photochemical oxidants (smog), sulphates and lead (Pb). The air pollutants are classified as primary and secondary pollutants depending on the process of formation. The primary air pollutants are generated directly from the source whereas the secondary pollutants are produced from primary pollutants by complex chemical reactions. In the Kurdistan region, the major sources of air pollution are industrial emissions and automobile emissions (Hamed M. Jassim et al., 2013). Therefore, what is needed is an appropriate framework to account for sector-wise emissions. If data are available on the emissions for different sectors the policy makers can go for an introduction of cleaner technologies wherever required, enforce tax rate where compliance is not achievable.

To find the emission of the industrial sector, we were only able to calculate the emission due to coal consumption in Table 5. Therefore the coal consumption of the different industries in the case of the Kurdistan region have been taken. Data with regards to other fuel consumption is not available. Industrial emission due to coal consumption, it is estimated by multiplying the calorific content of coal consumption with the emission coefficient. The data on consumption of coal is taken from the Annual Survey of Industries. Industrial contribution to air pollution for the Kurdistan region is presented in Table 5. Again these are only a fractured idea of contribution of air pollution of the industries. Since the ultimate objective of any particular state is to reduce air pollution, assessment of detailed contribution of air pollution of all the sectors may help in this situation. The detailed accounting will provide insight as to the true percentage contribution. On basis of that, proper controlling mechanisms with suitable enforcement will help the economy to a more sustainable state. Considering the issue that there

may exist a trade-off between development and environmental quality, if a command and control system cannot be enforced, other mechanisms like tradable pollution permits and introduction of tax may also be effective in reducing pollution level. Heavy reliance on the command and control technique for environmental regulation is not always cost effective as experienced by OECD countries. The Kurdistan Region Pollution Control Board is taking up various policies to combat and control air pollution particularly at the industrial and the automobile sector level. This will also enable economists to calculate the cost of industrial pollution and the associated abatement cost and cost of mitigation strategies which will reflect the actual welfare of the people in general addressing the intergenerational aspect also.

Table 5: Value of Water Productivity

	2003-04 GSDP at current prices (Rs Crores)	**Water use (in mcm)**	**Water Productivity**
Manufacturing	37574.45	2600	14.45

Source: Author's estimate based on Table and Statistical Abstract 2005

Table 6: Emission Account for Air Resource in Kurdistan Region

Kurdistan Region	**Emission CO tonnes**	**Emission NO2 tonnes**	**Emission PM10 tonnes**	**CO2 EMISSION**	**Emission SO2 tonnes**	**Carbon emission**
Industrial Coal Consumption	NA	33390.82	NA	NA	23381.58	1779242

Source: Author's estimate

Policy and Conclusion

Based on the data available from secondary sources, a framework is presented for industrial green accounting in accordance with the methodology as suggested in the literature. The following points are the important conclusions that can be arrived at based on this study:
In case of water account; the supply and use table can be used as a data base on the percentage of industrial water demand, inter-sectorial requirement and, therefore, can facilitate comparisons across time periods. However, as we have seen there are huge data gaps in this area, which, if addressed properly, will help in water resource management with water conservation, preservation and recycling thereby improving water use efficiency.

In case of air account, the ultimate objective of all states is to reduce air pollution. But for that, assessment of air pollution of all the sectors is needed. In this case, while preparing the industrial air accounting, we could only account for the emission due to coal consumption of industries in the Kurdistan region. Due to lack of data, and emissions due to other fuel use was

not calculated. Therefore, what is needed is industrial use of all fuels and the corresponding emission of different pollution parameters. In addition to this, supplementary information regarding exposure of the industrial workers to the industrial air pollution, and their health impact, if any, can truly reflect the air quality account of industries.

The most important conclusion is for sustainable development. The first step is proper accounting for natural resources at the industry level and public access to the data which will create the much needed awareness and, therefore, change the resource use pattern to promote efficiency. The Kurdistan region is a diversified province in terms of its socio-economic features and, therefore, the approach of accounting needs to be a bottom-up approach. That is, firstly the data building should be at the district level with appropriate access, availability and correction and ultimately consolidating it to the aggregate state level accounting. This secondary data source can facilitate the process of forming fairly good sustainable development indicator -water account and an air quality account can be prepared and used by policy makers for monitoring development pathways towards sustainable development. This can be updated from time to time and based on the findings, there needs to be a revision of policies addressing the priorities on a periodical basis. However, further improvement should also be in the agenda of the development planners.

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