EXECUTIVE SUMMARY
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Green supply chain management was emerging in the last few years. The GSCM concept covers every stage in manufacturing from the first to the last stage of life cycle, i.e. from product design to recycle. GSCM can not only be implemented in manufacturing organizations, instead GSCM can also be used to other organizations such as government, education and services. But most importantly it is very crucial for the chemical industries to implement the green supply chain management practices to reduce their continuously increasing effect on the environment. The chemical industry in India is fragmented and dispersed. It is multi product and multifaceted – which really makes it complex and a challenging task to address sustainability issues. The industries have been labeled to be the most polluting industries, still the sustainability issues are yet to come in widespread manner. This calls for the research in chemical industries for GSCM practices and is being undertaken as the topic for the research study with a special focus on chemical industries in Gujarat state.

The study used exploratory research design to study the macro environment of chemical industries for the GSCM implementation followed by the descriptive research to determine the relationships among various components of green supply chain management practices and interrelationships among them. The non probability convenience sampling method was used for data collection out of the chemical industries list provided by iNDEXiTb published in 2010. The study combines issues related to the environment with others supply chain management functions. The appropriate person from which the required data could be obtained should ideally have knowledge about both aspects. Managers of Environment Management Systems (EMS) departments or managers of Environment, Health and Safety (EHS) departments at various Chemical Industries were considered as sample universe for sampling procedure. Sample size calculation performed with consideration of Finite Population correction factor with $N = 2052$, $n = 384$, $p = 0.5$, $q = 0.5$, Confidence level = 95%, $\alpha = +$ or - 5% gives $n = 324$ as sample size.

A total of 1000 chemical industries in Gujarat were approached for the survey and were administered with the research questionnaire, and only 331 respondents completed and returned the instrument. This is a 33.1 per cent response rate.
Questionnaire was divided into three major sections containing 14 questions. All the 331 respondent’s entries were done in SPSS. For the analysis of data statistical methods are applied with the aid of Statistical Package for Social Science (SPSS) software, version 16.0 and excel. The data shows that most of the chemical industries surveyed are at the beginning Stage of green supply chain activities followed by the few large scale chemical industries which are at intermediate stage of green activities implementation. It is found that only very few players are implementing green activities entirely along the every activity and are at advanced stage of green activities implementation and there are almost practically no medium sized and large scaled chemical industries without green activities strategy. It also shows that there is an association between the state of green supply chain management process and ISO 14000 certification achieved by an organization. The stages of green management activities differ among organizations having ISO 14000 certification and not having ISO 14000 certification. There is also an association between the state of green supply chain management process and adoption of environmental management system. The stages of green management activities differ among medium and large size of organizations.

The top three influencing factors are environmental commitment of Top management followed by gain legitimacy and at the third rank are employee’s values. The preferences of organizations to work with various external parties/ stakeholders namely Competitors, Suppliers, Consultants, 3PL providers, Governmental Agencies and Customers differ. An exploratory factor analysis was conducted to derive groupings of Green Supply Chain Management (GSCM) Drivers/Pressures; they were extracted using maximum likelihood method, followed by varimax rotation. The eight factors on GSCM Drivers/ Pressures are labeled as Vertical Channel Partners, Environmental Regulations, Society, Expected Business Benefits, Top Management Support and Corporate Values, Competitors’ Practices, Organizational Factors and International Environmental Agreements. An exploratory factor analysis was conducted to derive groupings of Green Supply Chain Management (GSCM) Practices. Seven factors of GSCM Practices are labeled as Green Manufacturing, Green Procurement, Green Designing, Green Supplier Development, Green
Management, Green Logistics and Green Marketing. A similar factor analysis of the GSCM Performance items of also grouped the scale items as predicted. The five factors on Green Supply Chain Management (GSCM) performance are labeled as Environmental Performance, Financial Performance, Operational Performance, Competitive Performance and Reduction in Penalties.

After the both exploratory and primary research it was observed that the Indian Chemical Industries are feeling multiple pressures and drives to react to the environmental needs. They are also reacting with multiple and diverse set of actions of green supply chain initiatives. The large scales Industries are taking many innovative steps towards implementation of GSCM and practicing environmental sustainability. Most of the industries are at still at very beginning stage but the continuing pressures from all the major drivers will make them realize the need to implement and advanced the GSCM initiatives. The chemical industries are experiencing high regulatory and market pressures, pressures from their suppliers and other channel partners and at the same time from internal pressures from their organization, top management etc. Still they are lagging on external relationships such as green purchasing. Being a process oriented organizations they are more proactive towards environment needs of the manufacturing operations then their other parts of the operations like logistics, designing, supplier development and so on.

It is expected that the as time progresses the relationships between the increasing pressures and nascent GSCM Practices will become clearer. GSCM tends to have win-win relationships in terms of environmental performance and financial performance in log run. In arriving the results we must mention the presently the research is concentrated only to large and medium scale chemical industries and factory units in Gujarat State. As initial survey had revealed that the Small Scale Industries (SSI) does not have much awareness about the GSCM Practices. Also there is almost negligible implementation of GSCM in small scale industrial units because of unavailability of required funds for the initial investment for green activities implementation in supply chain. Overall this study provided the additional insights into the growing field of the relationships between GSCM drivers, practices and performances.

From the study it can be seen that most of the Indian business organizations including various chemical industries have increased the environmental awareness due to
regulatory, competitive and marketing pressures and other drivers. On the other hand GSCM is still in its infant state in India. This research is only one of few efforts to investigate green supply chain management practices in chemical industries and the investigation and its findings are still relatively exploratory. Future research can try out new relationships, including mediating and moderating relationships, that may exist between various items and factors we have identified. A more broadly based random sample study across India would also provide a better picture of these GSCM practices and what is going on throughout India in field of green supply chain management.