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CONTENTS

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Editorial Note

In the recent times higher education has become more and more interdisciplinary. An educated individual is expected to understand the basic issues of almost all the subjects apart from the main area of his specialization. For instance a trained management graduate is expected to have an orientation of all the functional areas along with his main specialization. Needless to say that he should possess the skills of computer along with mathematical and statistical skills. The decision making capacity of the trained graduates improves with all these newly acquired traits.

The B-schools realizing this emerging trend in the business environment are modifying their curriculum by introducing the new concepts. The educated post-graduate student at all levels is expected to be multi-skilled and ready to work in the new and dynamic environment. Personality development oriented courses are being given as add-on modules for better employability.

Recognizing these trends in the higher education and the requirement in the job market, we have encouraged articles of interdisciplinary nature in the present issue. The articles range from study of exports, accidents, pollution and other related issues. A book review on an important topic of financial management has also been included in this issue. All these articles are applied in nature and demonstrate the use of statistical techniques for writing good research articles. Therefore it is hoped that the research papers published in the present issue will serve as a good reference for researchers in all fields.

Dr. T. V. G. Sarma
Editor

Identification of Sources of Changes to India's Exports of Environmental Goods and Services

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Abstract: The increasing awareness of climate change and its impact on overall economic growth has encouraged many countries to pursue environmental friendly production and consumption of goods and services. Based on their comparative advantages, developing countries too are emerging as exporters of environmental goods and services (EGS) along with developed countries. An important question in this context is what are the sources of constraints to exports growth for these emerging EGS-exporting developing economies. Using data between 1996 and 2010, this paper identifies the constraints that India, which is one of the fast growing EGS exporting economies, faces for its EGS exports growth. The empirical results show that the growth of India's exports of EGS was negatively affected by its 'behind the border' constraints, while the reduction of India's trading partners' 'implicit beyond the border' constraints has made significant positive contribution to India's exports of EGS, especially during the period of analysis.

Keywords: Environmental goods and services, stochastic frontier gravity model, 'behind the border' constraints, 'explicit beyond the border constraints', 'implicit beyond the border' constraints, Asia Pacific countries.

1.0 Introduction

The East Asian experience confirms that one of the important sources of economic growth is export promotion. While export promotion of goods, particularly manufacturing goods would contribute to economic growth positively, they do contribute negatively in terms of environmental degradation. Thus, there is a great concern expressed in the literature about striking a balance between exports and environment, which is more important for developing countries, though it is important for developed countries too (Garnaut, 2011). India, which is one of the fast growing emerging economies, has increased the levels of living of its people in terms of increasing the per capita income since its 1991 economic reform. Based on the World Bank (WB) data, India's per capita GDP rose from USD 308 to approximately USD 1500 between 1991 and 2011. It also has attracted the attention of the world that India's growth trajectory would lead to various negative impacts on the environment. For example, India's remarkable economic growth has put pressure on energy demand and caused environmental problems such as air pollution, water pollution, garbage pollution and land quality degradation (Agarwal 2011). India's cumulative energy related CO2 emission is expected to reach 80 billion tons in 2030 (IEA, 2009). As a consequence, The Indian government has issued policy statements on forestry, abatement of pollution, national conservation strategy and environment and development to deal with those problems (Gaba et al., 2011).

The increasing awareness of climate change not only in India but also in the world leads to the requirements of environmental protection which results in high demand for environmental goods and services (EGS). During 2007 – 2008, the global market value of low carbon and EGS was £3,046 billion, in which Asia accounted for 38 per cent and India 6.3 per cent (BERR, 2009). Also, the high demand for services concerning the equipment for filtration and purification of water and solid waste handling and disposal in Thailand, Malaysia, Philippines and Indonesia will provide great opportunities for countries like India to export EGS, because the environmental goods and services production has emerged as a distinct industry in India recently. For example, the share of EGS in total exports rose from 1.4 percent in 1996 to reach a peak of 2.28 percent in2009 (Figure 1). However, despite the low effective tariffs on EGS, the "behind the

border" constraints or non-tariffs barriers in many EGS exporting countries including India are very high. Consequently, trade and investment in EGS are low in comparison with those in pollution intensive products. It is in this context, the important question concerns the identification of the sources that influence changes in EGS exports growth for India. Given the importance of the Asia Pacific countries for India's EGS exports, the top 10 Asia Pacific markets are considered for empirical analysis in this study. These countries include: Australia, Canada, China, Indonesia, Japan, Malaysia, Republic of Korea, Singapore, Thailand, Vietnam, and the United States.

The paper is structured as follows. The next section provides the concepts of EGS and overview of India's exports of EGS. Section 3 describes the methodology, empirical model, and data. Section 4 describes the empirical model and discusses the results of estimation along with the results of the decomposition of the changes in EGS exports between 1996 and 2000 and between 2005 and 2010. The conclusions and policy implications are drawn in section 5.

2.0 Overview of EGS and India's exports of EGS

2.1 Definition and classification of EGS

The definition of EGS has been contentious issues in the WTO negotiations. Hamwey(2003) describes that an environmental good is considered any equipment, material or technology used to address a particular environmental problem or asa product that is itself "environmentally preferable" to other similar products because of its relatively benign impact on the environment.

There are also narrow and broader definitions of EGS. Environmental goods can be narrowed down to goods whose use results in a beneficial environmental impact, such as catalytic converters for automobile exhausts. In this definition, environmental goods are actually the capital goods or technologies which are required for 'end-of-the pipe' pollution abatement. The broader definition, on the other hand, takes into account the environmental characteristics of the goods themselves and/or their production processes. This includes the industrial goods used to provide environmental services to address pollution and waste affecting water, soil and air. These goods generally have multiple end-uses and they have relatively less negative impacts on the environment at the production, consumption or disposal stage, or even in terms of being produced in an environmentally benign manner or with 'clean technology'. Examples of these types of goods include: pumps, valves, compressors, tanks and containers, chemicals used in water purification, air/water filters, trash compactors, brooms, plastic lining material for landfill sites, ceramic wares and furnaces used in incineration, sorting equipment for recycling, measuring equipment to monitor the environment, noise reducing mufflers, etc. (Katti 2005).

The issue of classification of EGS is important because it will set clear parameter on the types of goods that are actually liberalized. There are different approaches towards identification of goods that WTO members have proposed over the past few years for multilateral liberalization of trade in EGS. The first suggestion is a list of environment-friendly products which is proposed by the "Friend of Environmental Goods" group including Canada, EU, Japan, Republic of Korea, New Zealand, Norway, Switzerland, Taiwan and theUS. The list has wide-ranging coverage containing153 goods and services with the aim of securing a zero tariff for these products by 2013. In addition, India has advocated the "Environmental project approach",whereby each WTO member would designate a national authorityto select environmental project based upon criteria developed by the Special Session of the Committee on Trade and Environment. Following the framework of WTO, EGS can be classified by12 groups namely, air pollution control, management of solid and hazardous waste and recycling systems, Cleanup or remediation of soil and water, renewable energy plant, heat and energy management, waste water management and potable water treatment, environmentally preferable products, based on end use or disposal characteristics, cleaner or more resource efficient technologies and products, natural risk management, natural resources protection, noise and vibration abatement, and environmental monitoring, analysis and assessment equipment (Monkelbann 2011).

2.2 India's exports of EGS

Although the sector which produces EGS

was virtually non-existent in India two decades ago, India has been turning into a major exporter as well as a promising market for EGS. The domestic environmental industry is still highly disorganized and dominated by small scale units. The environmental business is shared by a number of entities, including equipment suppliers, system suppliers, engineering procurement and construction contractors, consultants and service providers (Katti 2005).

The contribution of EGS export is increasingly important for India. Table 1 shows the export value of EGS by groups over time. Before 2006, the group of waste water management and portable water treatment brought the highest value in terms of EGS exports. However, the export of renewable energy plant has played the most important role in the contribution (more than USD 2 trillion in 2010) of EGS exports. The export of air pollution control also brings high income for India. For example it accounted for more than USD 1 trillion in 2010.

According to the recent data of India'sexports of EGS, the Asia Pacific countries are the important markets for EGS from India and the value of India's EGS exports to these markets is increasing overtime. The US is a major importing partner, which imports most of India's EGS; for example, about 20 percent of the EGS consisting of renewable energy plant group was exported to the US market in 2010. The values of the goods in the groups of waste water management and potable water treatment and noise and vibration abatement sold in the US were around USD 300 million and USD 180 million respectively. Inaddition, China, Thailand, Malaysia and Australia are also dominant importers of India's EGS in the groups of clean up or remediation of soil and water (China – USD 10 million, Malaysia – USD 8 million), management of solid and hazardouswaste and recycling systems (Thailand – USD 34 million) and heatand energy management (Australia – USD 35 million).

3.0 Methodology, Empirical Model, and Data

3.1 Methodology

Gravity model which is based on Newton's law in physics is the most successful approach to empirically examine the factors affecting trade between countries. Although the gravity model is criticized for its lack of theoretical underpinnings, there have been many researchers including Anderson (1979) and Bergstrand (1989) have provided theoretical underpinning for the basic gravity models.

There are many studies that tried to improve the basic gravity model. For example, Harris and Mátyás (1998) showed that there are some omitted variables in the basic model such as exchange rates and foreign currency reserves. Also, Anderson and van Wincoop (2003) argued that the conventional ordinary least squares estimation may suffer from omitted variables bias and the comparative statics analysis would be unfounded. Another problem of the gravity model with respect to the omitted variables concerns the exclusion of 'trade resistances', such as 'behind the border' constraints or non-tariff barriers from the gravity equation. To deal with these problems, researchers have suggested different methods of modeling and estimation of the gravity equation. For example, some suggested fixed effects models (e.g. Bayoumi and Eichegreen 1997), while Egger (2008) suggested the use of panel data models which are non-linear in trade costs, and Feenstra (2002) used price differences between trading partners in his specification of the gravity model. Since McCallum (1995) many empirical papers have used 'remoteness' variables, generally defined by $\sum_{m \neq j} \frac{d_{im}}{y_m}$ where d is distance and y is GDP and the whole term represents the weighted average distance of country i from all its trading partners, except the particular partner j. Anderson and Wincoop (2003) criticized these remoteness variables and suggest another multilateral resistance term. However, these solutions are either not based on any theoretical arguments or cannot fully capture the inherent bias in the empirical estimation. These also give biased results for not taking care of heteroskedasticity and non-normality of the error term of the gravity equation, which emanate from the omitted variables bias.

Kalirajan (2008) suggested an alternative methodology to model and estimate the gravity model taking into account of 'behind the border constraints', which have bearings on heteroskedasticity and non-normality of the error term, drawing on the modeling and estimation procedures used in the stochastic frontier production function literature (Kumbhakar and Lovell, 2000). The advantage of using the stochastic frontier gravity model is

that it is possible to incorporate and measure the effects of 'behind the border' constraints on exports, when the researcher does not have full information about these constraints.

Drawing on Kalirajan (2008), export growth can be decomposed in terms of the different components of the determinants of export growth, such as 'natural' determinants, 'behind the border' determinants, 'explicit beyond the border' determinants, and 'implicit beyond the border' determinants. Thus, the supply of EGS (X) depends on many factors. First, it depends on the GDP and population of importing countries. The assumption is that higher income and population in foreign countries would generally lead to an increase in demand for EGS from India. However, the relationship between distance and EGS exports is negative due to the higher cost of transportation. These factors can be named as 'natural determinants' of export flows between countries.

Next, 'explicit beyond the border' determinants such as the relative price of the imported goods and services that are mainly influenced by importing countries' tariff and exchange rate are another factor affecting export performance. This factor is expected to have a negative correlation with EGS exports because increasing tariffs and devaluation of domestic currencies lead to higher imported prices in the domestic market. Therefore, the demand for imports is reduced.

Different kinds of institutional and infrastructural rigidities that exist in the exporting countries, such as poor port facilities may also influence exports negatively and these factors may be referred to as 'behind the border' determinants in the home country, which are under the control of the exporting countries. Unfortunately, it is difficult for researchers to quantify all the 'behind the border determinants' individually. Nevertheless, the combined effects of all these determinants can be modeled as a random variable with a truncated normal distribution.

Also, different kinds of institutional and infrastructural rigidities that exist in the importing countries would influence export flows negatively and these factors may be called as 'implicit beyond the border' determinants, which are beyond the control of the exporting countries. It is modeled as a random variable with a full normal distribution. Free trade agreements (FTA) that are in the form of improvement in trade promotion and facilitation policies of both India and its trading partners are expected to positively influence EGS exports of India. A dummy variable (TA) can be used to represent whether there are such trade agreements and the influence of these factors on exports may be named 'mutually induced determinants'.

3.2. Empirical Model

The empirical stochastic frontier gravity model, which is used in this study, is:

$$Ln(X_{ij}) = \alpha_1 + \alpha_2 ln(GDP_{ij}) + \alpha_3 ln(POP_{ij}) + \alpha_4 ln(DIST_{ij}) + \alpha_5 Ln(EXR_{ij}) + \alpha_6 (T_{ij}) + \alpha_7 (TA_{ij}) - u_{ij} + v_{ij} \quad \ldots\ldots(1)$$

In which, X_{ij} describes India's exports of EGS to country i by group EGS j; GDP_i and POP_i measure the gross product (GDP) and population of country i by group EGS j; $DIST_i$ indicates the distance from New Delhi to the capital city of India's partner country i by group EGS j; EXR_{ij} is the nominal exchange rate of the local currency of India's trading partners and the US dollar; T_{ij} is the average tariff of importing country i by group EGS j ; TA_{ij} is a dummy variable, which is equal to 1 if country i has a trade agreement with India, otherwise 0; u_{it} refers to the combined effect of 'behind the border constraints' in India; and v_{ij} is 'normal' statistical error term and implicit 'beyond the border' constraints. It is assumed that u_{ij} is zero if the influence of 'behind the border constraints' is not significant and otherwise, it takes a positive value. u_{ij} is assumed to follow a truncated normal distribution, truncated at zero and v_{ij} is assumed to follow a full normal distribution with mean zero and a constant variance. Using the joint density functions of $u_{ij}$and v_{ij}, the maximum likelihood estimation can be used to estimate the production coefficients, $\alpha_1 \ldots \alpha_7$ along with the total variance and the parameter γ, which is the ratio of the variance due to the combined effect of 'behind the border constraints' to the total variance of exports. Thus, γ indicates whether 'behind the border constraints' are one of the determinants of total exports of EGS. When γ is significant, it means that 'behind the border constraints' are important determinants of EGS exports (Kalirajan 2012). The software FRONTIER 4.1 (Coelli 1996) is used to estimate this model (1) for 4 different years, 1996, 2000, 2005 and 2010.

The methodology of export decomposition is explained in Figure 2. F_1 is the potential export frontier of the home country in the

period 1 in the absence of any 'behind the border constraints' and Y_1^* in period 1 is called potential exports. The actual export is Y_1, that is less than Y_1^* due to the existence of 'behind the border constraints' emanating from infrastructure constraints, institutional rigidities and other similar weakness in the home country. EI_1 is export inefficiency resulting from 'behind the border constraints', which prevent exports in period 1 from reaching their potential. EI_1 is measured as the vertical distance between actual exports and potential exports for the given export determinants X_1. However, 'implicit beyond the border constraints' tend to change due to multilateral or bilateral negotiations or trade facilitation steps taken by partner countries. These would generally shift the potential export frontier from F_1 to F_2 in period 2. Nevertheless, while Y_2^* represents potential exports without any 'behind the border constraints' in the home country, Y_2 is actual exports had there not been any 'behind the border constraints' in the home country in period 2. Potential exports growth due to the reduction in 'implicit beyond the border constraints' can be measured by the vertical distance between the frontier in period 1 (Y_1^*) and the frontier in period 2 (Y_1^{**}) evaluated for the same levels of determinants of exports in period 1.

The change in realized exports can be decomposed as follows (Khan and Kalirajan (2011):

$$
\begin{aligned}
D &= Y_2 - Y_1 = A + B + C \\
&= [Y_1^* - Y_1] + [Y_1^{**} - Y_1^*] + [Y_2 - Y_1^{**}] \\
&= [Y_1^* - Y_1] + [Y_1^{**} - Y_1^*] + [Y_2^* - Y_1^{**}] - [Y_2^* - Y_2] \\
&= \{[Y_1^* - Y_1] - [Y_2^* - Y_2]\} + [Y_1^{**} - Y_1^*] + [Y_2^* - Y_1^{**}] \\
&= \{EI_1 - EI_2\} + CIBBC + GCD
\end{aligned}
$$

Where,

$EI_1 - EI_2$ = differences between export inefficiency in period 1 and period 2 resulting from changes in 'behind the border' constraints in the home country.

CIBBC = changes in exports due to the trade facilitation steps taken by partner countries, leading to changes in 'implicit beyond the border' constraints.

GCD = changes in exports due to the sum of changes in the core natural determinants of trade like size, income per capita; changes in 'mutually induced determinants, such as trade agreements; and changes in 'explicit beyond the border' constraints, which include tariffs and exchange rates.

Thus, the changes in exports between two periods may result from the reduction in 'behind the border' constraints over time through home country' domestic reforms; reductioninboth 'explicit and implicit beyond the border' constraints in partner countries due to partner countries' reforms and mutual discussions; increase in export demand in partner countries due to increase in partner countries' income levels and population; and implementation of trade agreements between home and partner countries.

3.3 Data

EGS used in this study are the WTO 153 list, which are divided into 12 groups. The data of exports of EGS from India is collected from the official website of World Integrated Trade Solution (WITS) in the period between 1996 and 2010. While GDP, population, exchange rate are derived from the official website of World Bank. The data of distance is calculated between capital cities between India and its partner countries through the website of Distance Calculator. Tariff data is extracted from WITS by HS 6-digits and then tariff is calculated by average tariff for 12 groups of EGS. Trade agreements are collected from the website of Ministry of Commerce and Industry of India.

4.0 Results of Estimation & Decomposition

4.1 Results of Estimation

The estimated results are shown in Table 3. All the coefficients have been changing over time from 1996 to 2010, which indicates that the influence of different types of determinants of EGS exports has been changing overtime.

For example, the coefficients of GDP are positive at the 1 percent significant level, increasing from 0.1718 in 1996 to 0.2203 in 2000 and it reduces to 0.1551 with 15 percent significance in 2010. This shows that in the period from 1996 to 2000 the income of partner countries had an increasingly positive effect on India's EGS exports. Nevertheless, the impact of importing countries' GDP has become smaller in subsequent years. The reasons may be many. For example, as India's trading partners' income increases, they may produce import-substituting EGS, which then would

reduce the imports from India.

It is interesting to see that the dependence of India's EGS exports on distance declines continuously over time. The sign of the coefficient of distance is negative as expected, but the absolute value of that is reducing overtime and it is not significant in 2010. This implies that the demand for EGS from India does not depend on the distance from importing countries to India. As environmental services exports rather than environmental goods exports seem to be a major component of India's EGS exports, distance may not be a significant determinant of India's EGS exports. This conjecture may be justified by examining the coefficient of distance from other empirical studies on India's merchandise exports, which show that the distance variable has significantly larger negative influence on exports (Kalirajan, 2007).

The coefficients of exchange rate have negative signs as expected with the significance at least of 10 percent. This means that when India's partner countries depreciate their currencies, the prices of EGS imported from India are relatively more expensive. Consequently, the demand for India's EGS is reduced. This factor is not under the control of India and belongs to 'explicit beyond the border' constraints.

Tariff is another important factor in determining India's exports of EGS. The coefficient of tariff reduction from -0.0625 in 2005 to – 0.0293 in 2010 means that the tariff rates of partner countries on India's exports of EGS have become less relevant, on average, in terms of trade restrictiveness during this time. This is an indication of the effectiveness of the reduction in 'explicit beyond the border' trade costs in importing countries.

The magnitude of the coefficient of trade agreement has declined over time. This may be explained through actual export activities of India. An example of this is that there is not any trade agreement between India and the US but the value of India's export of EGS to the US accounted for 20 percent of total EGS exports in 2010.

The high value of gamma, which varies from 0.90 to 0.95 at the 1 percent level of significance, confirms that the selected stochastic frontier gravity model framework (Equation1) forthe present study is statistically valid for the present dataset. It also shows that the variation of India's exports of EGS mostly comes from the inefficiency emanating from 'behind the border' constraints. This implies that India has to eliminate its 'behind the border' constraints by improving its infrastructure and institutions to increase its EGS exports.

4.2 Results of Decomposition of Changes in India's exports of EGS

Changes in India's EGS exports is decomposed for the 12 groups of EGS for the selected 10 Asia-Pacific economies, which are the major trading partners of India for EGS, for 2 periods 1996 – 2000 and 2005 – 2010. Table 3 shows that in most cases, the 'behind the border' constraints, which are under the control of India, have negative effects on India's EGS exports, while the reduction of the 'implicit beyond the border' constraints, which are under the control of India's trading partners, have contributed strongly positively to the EGS export growth. The latter result thus indicates to India that it should take serious reform measures to eliminate its 'behind the border' constraints.

4.2.1. Air pollution control

The EGS of air pollution control was exported to all 10 Asia Pacific countries. However, the EGS exports to China, the Republic of Korea and the US increased rapidly in the first period 1996 – 2000. Vietnam, Indonesia, Thailand and China were the main markets of India's EGS which had impressive growth rates in the second period 2005 – 2010. The reduction in 'behind the border' constraints concerning this EGS group of air pollution control has contributed to the rapid EGS export growth in the first period for China (52 percent), the US (57 percent). However, it became a barrier to prevent India's EGS exports reaching its first period potential levels with respect to China and the US in the second period. The goods and services of air pollution control group exports to Vietnam and Indonesia surged to more than 200 percent and 100 percent respectively and dominated by the decline in the 'behind the border' constraints in the period between 2005 and 2010. In contrast, the EGS exports growth to the Republic of Korea was mainly influenced by the reduction in the 'implicit beyond the border' constraints in the Republic of Korea rather than the reduction in India's 'behind the border' constraints in the second period.

4.2.2. Management of solid and hazardous waste and recycling systems

This group of EGS exports from India to Japan and Thailand grew significantly from 1996 to 2010, while the exports to Indonesia fell by 79 percent from 1996 to 2000 and 54 percent in the next period. In the period from 1996 to 2000, the growth of India's EGS exports to the Asia-Pacific countries was mainly due to the reduction in the 'behind the border' constraints in India. For example, the high rates of export growth in Canada and Japan markets were predominantly due to the reduction in the 'behind the border' constraints in India. Though this trend continued with respect to the Japan market in the next period, it failed to continue in the case of the US market. Although India's EGS exports growth was negatively influenced by the 'behind the border' constraints with respect to its Asia-Pacific trading partners except Japan and Thailand in the second period, the reduction in the 'implicit beyond the border' constraints in the importing countries contributed substantially positively to India's EGS export growth to Malaysia, Vietnam, China and the Republic of Korea. As a consequence, the growth of India's EGS exports to these four economies increased during the period from 2005 to 2010.

4.2.3. Clean up or remediation of soil and water

India exported this EGS group mainly to 6 countries, Australia, Indonesia, Japan, Malaysia, Thailand and the US. From 1996 to 2000, India's EGS export growth was positively driven by the reduction in the 'behind the border' constraints with respect to all the above countries except Japan and Malaysia. Nevertheless, Japan's EGS imports from India increased due to the contribution of the changes in Japan's 'implicit and explicit beyond the border' constraints. However, in the second period, due to India's high 'behind the border' constraints, India's EGS exports to Japan declined by 115 percent, even though Japan's reduction in the 'implicit and explicit beyond the border' constraints was large. Thus, it is alarming that due to its 'behind the border' constraints, India incurred a huge loss with respect to the Japanese market.

4.2.4. Renewable energy plant

The EGS of renewable energy plant group has played an important role in India's EGS exports (about USD 2 billion in 2010) in recent years. The value of India's EGS exports to the Asia-Pacific economies increased from 1996 to 2010, excluding the EGS exports to Indonesia, Malaysia and Thailand for which the negative influence of the 'behind the border' constraints was strong. Australia, Japan and Vietnam were 3 main rapidly growing markets for India's renewable energy plant group of EGS. The 'behind the border' constraints were the main factor contributing to the reduction in EGS export growth. On the other hand, the reduction in 'implicit beyond the border' constraints or improvement in trade facilitation steps taken by partner countries were a major factor contributed to India's EGS export growth in the period between 2005 and 2010. This is because there were several FTAs signed by India during this time, such as the trade agreement with India and ASEAN to promote imports and exports between ASEAN economies and India.

4.2.5. Heat and energy management

India's exports of EGS of heat and energy management group to the Asia-Pacific countries excluding Australia and Malaysia decreased during 1996-2000. It is interesting to note that the contribution of the reduction in India's infrastructure and institutional rigidities towards the Australian market led to surging growth of India's EGS exports (88 percent) during the period. However, this contribution reduced to 55 percent during the second period. It is alarming that the negative impact of India's 'behind the border' constraints on its exports to Japan was large during the first period, which increased further in the second period, though in the case of Indonesia the negative impact remained at the same level during both periods. There were larger reductions in the 'implicit beyond the border' constraints in India's Asia-Pacific trading partner countries from the first period to the second period. However, due to India's 'behind the border' constraints, it could not reap the full gain from the partner countries' 'implicit beyond the border' reductions.

4.2.6. Waste water management and potable water treatment

This group of EGS grew differently over time. During the period 1996 – 2000, India's exports of this EGS group were relatively small and highly impacted by the 'behind the border' constraints. However, in the next period, the larger reductions of the 'implicit beyond the border' constraints in Asia-Pacific partner countries led to significant positive gains for

India with respect to the waste water management and potable water treatment exports. It is worth noting that India's export gain could be more, had it removed its 'behind the border' constraints concerning this group of exports considerably.

4.2.7. Environmentally preferable products, based on end use or disposal characteristics

India's exports of these EGS were substantially negatively influenced by the export inefficiency arising from the 'behind the border' constraints in both periods. On the other hand, the large reductions in the 'implicit beyond the border' constraints in India's partner countries arising from either bilateral / multilateral negotiations or trade facilitation measures taken by them in both periods. In contrast, the contribution of the reduction in 'explicit beyond the border' constraints to India's export growth of this EGS group was relatively small during 1996 – 2010.

4.2.8. Cleaner or more resource efficient technologies and products

India's exports of this EGS group did not show a strong growth trend during the period 1996, 2010. The 'behind the border' constraints emanating from the infrastructure and institution rigidities of India were the main factors impeding the export growth of this group of EGS, particularly during 2005-2010. An example of this is India's export growth of this EGS to Japan. Though reduction in Japan's 'implicit beyond the border' constraints led to 66 percent increase in the imports of India's EGS of this group from 2005 to 2010, the negative contribution of India's 'behind the border' constraints and 'explicit beyond the border' constraints, which could be the exchange rate influence, resulted in overall negative exports growth (-98 percent).

4.2.9. Natural risk management and 10. Natural resources protections

These 2 groups of India's EGS were mostly affected by India's 'behind the border' constraints despite the larger reductions in 'implicit beyond the border' constraints arising due to the increasing importance of the multilateral/bilateral negotiations or trade facilitation taken by India's partner countries. Canada increasingly imported the EGS belonging to natural risk management group from 122 percent in the first period (1996 – 2000) to 159 percent in the next period (2005-2010). In contrast, India's EGS exports of natural resource protection group have been declining over time due to the 'behind the border' constraints mainly. For example, these constraints reduced 121 percent of Japan's imports from India during 1996 – 2000 and reduced 286 percent in the next period.

4.2.10. Noise and vibration abatement

Like other groups of India's EGS, the export growth of this EGS group was predominantly affected by the institutional and infrastructure rigidities in India and was influenced by the positive contribution of reduction in the 'implicit beyond the border' constraints by India's trading partners during 1996 – 2010. The major markets of this EGS group during the periods (1996 – 2000) and (2005 – 2010) were the East Asian countries such as China (grew 178 percent and 66 percent respectively), the Republic of Korea (grew 102 percent and 126 percent respectively) and Japan (grew 88 percent and 12 percent respectively). It is interesting to observe that though the export of this EGS group to Indonesia was low during 1996, 2000, India's exports to Indonesia increased by 111 percent in the next period mainly due to the reductions in India's 'behind the border' constraints, and in Indonesia's 'implicit and explicit beyond the border' constraints.

4.2.11. Environmental monitoring, analysis and assessment equipment

As observed with respect to other groups of EGS exports, the effect of the 'behind the border' constraints was significant for India's export growth of this EGS group of environmental monitoring, analysis and assessment equipment during the period 1996–2000. However, the reductions in the 'implicit beyond the border' constraints dominated and positively contributed to India's export growth of this group of EGS in the next period. However, though the reduction in Malaysia's 'implicit and explicit beyond the border' constraints caused about 40 percent increase inIndia's exportsof EGS of this group to Malaysia, India's institutional and infrastructure rigidities reduced Malaysia's imports by 107 percent. Consequently, India's exports of EGS of environmental monitoring, analysis and assessment equipment group to Malaysia declined during the period 2005 – 2010.

5.0 Conclusions

EGS can bring more benefit to the Indian economy in terms of not only increasing its national income, but also of improving its environmental conditions at the national level. A stochastic frontier gravity model is used to identify the sources of changes in India's EGS exports over time. Empirical identification is done by analysing India's EGS exports to its top ten export markets of the Asia-Pacific economies, using the WTO 153 list classified into 12 groups. The analysis was done for 4 years 1996, 2000, 2005 and 2010. The results show that the contributions of income of partner countries and the distance between India and its trading partners appear to be less important over time. While exchange rate and tariffs negatively influenced the exports of India's EGS, trade agreement positively contributed to the exports during the study period.

Next, the changes in India's exports of EGS was decomposed into different components, such as growth due to reductions in the 'behind the border', 'implicit beyond the border' and 'explicit beyond the border' constraints along with 'natural determinants' and' mutually induced policy determinants'. The results show that the institutional and infrastructure rigidities of India, which are the main causes for the emergence of the' behind the border' constraints, exert dominant negative effects on its exports of EGS. Nevertheless, the negative effects were not significantly large for the EGS exports group of renewable energy plant. The reduction in India's trading partners "implicit beyond the border' constraints has made significant contribution to India's exports of EGS, especially in recent periods between 2005 and 2010. The export growth changes due to' explicit beyond the border' constraints are relatively small. Nevertheless, these results indicate to India that it should eliminate its 'behind the border' constraints.

Therefore, in terms of policy suggestion to promote exports of EGS, India needs to strengthen its policies to remove the 'behind the border' constraints to improve its infrastructure and institutional framework, which are central to India's exports. Though due to lack of uniform data, we could not identify what are the 'behind the border' constraints, some evidence-based conjectures can be made. For example, India can improve the performances of its exporting firms by disseminating knowledge and laws related to EGS of the importing countries. Also, port facilities can be improved for efficient functioning and bureaucratic delays in dispatching EGS can be avoided. Furthermore, India should enhance the trade agreements and multilateral/bilateral negotiations effectively to reduce the negative impact of its trading partner countries "implicit beyond the border' constraints on India's EGS exports.

A limitation of this study concerns the following. The impact of the changes in the 'implicit beyond the border' constraints to India's exports of EGS is measured by the vertical distance between the frontier in period 1 and the frontier in the period 2, evaluated for the same level of determinants of exports for period 1. This impact may also include the changes in the price of EGS which lead to changes in the value of Y1**. Due to lack of the proper data availability, this study does not separate the effects of the changes in prices from the impact of the 'implicit beyond the border' constraints.

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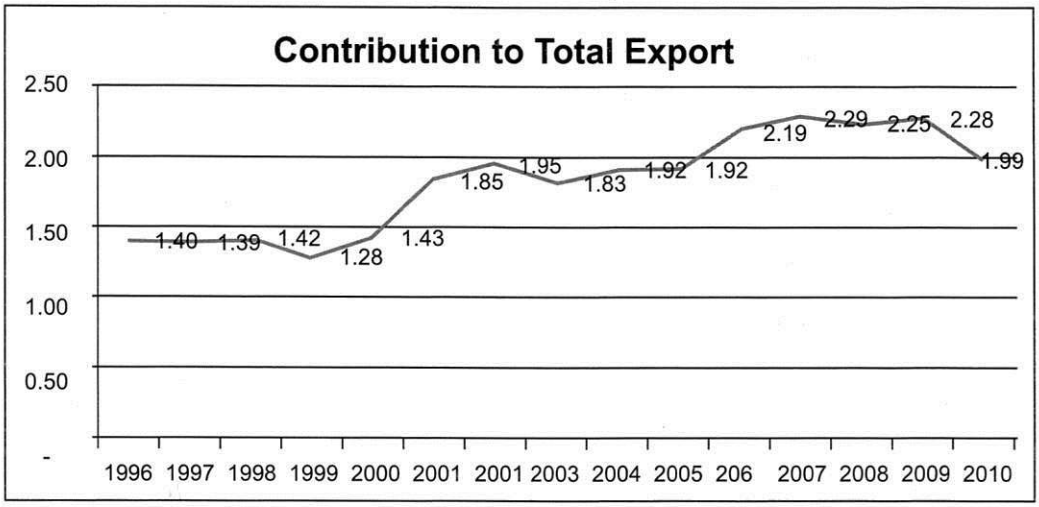
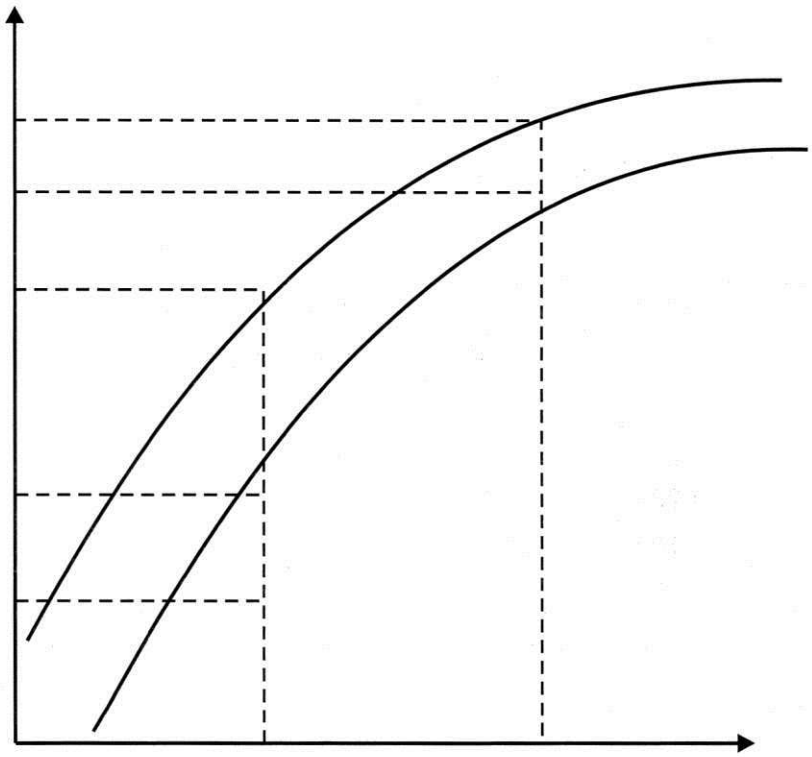
Figure 1 **Contribution of EGS in total export of India (percent)**



Source : Authors' calculation.

Figure 2 **Export growth decomposition**



Source:Khan and Kalirajan (2011).

Table 1 India's Exports of EGS to the World (1000USD)

Product description	2005	2006	2007	2008	2009	2010
Air pollution control	214,623	437,949	540,241	724,312	626,656	1,033,679
Management of solid and hazardous waste and recycling systems	423,145	466,624	604,740	681,157	587,238	546,804
Clean up or remediation of soil and water	17,514	25,529	64,292	64,099	90,333	69,379
Renewable energy plant	608,770	1,172,015	1,551,932	2,627,162	2,071,148	2,210,387
Heat and energy management	37,862	41,158	72,490	101,267	207,895	195,493
Waste water management and potable water treatment	810,145	1,045,467	1,333,873	1,855,767	1,542,465	1,746,190
Environmentally preferable products, based on end use or disposal characteristics	73,641	75,547	71,444	93,548	63,886	116,729
Cleaner or more resource efficient technologies and products	13,520	9,075	7,826	13,001	18,564	36,918
Natural risk management	17,508	31,711	34,224	41,729	82,670	30,817
Natural resources protection	18,403	20,553	10,424	14,378	21,906	29,685
Noise and vibration abatement	368,355	472,822	562,707	658,961	469,918	624,469
Environmental monitoring, analysis and assessment equipment	99,006	102,801	156,070	233,237	295,494	330,205

Source: Authors' calculation.

Table 2 Overview of India's Exports EGS to Asia Pacific Countries

1. Air Pollution Control

Country	2005	2006	2007	2008	2009	2010
Australia	3,276	3,681	6,411	8,146	4,461	5,214
Canada	923	707	1,298	1,113	1,040	2,105
China	10,233	88,065	16,946	26,416	94,810	37,451
Indonesia	1,223	2,433	3,852	4,703	7,811	12,463
Japan	1,709	2,674	2,750	4,258	5,913	3,575
Korea, Rep.	6,495	4,823	4,230	7,459	12,472	11,367
Malaysia	2,967	3,500	28,660	16,259	6,187	6,916
Thailand	7,009	6,917	20,484	28,963	14,999	51,373
United States	34,244	61,657	80,491	75,123	64,881	66,255
Vietnam	230	436	8,429	1,484	2,161	42,812

2. Management of Solid and Hazardous Waste and Recycling Systems

Country	2005	2006	2007	2008	2009	2010
Australia	6,135	3,015	5,097	7,658	5,787	8,732
Canada	3,681	4,806	3,347	3,624	2,764	2,705
China	6,783	7,649	14,762	8,687	13,831	11,882
Indonesia	42,766	6,789	5,120	11,432	12,418	12,291
Japan	1,863	3,346	2,019	6,450	2,730	2,014
Korea, Rep.	1,646	2,182	12,963	4,479	3,168	5,696
Malaysia	10,331	10,293	9,462	18,810	9,609	12,022
Thailand	5,184	11,682	7,984	8,633	13,656	34,081
United States	45,431	47,018	41,065	50,000	66,033	33,787
Vietnam	2,219	2,085	7,617	6,230	2,464	8,300

3. Clean up or Remediation of Soil and Water

Country	2005	2006	2007	2008	2009	2010
Australia	462	344	169	1,437	658	508
Canada	335	585	779	735	402	285
China	234	155	22,219	7,196	9,420	9,906
Indonesia	307	165	502	2,122	949	1,071
Japan	144	399	2,347	637	973	507
Korea, Rep.	67	91	494	248	1,047	1,391
Malaysia	263	191	528	2,062	7,488	8,157
Thailand	196	628	1,540	236	1,541	466
United States	1,189	1,059	2,009	3,606	9,253	1,911
Vietnam	4	261	2,098	631	540	485

4. Renewable Energy Plant

Country	2005	2006	2007	2008	2009	2010
Australia	6,110	12,279	87,535	137,676	111,623	88,614
Canada	2,824	9,427	18,692	21,217	10,854	11,686
China	21,637	27,933	34,848	39,017	48,255	86,734
Indonesia	4,158	5,479	4,453	7,213	10,905	18,090
Japan	7,167	13,972	16,431	15,369	12,756	16,599
Korea, Rep.	1,775	1,843	4,157	18,595	6,914	6,447
Malaysia	3,741	5,710	10,034	10,351	9,541	11,729
Thailand	6,580	5,448	9,557	9,954	12,771	16,499
United States	152,070	480,126	461,439	529,778	446,875	412,722
Vietnam	1,052	2,314	1,150	6,616	9,203	27,482

5. Heat and energy management

Country	2005	2006	2007	2008	2009	2010
Australia	1,350	1,863	4,489	3,481	18,038	35,219
Canada	3,581	237	307	531	507	286
China	1,471	752	3,332	1,564	64,715	2,614
Indonesia	837	1,270	1,071	911	6,998	338
Japan	50	136	219	144	404	286
Korea, Rep.	351	79	468	139	14,336	2,132
Malaysia	5,560	3,172	4,451	7,486	8,422	4,235
Thailand	428	1,073	3,317	632	1,195	1,422
United States	4,606	4,787	5,744	9,020	10,084	39,111
Vietnam	10	410	33	125	208	1

6. Waste water management and potable water treatment

Country	2005	2006	2007	2008	2009	2010
Australia	18,032	15,073	20,112	27,090	26,456	31,410
Canada	16,057	20,753	21,052	27,204	16,738	26,292
China	22,210	8,519	16,974	38,203	41,817	51,620
Indonesia	7,839	14,645	12,327	11,351	16,728	25,280
Japan	11,955	8,511	9,585	10,342	8,532	14,258
Korea, Rep.	17,270	20,840	27,217	40,718	24,337	22,934
Malaysia	11,709	19,085	27,026	30,281	33,539	25,350
Thailand	8,643	8,326	12,984	19,143	25,922	30,448
United States	183,314	223,637	251,195	353,475	281,155	303,432
Vietnam	1,694	1,368	9,591	6,352	3,191	7,958

7. Environmentally preferable products, based on end use or disposal characteristics

Country	2005	2006	2007	2008	2009	2010
Australia	4,422	2,439	1,813	2,550	2,158	3,273
Canada	297	347	463	704	507	497
China	-	-	-	-	-	4,534
Indonesia	29	200	954	56	297	2,207
Japan	1,359	1,324	889	529	261	318
Korea, Rep.	59	137	22	12	59	21
Malaysia	122	14	74	57	15	117
Thailand	35	-	52	838	13,158	2
United States	12,577	11,493	10,312	10,209	5,892	6,991
Vietnam	56	2	5	-	14	1,813

8. Cleaner or More Resource Efficient Technologies and Products

Country	2005	2006	2007	2008	2009	2010
Australia	106	60	71	35	68	80
Canada	79	62	49	26	48	91
China	12	16	65	22	88	4
Indonesia	54	561	67	4	48	210
Japan	364	7	5	13	28	38
Korea, Rep.	-	3	6	5	4	46
Malaysia	149	140	134	316	169	189
Thailand	55	204	69	135	108	21
United States	3,716	640	446	541	391	464
Vietnam	32	15	-	384	368	1

9. Natural Risk Management

Country	2005	2006	2007	2008	2009	2010
Australia	41	56	174	398	364	849
Canada	25	256	748	1,106	424	959
China	-	13	18	610	294	424
Indonesia	-	-	-	11	8	140
Japan	-	-	-	35	17	9
Korea, Rep.	-	15	-	0	5	10
Malaysia	-	-	11	128	14	344
Thailand	-	2	1	432	7	66
United States	4,692	7,387	7,778	10,640	22,917	6,065
Vietnam	0	-	-	6	22	-

10. Natural Resources Protection

Country	2005	2006	2007	2008	2009	2010
Australia	180	324	31	75	326	779
Canada	1,466	1,190	1,541	413	385	1,535
China	-	-	-	1	129	35
Indonesia	33	-	-	0	-	75
Japan	22	24	-	5	57	0
Korea, Rep.	43	-	7	5	127	326
Malaysia	1,619	0	0	-	1	11
Thailand	2	0	-	-	77	47
United States	5,235	7,669	1,952	4,072	12,555	10,208
Vietnam	-	-	-	19	12	24

11. Noise and vibration abatement

Country	2005	2006	2007	2008	2009	2010
Australia	2,523	1,863	1,976	2,864	2,761	4,447
Canada	2,731	4,665	2,491	939	1,533	2,247
China	3,350	5,104	4,541	5,814	10,503	15,459
Indonesia	928	719	608	1,542	6,763	11,911
Japan	6,943	8,952	9,487	7,461	4,129	9,141
Korea, Rep.	1,705	30,870	42,428	35,754	26,015	31,363
Malaysia	2,152	2,211	1,197	3,066	3,700	2,627
Thailand	3,444	3,422	1,614	2,632	1,943	3,776
United States	125,421	157,509	173,462	193,309	144,836	177,751
Vietnam	581	632	649	1,377	834	537

12. Environmental monitoring, analysis and assessment equipment

Country	2005	2006	2007	2008	2009	2010
Australia	1,126	896	1,278	2,480	3,192	4,559
Canada	631	1,300	1,530	1,917	1,920	3,428
China	5,041	4,399	6,181	5,086	7,773	7,986
Indonesia	242	332	952	1,594	7,175	1,935
Japan	3,021	2,110	2,640	10,001	3,918	8,428
Korea, Rep.	789	292	3,621	4,367	2,666	2,914
Malaysia	1,036	1,701	1,538	4,161	2,106	4,077
Thailand	664	922	1,522	2,593	2,650	4,240
United States	27,550	30,191	53,248	52,011	79,934	118,107
Vietnam	114	237	258	334	774	1,060

Source: Authors' calculation.

Table 3 Maximum Likelihood Estimates of the Stochastic Frontier Gravity model

Category	1996	2000	2005	2010
Constant	4.2863***	2.7020***	3.2250***	3.4197***
Log of GDP	0.1718**	0.2203***	0.0260	0.1551^
Log of Population	0.1840*	0.2881***	0.4380***	0.2399*
Log of Distance	-0.7985***	-0.5621***	-0.3039*	-0.2875
Log of Exchange rate	-0.0986***	-0.0929**	-0.1662***	-0.0853*
Tariff	0.0011	-0.0200**	-0.0625***	-0.0293*
Trade agreement	0.7611***	0.1252	0.1186^	-0.0614
Gamma	0.9511***	0.9465***	0.8999***	0.9347***

Note: ***, **, *, ^ show the significant level at 1%, 5%, 10% and 15%. **Source:**Authors' calculation.

Table 4 India's export of EGS decomposition

1. Air pollution control

	1996 - 2000				2005-2010			
Country	Behind BD	Implicit beyond BD	Explicit beyond BD	Export growth	Behind BD	Implicit beyond BD	Explicit beyond BD	Export growth
Australia	-0.0986	0.1134	0.0012	0.0160	-0.4328	0.5741	0.0604	0.2017
Canada	-0.3391	0.2411	0.0413	-0.0567	-0.2270	0.5475	0.0373	0.3578
China	0.5298	0.1291	0.0369	0.6958	-0.0991	0.4249	0.2377	0.5635
Indonesia	-0.1360	0.1556	-0.0973	-0.0777	0.4334	0.4830	0.0920	1.0084
Japan	-0.0625	0.3195	0.0020	0.2589	-0.3329	0.6571	-0.0410	0.2832
Korea, Rep.	0.2542	0.2061	-0.0140	0.4463	-0.4182	0.7395	-0.0782	0.2431
Malaysia	-0.0375	0.0452	-0.1084	-0.1007	-0.0687	0.4150	0.0213	0.3676
Thailand	-0.0388	0.0443	0.0749	0.0804	0.4547	0.3580	0.0524	0.8651
United States	0.5681	-0.1984	-0.0959	0.2738	-0.2154	0.4852	0.0169	0.2866
Vietnam	0.2124	-0.0087	0.0198	0.2235	1.7346	0.5446	-0.0097	2.2695

2. Management of solid and hazardous waste and recycling systems

	1996 - 2000				2005-2010			
Country	Behind BD	Implicit beyond BD	Explicit beyond BD	Export growth	Behind BD	Implicit beyond BD	Explicit beyond BD	Export growth
Australia	0.0696	0.1163	-0.0034	0.1825	-0.4693	0.5677	0.0548	0.1533
Canada	0.4670	0.2267	0.0541	0.7478	-0.7145	0.5462	0.0346	-0.1337
China	0.5036	0.1291	0.0369	0.6696	-0.4689	0.4471	0.2653	0.2435
Indonesia	-0.8724	-0.0207	0.0992	-0.7939	-1.1327	0.4850	0.1062	-0.5415
Japan	0.4128	0.3195	0.0020	0.7343	0.5301	0.6571	-0.0410	1.1463
Korea, Rep.	-0.3657	0.2096	-0.0140	-0.1701	-0.1418	0.7341	-0.0530	0.5393
Malaysia	0.0755	0.0599	-0.0535	0.0819	-0.3191	0.3776	0.0073	0.0658
Thailand	0.0997	0.0428	0.0749	0.2174	0.4441	0.3214	0.0524	0.8179
United States	0.6277	-0.1986	-0.0957	0.3334	-0.6263	0.4829	0.0148	-0.1286
Vietnam	-0.5547	-0.1846	0.0198	-0.7195	-0.3201	0.6842	0.2088	0.5730

3. Clean up or remediation of soil and water

	1996 - 2000				2005-2010			
Country	Behind BD	Implicit beyond BD	Explicit beyond BD	Export growth	Behind BD	Implicit beyond BD	Explicit beyond BD	Export growth
Australia	1.2701	0.1977	-0.0034	1.4644	-0.5632	0.5559	0.0490	0.0417
Indonesia	0.5098	0.0448	-0.0756	0.4790	-0.2663	0.5937	0.2155	0.5428
Japan	-0.1792	0.3195	0.0020	0.1422	-1.7663	0.6571	-0.0410	-1.1502
Malaysia	-0.3528	0.0551	-0.0864	-0.3841	0.9792	0.4606	0.0515	1.4913
Thailand	0.0996	0.0279	0.0749	0.2024	-0.0675	0.3918	0.0524	0.3767
United States	0.8617	-0.1983	-0.0960	0.5674	-0.2910	0.4826	0.0146	0.2061

4. Renewable energy plant

	1996 - 2000				2005-2010			
Country	Behind BD	Implicit beyond BD	Explicit beyond BD	Export growth	Behind BD	Implicit beyond BD	Explicit beyond BD	Export growth
Australia	0.6200	0.0840	0.0048	0.7089	0.5322	0.5700	0.0591	1.1614
Canada	0.2741	0.2135	0.0664	0.5539	0.0341	0.5471	0.0357	0.6168
China	0.1242	0.1291	0.0369	0.2902	0.1908	0.2845	0.1277	0.6030
Indonesia	-0.2024	0.0401	0.0366	-0.1258	0.1115	0.4666	0.0604	0.6386
Japan	0.2146	0.3195	0.0020	0.5361	1.9083	0.6571	-0.0410	2.5244
Korea, Rep.	0.3558	0.2162	-0.0140	0.5579	-0.0925	0.7238	-0.0710	0.5603
Malaysia	-0.7729	0.0406	-0.0908	-0.8231	0.1093	0.4135	-0.0265	0.4963
Thailand	-0.1702	0.0245	0.0749	-0.0708	-0.0246	0.3714	0.0524	0.3992
United States	0.5106	-0.1996	-0.0952	0.2159	-0.0656	0.4839	0.0153	0.4336
Vietnam	2.1367	-0.1142	0.0198	2.0422	0.8325	0.5952	-0.0106	1.4171

5. Heat and energy management

					2005-2010			
Country	Behind BD	Implicit beyond BD	Explicit beyond BD	Export growth	Behind BD	Implicit beyond BD	Explicit beyond BD	Export growth
Australia	0.4999	0.0627	0.0086	0.5712	0.7849	0.5709	0.0606	1.4163
Indonesia	-0.8359	0.0250	0.0932	-0.7177	-0.8718	0.4343	0.0443	-0.3933
Japan	-0.3406	0.3195	0.0020	-0.0192	-2.2374	0.6571	-0.0410	-1.6212
Malaysia	0.1205	0.0551	-0.0239	0.1516	-0.4402	0.3500	-0.0281	-0.1183
Thailand	-0.2985	0.0148	0.0749	-0.2088	0.1605	0.3088	0.0524	0.5217
United States	0.0257	-0.2003	-0.0941	-0.2687	0.4319	0.4826	0.0146	0.9290

6. Waste water management and potable water treatment

	1996 - 2000				2005-2010			
Country	Behind BD	Implicit beyond BD	Explicit beyond BD	Export growth	Behind BD	Implicit beyond BD	Explicit beyond BD	Export growth
Australia	-0.0395	0.0886	-0.0034	0.0457	-0.3969	0.5762	0.0617	0.2410
Canada	-0.2559	0.2232	0.0536	0.0209	-0.3764	0.5528	0.0378	0.2142
China	-0.4809	0.1291	0.0369	-0.3149	-0.0567	0.2845	0.1385	0.3663
Indonesia	-0.0161	-0.0165	0.0605	0.0279	0.0003	0.4644	0.0438	0.5085
Korea, Rep.	-0.2987	0.1729	-0.0140	-0.1398	-0.6109	0.7919	-0.0579	0.1232
Malaysia	0.3369	0.0295	-0.0548	0.3116	0.0177	0.3862	-0.0684	0.3355
Thailand	0.0677	0.0040	0.0749	0.1466	0.1111	0.3834	0.0524	0.5469
United States	0.5975	-0.2069	-0.0956	0.2950	-0.2864	0.4879	0.0174	0.2189
Vietnam	0.1084	-0.1120	0.0198	0.0162	0.0233	0.6146	0.0339	0.6718

7. Environmentally preferable products, based on end use or disposal characteristics

	1996 – 2000				2005-2010			
Country	Behind BD	Implicit beyond BD	Explicit beyond BD	Export growth	Behind BD	Implicit beyond BD	Explicit beyond BD	Export growth
Australia	-0.3155	-0.0133	0.0966	-0.2322	-0.7683	0.5766	0.0610	-0.1307
Canada	-0.7445	0.2679	0.0136	-0.4630	-0.3819	0.5583	0.0468	0.2233
Indonesia	-0.8673	0.1180	0.0051	-0.7442	1.4239	0.4277	0.0360	1.8876
Japan	-0.3250	0.3195	0.0020	-0.0035	-1.2475	0.6571	-0.0410	-0.6313
Korea, Rep.	-0.2799	0.1810	-0.0140	-0.1129	-1.1747	0.7791	-0.0534	-0.4491
Malaysia	-0.3834	0.0727	-0.0531	-0.3639	-0.4611	0.3776	0.0661	-0.0174
United States	0.3618	-0.1983	-0.0960	0.0675	-0.7522	0.4826	0.0146	-0.2551

8. Cleaner or more resource efficient technologies and products

	1996 – 2000				2005-2010			
Country	Behind BD	Implicit beyond BD	Explicit beyond BD	Export growth	Behind BD	Implicit beyond BD	Explicit beyond BD	Export growth
Australia	-0.4204	0.1977	-0.0034	-0.2260	-0.7289	0.5559	0.0490	-0.1240
Canada	-1.5337	0.1717	0.0979	-1.2641	-0.5328	0.5551	0.0378	0.0601
Japan	0.7665	0.3195	0.0020	1.0879	-1.5980	0.6571	-0.0410	-0.9818
Malaysia	0.8767	-0.0201	-0.0302	0.8264	-0.3821	0.4495	0.0358	0.1032
Thailand	-2.5157	-0.0732	0.0749	-2.5140	-0.9482	0.4748	0.0524	-0.4210
United States	0.3674	-0.2006	-0.0938	0.0730	-1.4022	0.4836	0.0155	-0.9032

9. Natural risk management

	1996 – 2000				2005-2010			
Country	Behind BD	Implicit beyond BD	Explicit beyond BD	Export growth	Behind BD	Implicit beyond BD	Explicit beyond BD	Export growth
Canada	0.9420	0.2498	0.0297	1.2215	1.0047	0.5517	0.0335	1.5898
Malaysia	-0.2204	0.0111	-0.0114	-0.2207	-1.3512	0.4053	0.1491	-0.7968
United States	0.8494	-0.2004	-0.0940	0.5550	-0.3856	0.4826	0.0146	0.1115

10. Natural resources protection

	1996 – 2000				2005-2010			
Country	Behind BD	Implicit beyond BD	Explicit beyond BD	Export growth	Behind BD	Implicit beyond BD	Explicit beyond BD	Export growth
Canada	1.3270	0.2679	-0.0075	1.5874	-0.5834	0.5665	0.0368	0.0199
Japan	-1.2191	0.3195	0.0020	-0.8977	-2.8557	0.6571	-0.0410	-2.2396
Malaysia	-0.0441	0.0182	-0.0314	-0.0574	-2.6148	0.4407	0.1804	-1.9937
United States	0.8078	-0.2466	-0.0974	0.4638	-0.2368	0.5045	0.0223	0.2900

11. Noise and vibration abatement

	1996 – 2000				2005-2010			
Country	Behind BD	Implicit beyond BD	Explicit beyond BD	Export growth	Behind BD	Implicit beyond BD	Explicit beyond BD	Export growth
Australia	-0.1291	0.1309	-0.0034	-0.0016	-0.4637	0.6610	0.0490	0.2462
Canada	-0.5442	0.2547	0.0270	-0.2624	-0.6778	0.5520	0.0412	-0.0846
China	1.5521	0.1291	0.0369	1.7182	-0.0229	0.4249	0.2622	0.6642
Indonesia	-0.5325	0.0791	0.0919	-0.3614	0.6276	0.4277	0.0530	1.1082
Japan	0.5634	0.3195	0.0020	0.8849	-0.4967	0.6571	-0.0410	0.1194
Korea, Rep.	0.8154	0.2162	-0.0140	1.0176	0.6150	0.7238	-0.0742	1.2646
Malaysia	0.5342	0.2033	-0.1622	0.5752	-0.5391	0.3677	0.0605	-0.1110
Thailand	-0.6549	0.0148	0.0749	-0.5653	-0.4042	0.3918	0.0524	0.0400
United States	0.5194	-0.2015	-0.0949	0.2229	-0.3490	0.4852	0.0152	0.1514
Vietnam	0.2030	-0.0627	0.0198	0.1601	-0.6824	0.6642	-0.0158	-0.0340

12. Environmental monitoring, analysis and assessment equipment

	1996 – 2000				2005-2010			
Country	Behind BD	Implicit beyond BD	Explicit beyond BD	Export growth	Behind BD	Implicit beyond BD	Explicit beyond BD	Export growth
Australia	0.4045	0.1146	-0.0016	0.5175	-0.0269	0.5714	0.0627	0.6073
Canada	-0.3484	0.2434	0.0403	-0.0647	0.1574	0.5437	0.0339	0.7350
China	0.1314	0.1291	0.0369	0.2974	-0.4980	0.4249	0.2729	0.1998
Indonesia	-0.4953	0.1347	-0.0108	-0.3714	0.4243	0.4291	0.0502	0.9036
Japan	-0.1905	0.3195	0.0020	0.1310	-0.1705	0.6571	-0.0410	0.4456
Korea, Rep.	-0.1912	0.2155	-0.0140	0.0102	-0.1066	0.7249	-0.0510	0.5673
Malaysia	0.0666	0.2291	-0.0250	0.2708	-1.0743	0.2756	0.1399	-0.6588
Thailand	-0.1330	0.0148	0.0749	-0.0434	0.4319	0.3207	0.0524	0.8049
United States	0.6050	-0.1994	-0.0949	0.3107	0.1350	0.4826	0.0146	0.6322
Vietnam	0.5934	-0.2901	0.0198	0.3231	0.2733	0.7672	-0.0705	0.9701

Source: Authors' calculation.

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A STUDY OF ACCIDENTS IN KOLHAPUR

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Abstract: In this study the information about the accidents in Kolhapur is collected from the records of police stations during the period of last six years. The collected information is classified according to many characteristics and analyzed statistically The results of the study show that the younger age group commit more number of accidents than the older. There is a significant difference in the average age of male and female who are responsible for accidents. There is no significant difference in the number of accidents, injuries and deaths in different years. The accidents were not uniform over different months in a year as well as it not uniform in all hours of a day. It shows that the accidents were mainly due to the negligence in driving, lack of awareness and experience.

Key words: Accidents, Statistical Significance, Negligence, Awareness

1.0 INTRODUCTION

Scientific development, literacy and awareness of various causes for diseases, have led to the death rate decrease substantially. But due to accidents the death rate is increasing rapidly. The accidents mainly cause loss of human lives, injuries and huge loss of vehicles. From the available records of Central Government it is revealed that, the losses due to accidents in the years 1982, 1992 and 2002 are approximately 230 crores, 5000 crores and 55,000 crores respectively .The accidents are not purely random. There are several causes for accidents, namely lack of proper maintenance of roads, inadequate knowledge of rules of driving and so on (M.V.act 59 of 1988)

2.0 NEED FOR THE STUDY

In this study the information about the accidents in Kolhapur District is collected from the records of various Police Stations and District Superindent of Police (DSP) office of Kolhapur (Daroga Singh and Chaudhary 1986). The information about vehicles is from RTO office of Kolhapur during the last six years. The information includes the number of accidents, deaths, injuries, age and gender of the person mainly responsible for accidents. The collected data is classified according to various characteristics and analyzed statistically and the following results are obtained. Such a study in Kolhapur especially using the police records has not been conducted earlier. In this research paper we attempt to fill this research gap.

(i) There is a significantly higher proportion of deaths due accidents in rural area than the urban area.
(ii) There is a significant difference in the average age of male and female who is responsible for accidents.
(iii) The younger age group is more in number than the older age for committing accidents.
(iv) The accidents are not distributed uniformly throughout the year as well as in all hours of a day.
(v) The accidents, injuries and deaths in the last six years independent of each other.

3.0 METHODOLOGY AND ANALYSIS:

The accidents in Kolhapur District during the years 2006 to 2011 are collected from the records of various Police Stations of Kolhapur District and DSP office of Kolhapur. The collected data is classified according to many characteristics such as region, gender, age, deaths and injuries in different years, months and time of accident. To study the significance of various causes Z-test and chi square tests are applied.

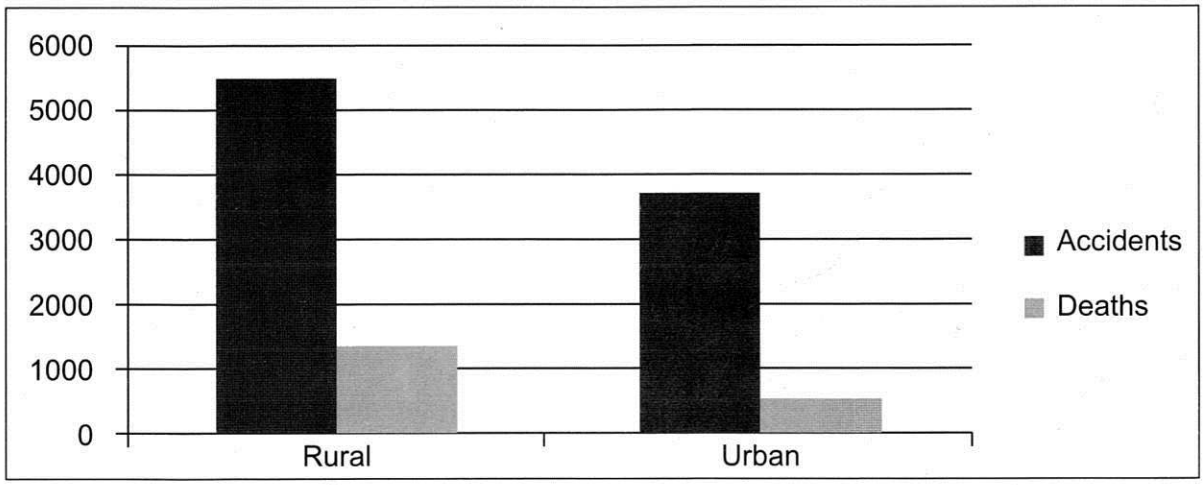
3.1 Region-wise Distribution of Accidents and Deaths:

A contingency table representing the region-wise accidents and deaths is as follows (Bishop, Fineberg and Holland.1975)

Table No. 1: Region wise Accidents

Region	No of accidents	No of deaths	Proportions
Rural	5528	1362	0.2463
Urban	3736	563	0.1507
Total	9264	1925	0.2078

Graph No. 1: Region wise Accidents



3.1.1 Test for equality of proportions:

Let P_1 and P_2 be the proportion of accidents in rural and urban area. Then corresponding sample proportions are p_1= 0.2463 and p_2=0.1507. The null hypothesis is $H_0 : P_1 = P_2$ against the alternative $H_1: P_1 > P_2$ .Under H_0 , value of the test statistic is Z_0 =11.125.At level of significance $\alpha = 0.05$, the critical value is 1.64.Therefore $Z_0 > 1.64$,hence reject H_0 (ParimalMukhopadhyay 2006)

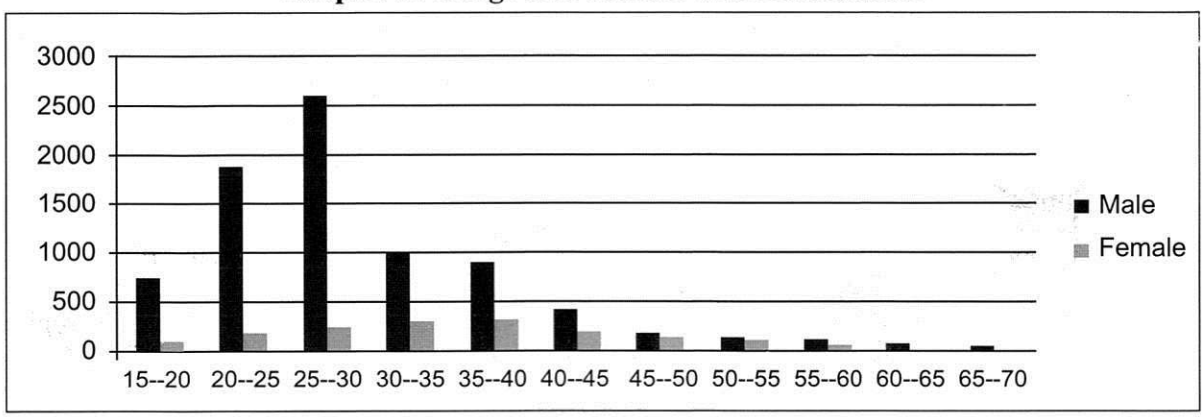
3.2.0 The distribution of age and gender of accident committers:

The distribution of age & gender of the persons who are responsible for accidents is as follows

Table No. 2: Age and Gender wise Distribution

Age	15-20	20-25	25-30	30-35	35-40	40-45	45-50	50-55	55-60	60-65	65-70
Male	727	1873	2613	1001	881	391	158	107	84	47	19
Female	81	145	206	268	281	163	102	78	37	00	00

Graph No. 2: Age and Gender wise Distribution



3.2.1 Test for equality of average age of male and female accident committers:

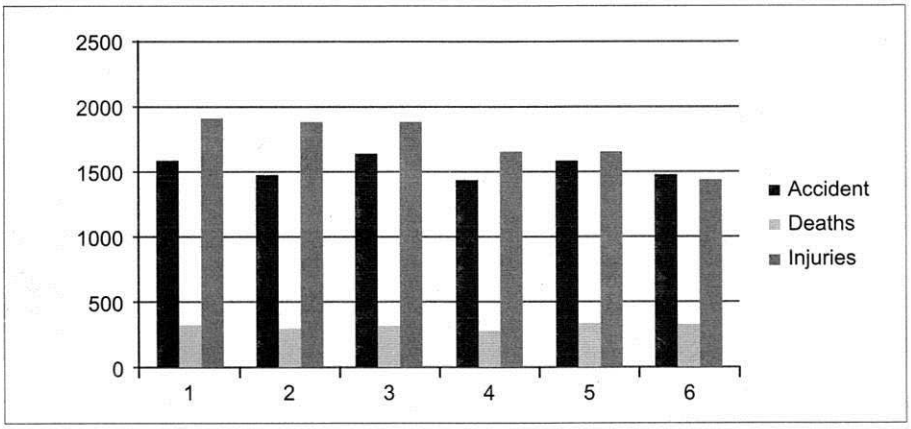
Let μ_1 and μ_2 be the average age of male and female persons who are responsible for accidents. The corresponding sample mean and variances are X_1 =29.25, X_2 =34.965 s_1^2 =2.98876 and s_2^2 = 3.8267.The hypothesis are H_0 : $\mu_1 = \mu_2$ against the alternative H_1: $\mu_1 < \mu_2$ .Under H_0 , value of the test statistic is Z_0 = -101.15.At level of significance α = 0.05, the critical value is -1.64.Therefore Z_0 <- 1.64 ,hence reject H_0

3.3 Distribution of Annual Accidents, Deaths and Injuries:

Table No. 3 Annual Accidents

Years	2006	2007	2008	2009	2010	2011	Total
Accidents	1598	1486	1648	1446	1597	1489	9264
Deaths	327	306	319	289	340	344	1925
Injuries	1924	1898	1888	1661	1666	1442	10459

Graph No. 3 Annual Accidents



Chi-square test for independence of these three factors in different years :

Let A denote the accidents, deaths and injuries in the given year and B denote different years of accidents. The hypothesis are H_0: A and B are independent against H_1:A and B are not independent. Under H_0 ,the value of the test statistic is χ_0^2 = Therefore accept H_0

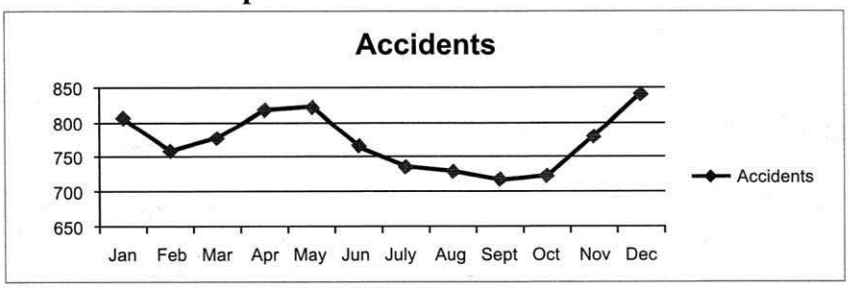
3.4 Distribution of Monthly Accidents:

The month-wise distribution of accidents is as follows

Table No. 4: Month wise Accidents

Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Accidents	805	757	776	817	821	766	735	729	718	722	779	839

Graph No. 4: Month wise Accidents



3.4.1 Let A denote the accidents in a given month and B denote different months of a year. The hypothesis are H_0: A and B are independent against H_1: A and B are not independent. Under H_0 ,the value of the test statistic is χ_0^2 =24.5642.At level of significance α=0.05,the critical value is 19.6751. Therefore χ_0^2> 19.6751, and hence we reject H_0

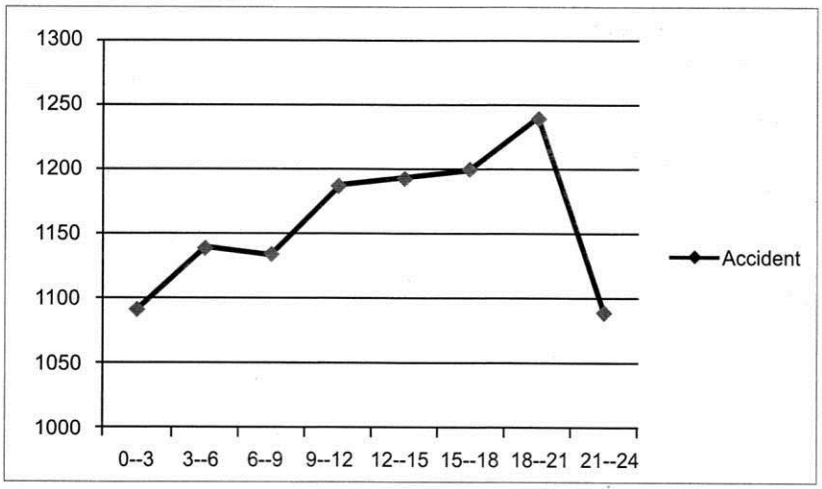
3.5 Distribution of accidents in different hours of a day:

The distribution of accidents in different hours of a day is as follows :

Table No. 5: Hourly Accidents

Hours	0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24
Accidents	1090	1138	1133	1186	1192	1198	1239	1088

Table No. 5: Hourly Accidents



3.5.1 Let A denote the number of accidents in the given time of a day and B denote different time interval of a day. The hypothesis are H_0: A and B are independent against the alternative,H_1:A and B are not independent. Under H_0 ,the value of the test statistic is χ_0^2 =17.8325.At level of significance α=0.05, the critical value is 14.10671. Therefore χ_0^2> 14.0671, hence we reject H_0

4.0 FINDINGS:

- Proportion of deaths due to accidents is significantly higher in rural area than the urban area
- Average age of the male who commits' accident is significantly smaller than the female.
- The accidents, deaths and injuries are independent in different years.
- The accidents are significantly different in different months in a year.
- The accidents are significantly different in different hours of a day.
- There is a significantly higher proportion of deaths due accidents in rural area than the urban area.
- There is a significant difference in the average age of male and female who is responsible for accidents.
- The younger age group is more in number than the older age for committing accidents.
- The accidents are not distributed uniformly throughout the year as well as in all hours of a day.
- The accidents, injuries and deaths in the last six years independent of each other.
- The death due accidents in rural area is higher because of bad maintenance of roads and inadequate knowledge of driving.
- There is no development in minimizing the road accidents during the last six years period.
- The highest number of accidents is expected in

the months of April, May, December and January.
- The accidents are large in numbers during the hours from 9am to 12 noon and from 6pm to 9pm in a day.

5.0 SUGGESTIONS:

Based on the study conducted we give the following suggestions for reducing accidents in Kolhapur

- The detective machines in roads are applied in order to identify and to regulate the violators of traffic rules.
- Imposition of heavy fine for petty traffic rule violators and confiscations of license in case of major accidents as well life imprison for negligence when death occurred for poor victim.
- There should be proper tress pass throughout the road system in order to make convenience for crossing the road by pedestrians.
- Proper signals and speed breakers are necessary near schools, hospitals and intersection of roads.
- There should be special vigilance team in sensitive areas.

6.0 SUMMARY

In the study a survey was undertaken about the accidents in Kolhapur city. Based on the data collected, preliminary analysis in done through graphical method. In order to test the different hypothesis about accidents in Kolhapur, Statistical techniques are adopted. From the entire study it can be concluded that the accidents in younger age group and middle age is higher. Improvement in the quality of roads and greater monitoring are the only ways where the accidents and fatalities in the city can be minimized.

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A Comparative Study of MGNREGS With Reference to Kolhapur District

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Abstract: Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGS), is one of the most ambitious, central sponsored wage employment scheme. The objective of MGNREGS is to ensure livelihood security of rural people by guaranteeing at least 100 days of wage employment in a financial year to every household, whose adult members volunteer to do unskilled manual work. During the last four years (2008-09 to 2011-12), on an average Rs. 32,101 crore are invested under various wage employment initiatives under MGNREGS. The scheme has been implemented in Kolhapur District in its Phase III from 1st April 2008. Until the F.Y 2012-13, total 176228 job cards are issued and 1265923 Person dayswage employment is generated in the district. Objective of this paper is to study the implementation of MGNREGS in Kolhapur district from the financial year 2010-11 to 2012-13. The study is based on the discussion with MGNREGS implementing authority in the district and MGNREGS implementation record uploaded on the MoRD'sMGNREGA website. Further, the paper attempts to compare the outcome of the MGNREGS in the District with its national average on various parameters stipulated in the Act.

Key Words: MGNREGA, Job card, wage employment.

1.0 INTRODUCTION:

Absence of gainful employment in the rural area is one of the major causes of chronic poverty in the rural India. After independence, Government of India has been implementing various rural employment generation schemes. However, the implementation of these schemes and its end results are not satisfactory and rural unemployment is one of the major problems at front of the Indian economy.

The lack of employment opportunities in the rural areas leads to farmer suicide, even in some of the fastest developing states of the country. On this account, Government of India enacted the National Rural Employment Guarantee Act (NREGA) in September 2005. It came into force in February 2, 2006, and implemented in a phased manner throughout the country. In its Phase I, it was introduced in 200 most backward district of the country. In phase II, it was implemented in an additional 130 districts in the year 2007-08. The scheme was extended to the remaining 274 districts of India from April 1, 2008 in its Phase III. In the Kolhapur District, it has been implemented from 1st April 2008 in its phase III. From October 2, 2009, National Rural Employment Guarantee Act (NREGA) has been renamed as Mahatma Gandhi National Rural Employment Guarantee Act.

Table No 1: Achievements of the scheme in Kolhapur District (2010-11 to 2012-13)

Particulars	2010-11	2011-12	2012-13
Total No. House Hold (HH) Issued Job Cards	143676	171247	176228
No. of S.C House Hold Issued Job Card	14044	16908	17599
Percentage Of S.CHH Issued Job	9.77	9.87	9.98
No. of S.T. HH Issued Job Card	272	518	537
Percentage Of HH issued Job Card	0.19	0.30	0.30
No. of Other HH Issued Job Card	129360	153821	158294
Percentage Of Other HH Issued Job Card	90.04	89.82	89.82
Employment Provided To Household	2675	38847	30511
Person days Generated			
Total	**35758**	**1266572**	**1433623**
SC	1472	74831	64031
SC Percentage Out Of Total Person Days Generated	4.1	5.9	4.47
ST	77	6176	6637
ST Percentage Out Of Total Person Days Generated	0.21	0.49	0.46
Other	34209	1185565	1362955
Other Percentage Out Of Total Person Days Generated	95.7	93.6	95.0
Women	24932	599315	641676
Women Percentage Out Of Total P erson Days Generated	69.7	47.3	44.8
Household Completed 100 Days	10	2235	3401
Percentage Of HH Completed 100 Days, Out Of Total HH Provided Employment Under The	0.37	5.8	11.1

Source:http://nrega.nic.in

(MGNREGA). Unique feature of MGNREGS ensures livelihood security for rural people by guaranteeing, at least 100 days of wage employment in a financial year to every household whose adult members volunteer to do unskilled manual work.

2.0 WAGE EMPLOYMENT GENERATED UNDER THE SCHEME IN KOLHAPUR DISTRICT:

The scheme is implemented in Kolhapur District in its Phase III from 1st April, 2008. Although the implementation of the scheme was started from the April 2008, the implementation of the scheme has been geared up from 2010-2011. Form the financial year 2010-2011 to 2012-13, total 2735953 wage employment person days are generated in the district. In the financial year 2010-2011 total number of 2675 households were provided employment in the District, these households generated 35758 person days in the year under the scheme. In F.Y 2011-12, 38847 households were provided employment, and these households generated 1266572 person days wage employment. Further in F.Y 2012-13, 30511 households were provided employment and total 1433623 person days wage employment were provided.

Along with identifying the absolute figures of wage employment generated in the District, it is most important to study the Socio-economic characteristics of this employment generated and inclusive growth achieved through the scheme in the District.

3.0 OBJECTIVES OF THE STUDY:

The main objectives of the study is to explore the outcome of the Scheme on various key parameters. The specific objectives of the study are listed below:

(i) To identify the key quantitative achievement in employment generation under the MGNREGS in the Kolhapur District.

(ii) To compare the wage employment generation performance of the MGNREGS implemented in Kolhapur district with its National level performance on the following parameters.

(iii) To compare women participation in Kolhapur District against National women participation.

(iv) To compare SC, ST participation in Kolhapur District against National SC, ST participation.

(v) To compare **Average person days generated per HH in the District against National Average person days generated per HH.**

4.0 HYPOTHESES OF THE STUDY:

(i) H_0: There is no significant difference between average women participation in Kolhapur District and average women participation at national level.

(ii) H_0: There is no significant difference between average SC participation in Kolhapur District and average SC participation at national level.

(iii) H_0: There is no significant difference between average parson days wage employment generated per household in Kolhapur district and average person days wage employment generated per household at national level under the MGNREGS.

5.0 DATA SOURCE AND TECHNIQUE:

To examine the performance of MGNREGS implementation in Kolhapur district against its national performance on the stated variables, data was obtained from MGNREGS MIS maintained by Ministry of Rural Development on MGNREGS website. The time period selected for the study is 2010-11 to 2012-13. To examine the stated hypotheses, student t test is used. A detailed review was conducted on the previous research finding on MGNREGS implementation.

6.0 Performance Analysis : MGNREGS in Kolhapur

6.1 Registration of Household:

The Implementation of MGNREGS was started from 1st April 2008, however implementation of the scheme was geared up in the Kolhapur district only from the financial year 2010-11. In the financial year 2010-11 total 143676 household were issued job cards, in the district, out of it 14044 households were SC, 272 households were ST and 129360 were other households. This accounts 9.77 per cent SC households, 9.77 per cent ST households and 90.04 per cent other households respectively. In the financial year 2011-12 total 171247 households were issued job cards, out of it 16908 (9.87per cent) were SC households, 518 (0.30 per cent) were ST households and 153821 (89.83 per cent) were other households. Whereas in the year 2012-13 total 176430 households were issued Job cards, out of it 17599 (9.98 per cent) were SC households, 537 (0.30 per cent) were households, and 158294 were other households.

Table No. 2 compares percentage of SC household registered under the scheme and percentage of SC household below poverty line as per Socio-Economic Poverty Census 2002, in the Kolhapur District. As per the Socio-Economic Census 2002-2003, 20.18 per cent SC household were below poverty line out of total rural BPL Households, whereas by the F.Y 2012-13 only 9.78 per cent SC households were registered under the scheme. It indicates every block in the district has a gap between percentage of SC household living below poverty line out of total household living below poverty line and the percentage of SC households registered under the scheme.

Above figures, shows that many potential SC households are not yet registered under the scheme. SC, ST households are the most backword section of our society. Special efforts are needed to identify the potential household those can be registered under the scheme. A grassroot level, door to door survey need to be conducted to identify the potential household and their registration under the scheme.

Table No. 2: Below poverty line Household as per the 2002-03 Socio-Economic Census and their comparison with SC household registered under the MGREGS.

Block	No. Rural HH As per 2002 Socio-Economic Poverty Census	Total No Rural HHBPL as per 2002 Socio-Economic Poverty Census	No of SC HHBPL as per 2002 Socio-Economic Poverty Census	% of SC HHBPL out of total rural BPLHHs	Cumulative % of SC HH issued Job Card Up to F.Y 2012-13 under MGREGS
AJRA	27651	4818	527	10.94	5.72
BAVDA	6819	1199	436	36.36	8.44
BHUDARGAD	33224	5769	781	13.54	9.79
CHANDGAD	36375	6404	930	14.52	2.9
GADHINGLAJ	48938	8608	1438	16.71	8.11
HATKANANGALE	83891	14755	3641	24.68	7.97
KAGAL	49829	8764	1805	20.60	16.03
KARVIR	79703	14028	3037	21.65	8.49
PANHALA	52302	9199	1602	17.41	14.11
RADHANAGARI	43324	7620	1199	15.73	12.06
SHAHUWADI	39929	7023	2067	29.43	4.37
SHIROL	59754	10509	2452	23.33	21.54
Total	561739	98696	19915	20.18	9.78

6.2 WOMEN PARTICIPATION IN MGNREGS:

The MGNREGS act stipulates that while offering employment, priority shall be given to the women in such a way that at least one-third of the beneficiaries shall be women who have registered and requested for work under this Act. In the Kolhapur district from the F.Y year 2010-11 to 2012-13 total 1265923 number of women employment days have been generated. The percentage of women employment days generated for F.Y 2010-11 to F.Y 2012-13 are 70 per cent, 47 per cent and 45 per cent respectively. On this account, national average for women participation for the same period is 48 per cent, 48 per cent and 53 per cent respectively.

Here an attempt has been made to compare average Women Participation in Kolhapur District against National average Women participation. The null hypothesis can be stated as below:

H_0: There is no significant difference between average women participation in Kolhapur District and average women participation at national level in MGNREGS

To examine the significance of difference use the t test. The results are presented in the Table No 3 and Table No. 4.

Table No. 3: Descriptive Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Women Participation	12	45.9267	6.59020	1.90243

Table No. 4 : t test Results

	Test Value = 48.99					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Women Participation	-1.610	11	.136	-3.06333	-7.2505	1.1239

Here observed value of t=-1.610; with P>0.05 indicates that there is no significant difference between average women participation (45.92 wage employment days) in Kolhapur district against its national average.

Women participation under the scheme is well ahead of the stipulated one third of the total beneficiaries in the district. The scheme has emerged as an alternative source of income to the rural women. Additional income generated by woman employment is not only expected to support families get better livelihood but also to improve status of woman in the family. It is imperative to access the socio-economic change taken place among the women beneficiaries of the scheme in the district.

6.3 Work Participation of SC/ST:

Although there is no special provision for participation of SC/ ST under the MGNREGA, the scheme suggests special communication strategies to be planned to increase the participation of the marginal section of the society. In the Kolhapur district from the F.Y 2010-11 to 2012-13 140411 person days are generated, under the scheme. Cumulative percentage of SC & ST from the F.Y 2010-11to2012-2013 stands at 4.3 per cent, 6.40 per cent, and 4.9 per cent respectively. At the other hand, percentage share of SC and ST to the total population of the district is 12.88 per cent. However, National average of SC/ST participation for the same period is 51.48 per cent, 40.35 per cent and 38.08 per cent.

Here an attempt has been made to compare average SC participation in Kolhapur District against National average SC participation. The null hypothesis can be stated as below:

H_0: There is no significant difference between average SC participation in Kolhapur District and average SC participation at national level.

H_0: There is no significant difference between average parson days wage employment generated per household in Kolhapur district and average person days wage employment generated per household at national level under the MGNREGS.

Table No. 7: Descriptive Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Average Person days Per HH	12	36.9508	7.50066	2.16525

Student T test to compare the Average Person days Per HH in Kolhapur District against its National Average.

Table No. 7: t Test Results

	Test Value = 45.33					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Average Person days Per HH	-3.870	11	.003	-8.37917	-13.1449	-3.6135

Here observed value of t= -3.870; with P <0.05 indicates that there is significant difference between average person days wage employment generated (36.95 wage employment days per household) in Kolhapur district against its nationalaverage 45.33.

Based on the results and discussion it can be concluded that the work under MGNREGS needs to be planned in such a way that maximum household can reap the benefits of these 100 days of employment. The detailed analysis of work availability pattern in the village from its agro-economic activities and accordingly converging between MGNREGS work and agriculture work need to be done. So that, agriculture would not face shortage of labour supply and problem of under employment in rural economy can be resolved. Base line survey needs to be arranged for assessing the timing of demand for work. Here Gram Sabhas, local government, Panchayat raj institution can play the imperative role in planning and implementation of MGNREGS.

7.0 SUMMARY

Various studies conducted by Professional Institutional Network of MGNREGSand other researchers have stated that MGNREGS has emerged as important alternative source of income at rural area. The performance of the scheme in Kolhapur district is satisfactory in terms of women participation and well ahead of its stipulated one third women participation rate, stated in the MGNREGA. However, the district is lagging behind in terms of SC participation under the scheme and average annual person days wage employment generated per household. Besides, there were news in the local news papers on irregularities in implementation of the scheme in the district. There is hard of in-depth field research to access the implementation of the scheme and its socio-economic impact in the district.

Appendix

Details of wage employment person days generated under MGNREGS.

National Person days generated					Kolhapur Person days generated			
Figures in Crore					Actual Figures			
	2010-11	2011-12	2012-13	Total	2010-11	2011-12	2012-13	Total
Total	257.15	216.34	229.37	702.86	35758	1266572	1433623	2735953
SC	78.76	47.7	50.75	177.21	1472	74831	64031	140334
SC %	31	22	22	25	4.1	5.9	4.5	6.16
women	122.74	103.81	117.75	344.3	24932	599315	641676	1265923
%women	47.7	48.0	51.3	48.99	69.72	47.32	44.8	45.93
Persondays per HH	47	43	46	45.33	13.4	32.6	47.0	36.95

Source: http://nrega.nic.in

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INDUSTRIAL EMISSION –A CASE STUDY

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ABSTRACT: Rapid industrialization is a primary requirement for developing countries in order to enhance living status of its population and contributing to sustainable growth. Industrialization deteriorates the environment. Key atmospheric pollutants are particulate matter, oxides of nitrogen, oxides of sulphur and RSPMs. India ranks fifth globally in overall emissions and is projected to rank higher as the economy grows.

W.H.O defines "air pollution as the presence of materials in the air which are harmful to the living beings when they cross their threshold concentration levels". The Ohio Environmental Protection Agency [EPA] provides the definition of "Air pollutant" or "air contaminant" as particulate matter, dust, fumes, gas, mist, smoke, vapor or odorous substances, or any combination there of. Airborne particles smaller than 10 micrometers, called as particulate matter less than 10 μm [PM10s] cause serious respiratory problems in humans, other pollutants which are harmful are oxides of sulfur and oxides of nitrogen.

Key words: Pollutants, Particulate matter, WHO, EPA, AQI, Environment, Standards.

1.0 INTRODUCTION

Industrialization and urbanization have resulted in a profound deterioration of India's air quality. India's most severe environmental problem, come in several forms, including vehicular emissions and untreated industrial smoke, that change the composition of atmosphere and affect the biotic environment. Urbanization has resulted in the emergence of industrial centers without a corresponding growth in civic amenities and pollution control mechanisms. Various contaminants continuously enter the atmosphere through natural and man-made processes and these contaminants interact with the environment to cause disease, toxicity, environmental decay and are labeled as pollutant and are injurious to human beings other living creatures and the environment. Air pollutants and can be either particles, liquids or gaseous in nature.

Air has a relative constant composition of gases and is utilized by living organisms in respiration to liberate chemical energy for their survival. Air pollution is defined as the addition of various hazardous chemicals, particulate matter, toxic substances and biological organisms into the Earth's atmosphere. There are various factors causing air pollution, but what comes from industries and factories is often considered a prime factor in air pollution. Air pollutant can be defined based on the concentration of chemical present in environment. The composition of clean air (Figure 1) is used as a bench mark. If the concentration of a chemical is above the concentration of chemical present in air, it is then termed as an air pollutant.

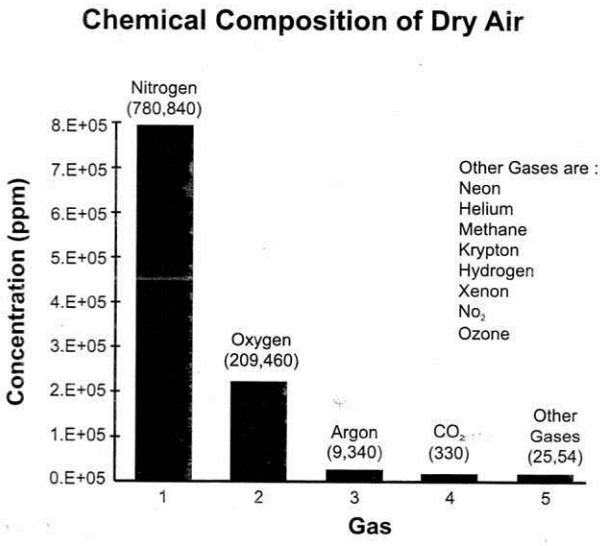


Figure1: Composition of Dry Air

*PPM: Parts Per Million

There are two basic physical forms of air pollutants. The first is gaseous form. For example, sulfur dioxide, ozone and hydro-carbon vapors exist in the form of a gas. The second form of air pollution is particulate matter such as smoke, dust, fly ash and mists. The pollutants are also classified as primary pollutants and secondary pollutants. The primary pollutants remain in the same chemical form as they are released from a source directly into the atmosphere. For example: sulfur dioxide and hydrocarbons. The secondary pollutants are a result of chemical reaction among two or more pollutants, releasing harmful chemicals into the atmosphere. The production of PAN (Peroxyacetyl Nitrate) during photochemical reactions is an example of secondary pollutant. Primary pollutant combines with some component of the atmosphere to produce a secondary pollutant (Naik S., 2005).

Six common pollutants identified are (also known as "criteria" pollutants): Sulfur oxides, Carbon monoxide, Nitrogen dioxide, Ozone, Total suspended particulate matter, and Lead. In this paper the emission levels of various pollutants are measured and compared with the standards provided by the pollution control board to know whether the concerned organisation is polluting the environment were it operates.

2.0 OBJECTIVES OF THE STUDY

The major objectives of the study are as below:

(i) Assessment of emission of SPM, SOX and NO_X at different locations in the paint booth at TATA Marcopolo.

(ii) To know about Air Pollution Index.

(iii) To assess the status of air pollution because of emission of various pollutants.

3.0 TATA MARCOPOLO

The state-of-the-art bus manufacturing facility of Tata Marcopolo Motors at Dharwad (Karnataka) is a 51:49 joint venture of Tata Motors and Marcopolo of Brazil. The Dharwad plant caters to India's growing need for world-class fully built buses for intra-city and inter-city transportation with international standard comfort, quality and safety.

The plant produces a comprehensive range of buses. The range, are marketed under the 'Starbus' and 'Globus' brands, includes 16- to 54-seater standard buses, 18- and 45-seater luxury buses, luxury coaches and low-floor city buses. The plant, spread over about 123 acres, has a capacity to produce 30,000 units a year. The joint venture has already invested about Rs200 crore.

3.1 AIR POLLUTION INDEX

In order to communicate with the public, regulatory agencies in various countries have developed different air pollution indices. The idea is to translate technical information on concentration levels of various pollutants into a simple and easy to understand language for the public.

Environmental Protection Agency in US has developed the pollutant standard index (PSI) for introducing consistency in providing information regarding the air quality throughout the U.S. The system is based on a scale of 0-500. An index below 100 indicates that the air quality is within acceptable range. A value over 100 implies potential health problems. The alerts are issued at 200, 300 and 400 levels. Five pollutants (carbon monoxide, sulfur dioxide, total suspended particulate, ozone and nitrogen dioxide) are included in the index.

Table1: Indian Air Quality Index for Different

S.No	Index	Category	SO_2 (24 hr avg) (ugmlm$_3$)	NO_2 (1-hr avg) (ugmlm$_3$)	SPM (24 hr avg) (ugmlm$_3$)	CO (1-hr avg) (ugmlm$_3$)	CO (8-hr avg) (ugmlm$_3$)	O_3 (1-hr avg) (ugmlm$_3$)	O_3 (24 hr avg) (ugmlm$_3$)	$PM_{2.5}$ (24 hr avg) (ugmlm$_3$)	Pb (24 hr avg) (ugmlm$_3$)	PM_{10} (24 hr avg) (ugmlm$_3$)
1	0-100	Good	0-80	0-80	0-200	0-4	0-2	0-180	0-60	0-400	0-1	0-100
2	101-200	Moderate	81-367	81-180	201-260	4.1-25	2.1-12	180-225	61-90	400-550	1.1-5	101-150
3	201-300	Poor	368-786	181-564	261-400	25.1-35	12.1-17	225-300	61-210	550-700	1.5-2.25	151-350
4	301-400	Very Poor	787-1572	565-1272	401-800	35.1-75	17.1-35	301-800	211-250	700-900	2.25-3.25	351-420
5	401-500	Severe	>1572	>1272	>800	>75	>35	>800	>250	>900	>3.25	>420

To reflect the attainment of National Ambient Air Quality Standards [NAAQS], the AQI is referred to as Good between the ranges 0 - 100. For the second break point(at the standard of United States Environmental Protection Agency [USEPA]), the AQI takes the value of 200 and referred to as Moderate. In absence of any other pollutant of any other pollutant health criteria in India, rest of categorization of Index is based on the USEPAFederal Episode criteria and Significant Harm Level. IND-AQI is primarily a health related index with the following descriptor words: "Good (0 - 100)", "Moderate (101 - 200)", "Poor (201 - 300)", "Very poor (301 - 400)", "Severe (401 - 500)".

3.2.0 DIFFERENCE BETWEEN EMISSIONS AND IMMISSIONS?

Emissions are generally defined as the release of substances or energy from a source into the environment. The Federal Immission Control Act defines emissions as air pollution, noise or odour originating from an installation. Immission relates to the effects of emissions on the environment. With regard to air pollution control, this means the effect of air pollutants on plants, animals, human beings and the atmosphere.

3.2.1 EMISSION INVENTORY

Emission Inventory is a study of the pollutant emission estimates from sources in a given area. The development of emission inventory is important for a company as well as for the pollution control agencies. The inventory allows an environmental scientist to locate pollution sources, to define types and amounts of emission from each source, to define physical characteristics of sources, to determine emission frequency and duration of each pollutant exposure, to determine relative contributions to pollution problem in the area due to individual sources or a group of sources, to determine pollution controls needed to protect public health, and to provide a data base for air quality modeling and risk assessment. Emission Inventory developed may be used for

(i) Identify types of pollutants emitted from specific sources.
(ii) Determining the magnitude or amount of emissions from those sources.
(iii) Developing emission distributions in time and space.
(iv) Calculating emission rates under specific plant operating condition.

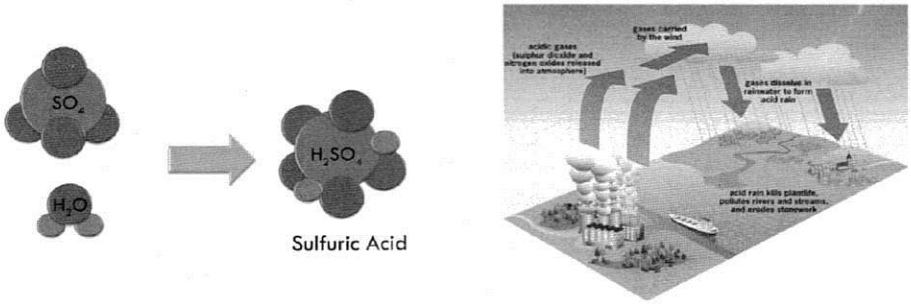
3.2.2 IMPACT OF EMISSION

Some of the effects of air pollution due to industrial emission are:

(i) Global Warming : Global warming is largely considered one of the most hazardous and serious complications associated with air pollution caused by industries and other stationary sources of air pollution. The liberation of certain gases such as methane, or CH4, and carbon dioxide, or CO2, together known as greenhouse gases, is often considered to be prime factor causing global warming. These greenhouse gases often result in an increase in the atmospheric temperature, causing global warming. Global warming has various serious implications both on the ecological balance as well as human health.

(ii) Acid Rain : Industries often emit large amounts of nitrogen and sulphur gases into the Earth's atmosphere. When these gases react with water vapors in the atmosphere, they often change into more aggressive gases, namely nitric acid and sulphuric acid respectively. The rain containing large amounts of these acids is known as acid rain. Acid rain has various health and natural dangers.

Figure1: Effect of Sulphates and Nitrates



(iii) Respiratory Disorders: The emission of various gases such as carbon monoxide, or CO, often results in various respiratory disorders such as bronchitis, asthma, chronic obstructive pulmonary disease, or COPD, in individuals. CO damages air passages in individuals, leading to respiratory disorders. However, if carbon monoxide is present in increased levels in the atmosphere, it can even cause the death of the person, by inhibiting oxygen intake by combining with hemoglobin.

(iv) Ozone Layer Depletion: The ozone layer is a gaseous blanket that helps in supporting and sustaining life on Earth by protecting us from various hazardous radiations such as UV rays. Hence, the addition of some of the above mentioned pollutants often damages the atmosphere, thus causing various health risks in humans such as skin disorders like rashes, irritation and even cancer in severe cases.

4.0 METHODOLOGY OF THE STUDY

The tables given below show the methodology followed to conduct the study and data collected.

Table No. 2 Methodology

Particulars	Details
Monitoring for	Stack Emission Monitoring and Analysis
Sampling Procedure	As per IS/APHA/EPA Guidelines
Sampling Location Stack Attached To:	1. Paint Booth- Primer application booth 1 – vent 1 2. Top coat paint booth 1 paint shop 3. Oven for paint drying in paint shop
Method of measurement	EPA
Instrument	Stack VSS1 Vayubodhan

Table No. 3 Data

Stack Attached To	Paint Booth - Primer application booth -1 vent1	Top coat paint booth 1 Paint shop booth	Oven for paint drying In paint shop
Stack Height [mts]	16.60	16.60	16.60
Stack Shape	Rectangular	Rectangular	Rectangular
Stack Area[mm]	1350x950	1350x950	1350x950
Product	BusBuilding	BusBuilding	BusBuilding
Stack Temperature[k]	303	303	303
Ambient Temperature [k]	301	301	301
Velocity m/sec	6.18	6	6.52
Quantity of Emission [Nm^3/Hr]	1546.97	1501.92	18144.55
Particulate Matter [mg/Nm_3]	64.43	56.18	77.17
Oxidesof Nitrogen NO_x [mg/Nm^3]	13.8	13.3	13.6
Oxides of SulphurSO_x [mg/Nm^3]	12.0	12	12.0
Carbon Monoxide[% Volume]	0.1	0.1	0.2

In thepresent study the AQIis calculatedusing IND-AQI [See table 1 or Annexure1]. The index has beendeveloped based on the dose-responserelationship of various pollutants. Theindex is named as IND-AQI (Indian AirQuality Index). The major air pollutant,which can cause potential harm tohuman health have been included viz. SO2,NO2, SPM, and CO.

$$I_p = \left[\frac{(I_{Hi} - I_{Lo})}{(BP_{Hi} - BP_{Lo})}\right](C_p - BP_{Lo}) + I_{Lo}$$

where IP is the AQI for pollutant "p", CP is the actual ambientconcentration of the pollutant "p", BPHi is the breakpoint in Table 1 [or see annexure1] that is greater than or equal to Cp, BPLo is the breakpoint in Table 1that is less than or equal to Cp, IHi is the sub index valuecorresponding to BPHi, and, ILo is the sub index value correspondingto BPLo.The AQI is determined on the basis of AQI of study pollutantsand the highest among them is declared as the overall AQI. Theformula used here is same as used by USEPA, in which sub-indexand breakpoint concentration depends on Indian **National Ambient Air Quality Standards** [NAAQS].

5.0 RESULTS OF AQI FOR VARIOUS POLLUTANTS

The results of AQI for various pollutants are given in the following tables :

Table 2.1: AQI Calculation for SO_2

Stack Attached to	Sulphur Dioxide (SO_2)	AQI	Category
Paint Booth-Primer application booth -1 vent1	12	15	Good
Top coat paint booth 1 Paint shop booth	12	15	Good
Oven for paint drying In paint shop	12	15	Good

Table 2.2: AQI Calculation for N_2

Stack Attached to	Nitrogen Dioxide (NO_2)	AQI	Category
Paint Booth-Primer application booth -1 vent1	13.8	17.5	Good
Top coat paint booth 1 Paint shop booth	13.3	16.25	Good
Oven for paint drying In paint shop	13.6	17.5	Good

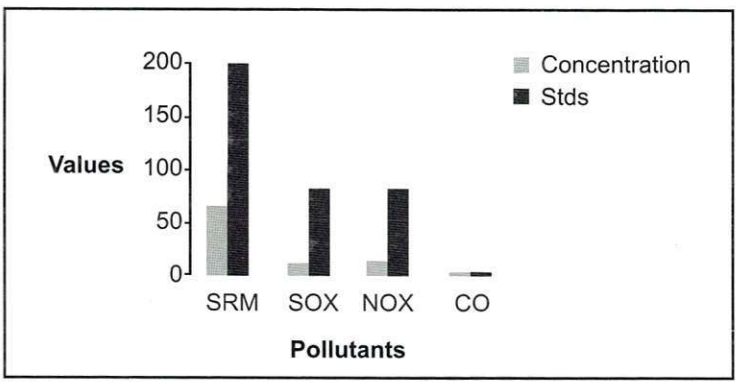
Table 2.3: AQI Calculation for Particulate Matter

Stack Attached to	Particulate Matter	AQI	Category
Paint Booth-Primer application booth -1 vent1	64.43	32.5	Good
Top coat paint booth 1 Paint shop booth	56.18	28	Good
Oven for paint drying In paint shop	77.17	38.5	Good

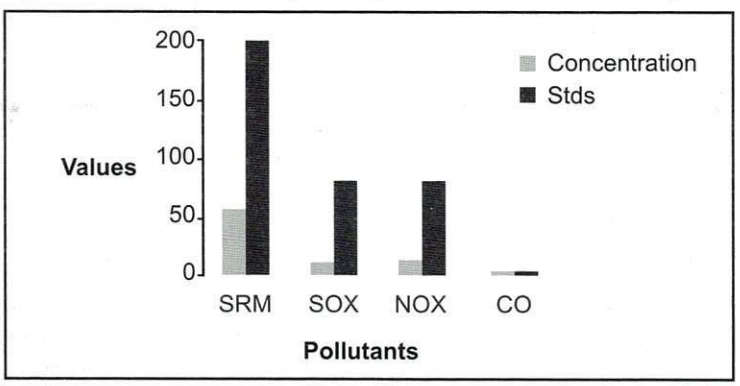
Table 2.4: AQI Calculation for CO

Stack Attached to	Carbon Monoxide	AQI	Category
Paint Booth-Primer application booth -1 vent1	0.1	5	Good
Top coat paint booth 1 Paint shop booth	0.1	5	Good
Oven for paint drying In paint shop	0.2	10	Good

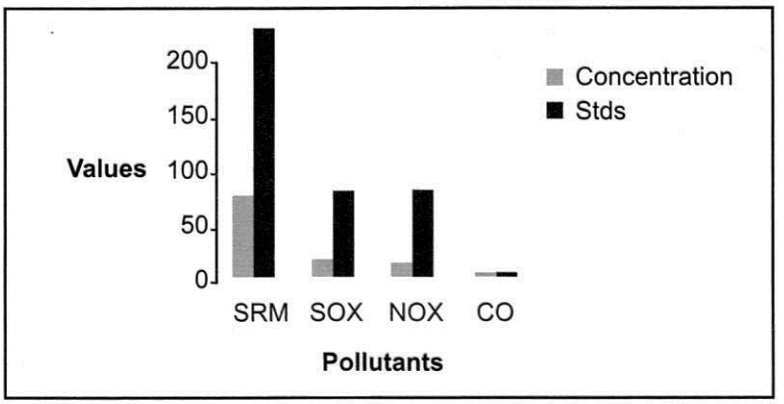
Graph 1.1: Location - Paint Booth-Primer application booth -1 vent1



Graph 1.2: Location - Top coat paint booth 1 Paint shop booth



Graph 1.3: Location - Oven for paint drying in paint shop

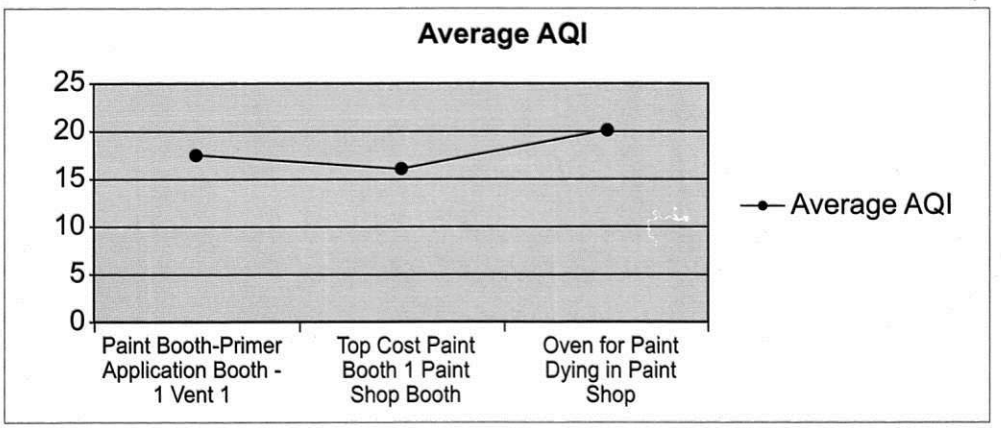


CALCULATION OF AVERAGE AQI

Table 3: Average Values of AQI at Different Locations

Location	Average AQI
Paint Booth- Primer application booth -1 vent1	17.5
Top coat paint booth 1 Paint shop booth	16.06
Oven for paint drying In paint shop	20.25

Graph 2: Plot of Average AQI at different Locations



6.0 CONCLUSION

Air pollution measured in the form of Air Quality Index provides a meaningful assessment of air pollution rather than individual air pollution level while planning prevention of air pollution in industrial areas. It is concluded from the observations at different monitoring stations the emission levels of pollutants are within permissible limits as specified by Central Pollution Control Board (CPCB).

Even though the AQI at all the three locations is much below the permissible range ,AQI at the oven for paint drying in paint shop location is relatively higher than the other two locations because of higher level of suspended particulate matter[SPM]. From the result we can conclude that the company is taking care of the working environment and keeping the premise clean and less polluted, the workers are provided with safety equipments while

working in the paint area and are also properly trained thus maintaining the health and safety of its employees. Since the AQI level of this company is well below the standards, there are no reports of any impact of pollution either on the environment or on the health of the employees. The strategy followed by the company is to regularly monitor the concentration of various pollutants with the help of a monitoring agency, ensuring regular medical checkups for the employees Further they have planted lots of trees to reduce the level of pollution, since trees help in trapping dust and also help in keeping the working environment green and less polluted. With this kind of working environment and pollution control methods one can say that the organisation is contributing to environment sustainability. We can say that he need of the hour is in striking the right balance between environmental, economic and societal concerns to minimize industrial emissions while supporting innovation and competitiveness.

ANNEXURE 1

Sub-Index and Breakpoint Pollutant Conentration for Indian Air Quaality Index (IND-AQI)

Sub-Index	Category	Pollutants (μ/m^3)					
		SO_2	NO_2	SPM	PM_{10}	CO	O_3
		24-h avg.	24-h avg.	24-h avg.	24-h avg.	8-h avg.	8-h avg.
0-100	Good	0-80	0-80	0-200	0-100	0-2	0-157
101-200	Moderate	81-367	81-180	201-260	101-150	2.1-12	158-235
201-300	Poor	367-786	181-564	261-400	151-350	12.1-17	236-784
301-400	Very Poor	787-1572	565-1272	401-800	351-420	17.1-35	785-980
401-500	Severe	> 1572	> 1272	> 800	> 420	> 35	> 980

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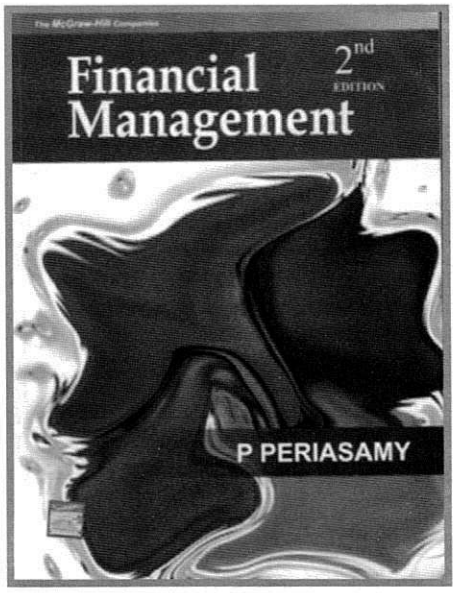
BOOK REVIEW



Financial Management
2nd Edition

P. Periasamy
The Tata McGraw-Hill Education
Private Limited,
New Delhi.
ISBN-13: 978-0-07-015326-4

The book "Financial Management" 2nd edition by the P Periasamy takes an international view of managing the funds for the company. The conviction of the author that it is necessary to make use of available all the resources at its maximum level, which may lead to earn profit and also to increase in organizational turnover. The book describes these issues in the finance perspective. It becomes necessary to have the right knowledge of procurement of fund and its well utilization as day-by-day the market is changing, customers test, competitor's policy, production policy, cost structure, employee turnover and depending upon this the requirement of the fund also are changing. So the author is throwing light on this entire changing scenario especially on the fund management.Moreover with their experience of the changing scenario and market conditions, the authors include an innovative perspective to the practice by the management for the greater fund management and traveling towards the profit. Beyond the discussion of fund management in the company the author has discussed the other finance related various topic which are also important while taking the crucial financial decision which are normally missing in other books.

The term financial management has been defined differently by various authors. The most acceptable definition of financial management deals with procurement of funds and their effective utilization in the business. There are, thus, two basic aspects of financial management procurement of funds and an effective use of these funds in the business. Because the funds in the company are equally important as blood is important for the human body. In the globalised competitive scenario it is not enough to scout for available ways of raising finance but resource mobilization has to be undertaken through innovative ways or financial products which answer the needs of investors. Multiple option convertible bonds can be sighted as an example. Funds can be raised indigenously as well as abroad. Foreign Direct investment (FDI) and Foreign Institutional Investors (FII) are two major routes for raising funds from foreign sources. Obviously, the mechanism of procurement of funds has to be modified in the light of the

requirements of foreign investors.

The book is classified according to the background, techniques of financial analysis, long-term investment decisions, financial decisions, dividend policy decisions and current assets management. The systematic approach has been used by the author throughout the book.

Part 1 covers the basis of financial management theory and practice; it also introduces the systems model that serves as the frame work of the book. To provide the perspective of the book, Part1 includes chapterfinancial management and its nature and scope in the corporate line, its goals and objectives, various function of financial management, to maintain optimum capital employed and increase the return on investment,the financial manager has to consider the various applications of financial management techniques, methods, procedures etc. the scope and nature of financial management is closely related to the field of economics, marketing and production accounting. The study of functions, objectives and various techniques of financial management is an important field of study for s student of commerce and management.

Part 2 throws light on financial statements analysis and planning, statement of changes in financial position i.e. funds flow statement analysis (working capital basis), cash flow statement analysis (cash basis) and Accounting Standard-AS3 (Revised) cash flow analysis and the financial statement analysis through ratio analysis. The relevant principles, or guides, for each function are summarized in Appendix given at the end of the book.

The financial management at domestic and international perspectives of managing are emphases upon in each of the parts closing section. The closing for parts 5 to 12 have an international and financial focus section that gives special attention to important issues capital budgeting, risk analysis in capital budgeting, risk and return analysis in portfolio investment, sources of Long-term Finance as shares, debentures and term loans, financing from capital markets and exports financing etc. To exemplify the global competitiveness of financial management of the companies, various live cases have been discussed in each part closing, and to asset new entrepreneurs, the authors include a long term survival financial planning outline in the format expected by business professional.

The basic purpose of this book is to assist the readers and students to develop a thorough understanding of the various financial management concepts, principles, techniques and important theories of financial management in a systematic way. Although there are a good number of standard books on 'Principles of Financial Management', there are differences in the adoption of the best methods of applying these principles. A significant highlight of this book is the method of presentation, comprehensive coverage of topics and an emphasis on lucidity. While writing this book, the author has taken special efforts to adopt a simple language and style of presentation and follow a student-friendly approach.

Part 1 (Chapters 1) includes discussion on nature and scope of financial management, need of finance, types of finance, importance of financial management, major areas of financial management, objectives of financial management and other important decision criterion. Part2 (Chapters 2 to 4) presents new techniques of financial analysis for which, financial statements analysis and planning, funds flow and cash flow in revised format as per AS-3 and ratio analysis are important areas are discussed here. The various issues of long term investment decisions in Part3 (Chapters 5to12) presents new techniques of long term

investment decision for which, capital budgeting, risk and return in portfolio investments, financing from capital markets and exports financing, measurement of cost of capital, importance and status of mergers, amalgamation and acquisition or takeovers and lease financingthese many important areas are discussed here.

Financial decisions are discussed in Part4 (Chapters 13 to16) with the help of leverage analysis which is one of the important topic in the risk analysis, capital structure planning, capital and capitalization and the designing of capital structure-approaches to establish target capital structure. The dividend policy decision part has been discussed in this in Part5 (Chapter 17) focus on factors affecting dividend policy, bonus shares concepts, stock splits and ratio analysis for dividend policy. Part 6 (Chapters 18to23) deals with the current assets management includes working capital management, planning and financing of working capital, management of cash and marketable securities, management of accounts receivable, inventory management and reporting to management.

The appendices at the end summarize the principles, or guides, for the managerial function of procurement of fund, utilization of fund, financial statement analysis, risk and return in portfolio investment. The principles allow the students and managers to check whether organizational financial problems can be traced to the violation of financial managerial principles. Also at the end the author has given glossary which more useful the young readers, researchers and also the student community. There after the author has taken lot of pain to make available the objective type of question with four options to each objective. These questions are apart from the questions given at the end of the each chapter, which help to the reader to check their own knowledge after reading the particular chapter and can make the self assessment on their own. Overall the book gives a very clear insight into the basic of financial management. In every chapter wherever it is necessary the author has given the graphs, flow charts, diagrammatic and the tabular presentation of the important concepts are very handy for the readers understanding. The success or otherwise of any business undertaking depends primarily on earning revenue that would generate sufficient resources for sound growth. The achieve this objective; the management should discharge its functions efficiently and effectively. The financial management systems are highly useful to the management for effective planning and control. A regular system of financial management is considered as a better guidance for prompt decision making. Hence it is necessary to have a good financial management system at the organizational level. The book therefore is a must read for students and young researchers who interest is to understand financial management concepts and shape new organizations on the new financial management principles.

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