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RESPONSIBILITY REPORTING (ENVIRONMENTAL ACCOUNTING AND REPORTING)-METHODS, TECHNIQUES AND TIPS TO PREPARE- A CASE STUDY

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Abstract:

The most important issue which bothers the researchers, academicians, experienced and new to accounting and audit profession related to environmental accounting is how to measure and record environmental related transactions in the books of accounts, what to be reported and how to report. It is felt by many academicians and professionals that there is no standard to measure and record environmental related transactions. The profession institutes have tried to educate one's professionals over a period of time, but it has not adequately reached neither professionals nor academicians in India especially South East Asia. Different countries come with legal/voluntary implementation of environmental related reporting but to handle such environmental issues there is a perception that there is a dearth of knowledge on this subject. Therefore, it is necessary to bring out valuable inputs in this regard to educate and valuable resources in order to understand the environmental recording and reporting so that the educational institutions, professional bodies can get adequate personnel to implement at the speed of environmental degradation. This research is conceptual in nature and based on secondary data. The limitations of the study is that all resources are not adequately given here in this paper to educate environmental issues related accounting and reporting. The users of this research article-Academician, professional, training organisations can make use of this resources to bring change to implement environmental accounting and reporting for the welfare of the society and make adequate change in the financial books of account to incorporate as a part of liability in the Balance sheet statement

Key words: Environment, recording, reporting, organization, financial statements, and Accounts

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Introduction

The perception of academicians, professionals in accounting regarding environmental accounting is that it is difficult to define environmental cost, recording and reporting. Having defined such costs are difficult to separate out and identify. Having done all of the above it is difficult to control such costs unless they are correctly identified. More over the computation of CO2 for each type of fuel, types of mode of transport, water conservation, and quantum of reuse of water, carbon neutral measurement, carbon credit and appropriate methods for the calculation of environmental costs are also to be addressed here.

Accountancy is the business language, which is expressed in terms of money or money's worth in black and white. It is a symbolic communication between the organization and the stake holders. Its grammar is accounting concepts. The foundation for accounting is based on four accounting concepts such as money measurement, accounting periods, distinct business entity and going concern. Later, many more accounting concepts and conventions emerged.

The limitations of traditional accounting system is that it focused on the information needs of those involved in business resource allocation and decision, assumes that it is difficult to quantifying costs of environmental reporting, Liabilities are discounted to present value of future clean up expenditure is considered as ordinary, entity is treated as distinct from owners and other stakeholders, ignores externalities caused by the reporting entity, expenses not controlled by the entity are excluded and externalities caused by the entity can not be reliably measured and so not recognized.
Pollutants

Atmospheric pollutants are either gaseous or particulate in nature. They adversely affect human beings, vegetation, materials and climate in several ways. Following are some of the atmospheric pollutants. There are six primary pollutants which include sulfur dioxide, nitrogen oxides, two measures of particular matter (PM2.5 and PM10), ammonia, volatile organic compounds and carbon dioxide emissions.
Following are some of the pollutants cause for environmental degradation: Types of Pollutants/Effluents: pH, Oil and Grease, Biochemical Oxygen Demand (BOD),

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Chemical Oxygen Demand(COD), Suspended Solids, Phenols, Sulphides(S), Sulphates($SO4^2$)CN, Ammonia, TKN, P, SO2, NOx, Particular Matter(PM), Flourides(F) Carbon Monoxide(CO), Nickel and Vanadium(Ni + V), Opacity %, VOC reduction, Cardium(Cd), Nikei(Ni), Zink(Zn), Hexavalent, Chromium(Cr), Copper(Cu), Lead(Pb), Iron(Fe), Suspended Solids, Phenolic compounds(C6H5OH), Ammonium Nitrogen (N), Bio-assay Test(90% survival of fish after 96 hours), CER(Carbon Emission Reduction) and HFC23.

In 2003, the UNDSD come out with four management accounting techniques such as input/output analysis, ABC(Activity Based Costing), Lifecycle Costing and Flow Cost Accounting for the identification and allocation of environmental costs.

Methods and Material

This case study is based on secondary data collected from various companies' responsibility reporting specifically from WIPRO, INFOSYS Bangalore, web sites, research articles, books, news papers. The limitation of the study limited to one or two companies are sample of the study. Good number of studies

Objectives of the study

Being a new concept in Indian situations, many professionals, academicians are to be educated to understand Responsibility Reporting or GRI which is imperative. The methods, techniques and tips in this case study will be immense help to professionals and academicians who are interested in teaching and practicing on environmental accounting and reporting.

Methods of environmental accounting

The research paper is based on secondary data collected from news papers, books, research journals, web etc. The limitations of the case study is that case to case preparation of environmental recording and reporting differ, how ever this can be used as a guideline in the preparation of environmental accounting.

Following are environmental accounting methods to measure environmental costs.

1. Input/outflow analysis

   What comes in must go out. Input must be equal to output. Suppose for every 100

SJCC Management Research Review
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Vol: 6 No : 1 June 2016, Page No: 1-15

Kg of input, 80 Kg output and the remaining physical quantity either as scrap or waste. The waste material may have environmental impact either in the form of pollutants or add additional costs to treat effluents before being let into field or water resources or air. Here, we know the physical quantities and in monetary terms too.

2. **Activity-based costing**

Environmental accounting has a major importance as it is to be measured in monetary terms and disclosed in the financial statements. Environmental costs are divided into direct, indirect and contingent. They are hidden in the general overheads.

The Direct environmental costs are identified and allocated and indirect environmental costs are identified and revise the allocation bases using Activity Based Costing (ABC).Key environment cost drivers are identified for allocation of indirect environmental costs.

For example, Nigeria National Petroleum Corporation(NNPC) identified, collected and analysed physical and monetary information on the use, flows and destines of energy, water, material(including waste) for internal decision making.

The Everlight (Taiwan) environmental accounting system includes a cost rationalization allocation method. This system can accurately reflect the environmental costs and total costs each product, which thereby enables Everlight to better control product costs, product pricing, or strategies related to orders for products. This data also helps Everlight make correct judgement when it engages in investment.

The following are environmental costs and benefits based on ABC:

1. Environmental related costs:

a) Capital costs: building, production equipment, pollution control equipment, emission monitoring equipment.

b) Production costs: Residual management and disposal costs, energy, raw material, supplies, monitoring , testing, reporting, record maintenance, insurance, environmental taxes, labeling, research and development.

c) Liability Costs: Penalties and fines, future liabilities from contamination of production and residual disposals, soil and waste removal and treatment, ground water removal and treatment, economic loss and natural resource damage, bans and taxes on chemical usage, fines for non compliance, research and development to identify environmentally benign alternatives.

2. Benefits: Recycle residuals, managed residuals, green marketing, brand equity, corporate reputation, risk management, consumer loyalty, savings on insurance premium. (www.umich.edu/npppcpub/resoources)
   Pollution(Latin: Pollutionnem, meaning to soil)
   It refers to any change which adversely affects the biological and non-biological equilibrium of the environment. A man needs about 25 kg of air for his requirements of oxygen per day. Air is mixture of several gases. Following are the components of air.

Component	% by volume
Nitrogen	78.08
Oxygen	20.95
Carbondioxide	0.033
Hydrogen	0.00005
Argon	0.934
Methene	0.00015
Ozone	0.00005
Others	1.0028
Total	100%

SJCC Management Research Review
Printed ISSN - 22494359
Vol: 6 No : 1 June 2016, Page No: 1-15

International standards for drinking water

The following table gives international standard for drinking water.

Component	Standard
pH	Range 5.5-9.5
Fluoride	1ppm or 1mgdm^{-3}
Excess of floride-poisonous	10 ppm
Lead	50ppb($\mu g\ dm^{-3}$)
Sulphate	500ppm
Nitrate	50ppm
Zn(Zink)	5ppm
Fe(Iron)	0.2ppm
Mn	0.05ppm
Cu	3.0ppm
Cd	0.005ppm
Al	0.2ppm

Source: Dr. H.C. Srivastava, ISC Chemistry,Nageen Prakashan Pvt. Ltd,Tenth edition pp.834.

i) Carbon standards

The emission standard for India was instituted by the Government of India to regulate output of air pollutants from internal combustion engine equipment which includes motor vehicles. The power is with the Central Pollution Control Board under the Ministry of Environment & Forests. It is applicable to all new vehicles manufactured after the implementation of the new norms. In 2014, Euro 3 and Euro 4 based norms are prescribed. Euro -6 norms are planned by the April, 2020 across the country. (https://en.wikipedia.org/wiki/Carbon_accounting, May 21, 2016); SIAM

ii) Equation between carbon dioxide and burning gasoline and diesel fuel. The following table gives data related to type of fuel and CO2 emission(Year: 2015)

Formula for conversion of one litre of diesel into grams of Co2

Co2 in Grams per litre = [(Weight per litre in grams x carbon %) + Oxigen required

SJCC Management Research Review
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Vol: 6 No : 1 June 2016, Page No: 1-15

for combustion in grams]/ Kilometre run per litre of diesel It is to be noted that the carbon content number of kilometers run makes the different based on the efficiency of the vehicle to be considered while calculating CO2 emission per litre of oil or gas etc. Following are illustrations in computation of CO2 of various fuel.

Diesel:

	Fuel	Weight in grams
1	One litre of diesel	835
2	% of Carbon content	86.2%
3	Carbon content (835 x 86.2%)	720
4	Oxygen required to compust	1920
5	Total weight(720 + 1920)	2640
6	No of kilometr run per litre	20(assume)
7	CO2 in grams =Total weight/No.of Kms per litre run	2640/20= 132

1 liter of diesel weighs 835 grammes. Diesel consist for 86,2% of carbon, or 720 grammes of carbon per liter diesel. In order to combust this carbon to CO_2, 1920 grammes of oxygen is needed. The sum is then 720 + 1920 = 2640 grammes of CO_2/liter diesel.

An average consumption of 5 liters/100 km then corresponds to 5 l x 2640 g/l / 100 (per km) = 132 g CO_2/km.

Or

(Gram Weight of carbon content in per litre of diesel + weight of oxygen required for combustion)/no of kilometer per litre
2640 g/Liter diesel/ 20 kilometres per litre = 2640/20 = 132 grams CO2 per Kilometre.

Petrol:

	Fuel	Weight in grams
1	One litre of Petrol	750
2	% of Carbon content	87%
3	Carbon content (835 x 87%)	652
4	Oxygen required to compust	1740
5	Total weight(720 + 1740)	2392
6	No of kilometr run per litre	20(assume)
7	CO2 in grams =Total weight/No.of Kms per litre run	2392/20= 119.6 grams per litre of petrol

1 liter of petrol weighs 750 grams.

Petrol consists for 87% of carbon, or 652 grams of carbon per liter of petrol.

In order to combust this carbon to CO_2, 1740 grams of oxygen is needed.

The sum is then 652 + 1740 = 2392 grams of CO_2/litre of petrol.

An average consumption of 5 liters/100 km then corresponds to 5 l x 2392 g/l / 100 (per km) = 120 gram CO_2/km.

LPG:

1 liter of LPG weighs 550 grams.

LPG consists for 82,5% of carbon or 454 grams of carbon per liter of LPG.

In order to combust this carbon to CO_2, 1211 grams of oxygen is needed.

The sum is then 454 + 1211 = 1665 grams of CO_2/liter of LPG.

An average consumption of five liters / 100 km then corresponds to 5 litre x 1665 gram/litre / 100 (per km) = 83 grams of CO_2/km.

CNG:

The high pressure CNG gaseous fuel can be expressed in Nm^3/100Km and also in kg/100km. Nm^3 stands for cubic metre under normal conditions. There are two types of natural gas such as Low –calorific and High-Calorific gas. CO2 emission differ due to the composition and origin of the gas. Low –calorific has low energy and low CO2 emission. High-Calorific contains more energy and more CO2 emission.

SJCC Management Research Review
Printed ISSN - 22494359
Vol: 6 No : 1 June 2016, Page No: 1-15

a) Low-calorific:

1 kg of L-gas consists for 61,4% of carbon, or 614 grams of carbon per kg of L-gas. In order to combust this carbon to CO2, 1638 grams of oxygen is needed. The sum is then 614 + 1638 = 2252 grams of CO2/kg of L-gas.

An average consumption of 5 kg / 100 km then corresponds to 5 kg x 2252 g/kg = 113 g CO2/km.

b) High-calorific:

1 kg of H-gas consists for 72,7% of carbon, or 727 grams of carbon per kg of H-gas. In order to combust this carbon to CO2, 1939 grams of oxygen is needed. The sum is then 727 + 1939 = 2666 grams of CO2/kg of H-gas.

An average consumption of 4,2 kg / 100 km then corresponds to 4,2 kg x 2666 g/kg = 112 g of CO2/km.

Types of fuel per gallon	CO2 produced(pounds)
Gasoline(does not contain ethanol)	19.63
Diesel	22.38
E10 burning (Ethanol 10%)	17.68
E10 from ethanol combustion	18.95
Pure ethanol	12.73
B20(bio diesel mix of 20% in Diesel)	22.06
B100	20.77

Source: www.eiu.gov/todayinenergy/detail.cfm?id=26092(May 2016)

Calculation of CO2 emissions

Fuel type	Kg of CO2 per unit of consumption
Grid electricity	43 per k Wh
Natural gas	3142 per tonne
Diesel fuel	2.68 per litre
Petrol	2.31 per litre
Coal	2419 per tone
LPG	1.51 per litre

Source:http://people.exeter.ac.uk/TWDavies/energy_conversion/Calculation%20of%20CO2%20emissions%20from%20fuels.htm

Transport conversion table

Vehicle type	Kg CO2 per litre
Small petrol car 1.4 litre engine	0.17/km
Medium car (1.4 – 2.1 litres)	0.22/km
Large car	0.27/km
Average petrol car	0.20/km
Small diesel car (>2 litres)	0.12/km
Large car	0.14/km
Average diesel car	0.12/ km
Articulated lorry, diesel engine	2.68/km (0.35litres fuel per km)
Rail	0.06 per person per km
Air, short haul (500km)	0.18 per person per km
Air, long haul	0.11
Shipping	0.01 per tonne per km

Source:
http://people.exeter.ac.uk/TWDavies/energy_conversion/Calculation%20of%20CO2%20emissions%20from%20fuels.htm (on 21st May 2016

Trees and CO2

Trees help reducing soil erosions, creating a suitable for microorganism to grow . A tree is able to absorb around 48 pounds of carbon dioxide per year and has ability to absorb 1 ton of carbon dioxide over 40 years. It takes 10 minutes to walk around the crown of a giant Banyon tree in Calcutta. On an average, trees that are grown in city conditions often do not live more than 13 years.

GHG conversion table (Case study based on WIPRO)

1. Assumptions & Rules of Thumb For HFC's and PFC's the Global Warming Potential of the refrigerant along with a conversion factor of 0.001 is converted into CO2e using standard conversion formulas
2. Waste Protocols Followed Waste figures are obtained based on the generated vs. disposed figures which are maintained in waste reporting sheets
3. Post discussions with vendors the following calculations are to be considered > 1 load = 3kl of slurry ; 1kl = 15 kg of sludge ; therefore, 1 load = 45 kg of sludge Weight of one UPS battery is considered as 11.70Kgs .
4. This figure has been utilized in the event that locations have provided the number of batteries being used as opposed to the Kg Weight of 1 litre of used oil is considered as 0.88kgs.

5. This figure has been utilized in the event that locations have provided the number of litres of used oil being disposed as opposed to the Kg Weight of one CFL bulb is considered as 126g.

6. This figure has been utilized in the event that locations have provided the number of CFL's being disposed as opposed to the Kg Weight of one tubelight is considered as 250g.

7. This figure has been utilized in the event that locations have provided the number of tubelights being disposed as opposed to the Kg Weight of one DG filter is considered as 1.5Kg.

8. This figure has been utilized in the event that locations have provided the number of DG filters being disposed as opposed to the Kg Computation process (IT Systems or Manual) Data on air pollution and refrigerants is recorded in manual systems and aggregated in a central database Environment Employee Commute Computation process (IT Systems or Manual) Protocols Followed Costs are determined based on reimbursement of claims that are submitted by employees on a monthly basis Bus & Cab details are obtained from daily trip sheets

9. Data on employee car reimbursements are obtained from SAP Based IT Systems Data on Bus and Cab travel is recorded in manual systems and aggregated in a central database Assumptions & Rules of Thumb

10. Personal Transport: For 4 wheelers & 2 wheelers, the emissions on account of employee commuting have been computed based on the assumption that 80% of fuel costs assumed are be associated with petrol, 20% of fuel costs assumed to be associated with diesel. This split in vehicles by fuel category is based on the model list of company leased vehicles provided to certain bands of employees.

11. Emissions are overstated by at least 20% as the fuel claim also includes personal travel on the part of employees. We can use parking lot occupancy figures across all India locations to determine a factor of the employees using 4 & 2 wheelers. Based on the annual commute survey results, distance traversed (to and fro) per

day is taken at 31 Km. Public Transport: We can assume an average of 31 Km per passenger per day for public transport. We can arrive at the average distance commuted by means of a travel survey.

12.Multiplying the average passenger KM per day by the assumed number of working days in a year(250) and the number of employees who use the service. The number of employees who use public transport by inference i.e. by subtracting the total of the number of employees who use cars, two wheelers and Wipro operated buses from the total number of employees in our India operations.

13.The WARM (Waste Reduction Model) tool created by the US nodal environmental agency, Environment Protection Agency (EPA) was used for emissions from waste in landfills. This tool available at http://www.epa.gov/climatechange/wycd/waste/calculators/Warm_Form.html In addition.

14.we can use GHG coefficients that are specific to India... for which we have used the guidance tables available from the office of CII (Confederation of Indian Industry's) Mission for Sustainable Development at http://www.cea.nic.in/planning/c%20and%20e/user_guide_ver5.pdf http://www.greenbusinesscentre.com/documents/GHGGuide.pdf

15.Business Travel Assumptions & Rules of Thumb :Air Travel (WTSL* and Agent Booked, covers all geographies across all businesses): Itineraries with IATA airport codes are available for this category. The itineraries are split into individual legs and the distance for each airport leg is calculated using the a airport distance calculator (Flightmap). More than 95% of all business travel is economy class. We can use economy class emission factors throughout all air travel.

16.Bus and Rail for India (WTSL Booked): Itineraries of all tickets (rail and bus) booked are available with Indian Railways Station Codes. For both bus and train, can consider route segments which contribute to 80% of travel. For Rail, this 80% is from 82 routes. The balance 960 routes cover the balance 20% of air travel. For Bus, , this 80% is from 12 routes. The balance 535 routes cover the balance 20% of bus travel. For the selected routes, the distance has been calculated using the station code rail distance calculator available at erail.in. A weighted average for distance (based on selected routes and the number of journeys for that route) is calculated each for rail (506 Km in 11-12) and bus (410 Km in 11-12). The weighted average distance is applied across the balance 20% of journeys.

17. Self booked tickets: A significant portion of bus and rail travel in India (50 to 60%) itself booked by employees as per travel policies and then subsequently reimbursed. For self booking tickets, IATA airport codes, Railway Station Codes or standard city names may not be available. Hence we can use a fare basis for different modes of travel to arrive at Kms traversed. However, this assumes that a linear (Kilometer based) cost model is used by all service providers. In India, this assumption is reasonably valid – especially with Indian Railways. Rail: As per India policy, all train travel is by 2nd A Class. Based on key sectors for rail travel (BangaloreChennai, Bangalore –Hyderabad), we can calculate the cost per Km to be Rs 1.8/Km.

18. Bus: Based on key sectors (Bangalore-Chennai, Bangalore –Hyderabad), we can calculate the cost per Km also to be Rs 1.8/Km. Air: Based on key sectors (Bangalore-Chennai, Bangalore –Hyderabad, Bangalore-Delhi), we can calculate the cost per Km also to be Rs 6/Km. This cost/km basis is used to calculate the total business travel Kms and then apply appropriate passenger-km based emission factors.

19. For unclassified travel modes (less than 10%), we can assume a weighted average based distribution and added to the calculations. Conveyance Claims (India): While on business travel, employees also use local conveyance to travel between residences and airports /stations. A majority of these claims (more than 90%) is by private cabs or taxis. Based on the total claim amount and assuming a cost per km of Rs 15, we can calculate the total km traversed.

20. We can calculate the average km per trip. This comes to around 29 Km/trip. Hotel Stays (during Business Travel): The calculation is based on estimated Co2 emissions/day of stay. Based on a
(www.carbonfund.org and
http://www.epa.gov/chp/documents/hotel_casino_analysis.pdf)

21.The split of emissions is done as follows:

a) Electricity: 4 KwH/day.

b) Using emission Factor (average across countries) as 0.7 kg/KwH,

c) Total emissions due to electricity per day is 3 Kg Co2/Day

d) Air-conditioning: Average room size is assumed as 30 m2. Constant cool down from 30 to 25 degcel takes 0.03 KwH/m2. Assuming electricity emission factor of 0.7 Kg/kwh, and 24 hours of use, the emission per day is 16 Kg Co2/day.

22.Heating : Based on 125 Kg Co2/m2 per annum and hotel room size of 30m2, estimated emission due to heating is 10 Kg/day. For India, we can use 19 Kg Co2/day (does not include heating). For overseas, it is used 29 Kg Co2/day.

Conclusion

This case study brings out a selected methods, techniques and conversion tips based on selected companies in India. The conversion for a particular industry depends on the individual environments, law of the country, professional outlook, type of equipments used, year of purchase of equipment, frequency of usage of equipment, mode of transportation, city road and transport conditions, type of pollution, international standards for the year of pollution are to be considered in the computation of environmental cost. The author or the publisher is not responsible for the individual situations or legal repercussions. The above information has to be used judiciously by the user. The appropriate sources are given in the respective places, it will be very useful. These are guidelines based on collection of the author from appropriate sources but not the final end.

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