The Indian sugar industry is a key driver of rural development, supporting India’s economic growth. The industry is inherently inclusive supporting over 50 million farmers and their families, along with workers and entrepreneurs of almost 500 mills, apart from a host of wholesalers and distributors spread across the country.

The industry is at a cross roads today, where it can leverage opportunities created by global shifts in sugar trade as well as the emergence of sugarcane as a source of renewable energy, through ethanol and cogeneration. While some of these opportunities have been well researched in the past, there was a need to assess the potential for India and to develop a comprehensive and actionable roadmap that could enable the Indian industry to take its rightful place as a food and energy producer for one of the world’s leading economies.

Indian Sugar Exim Corporation (ISEC), an apex body with both Indian Sugar Mills Association (ISMA) and National Federation of Cooperative Sugar Factories (NFCSF) as its constituents, has sponsored KPMG for developing this roadmap. Over last few months, KPMG had extensive discussions with stakeholders across the value chain – farmers, millers, international traders and policy makers. These were supported with data collation from various sources, a comprehensive consumer study and expert views from international sugar research agencies. This report is the culmination of all these efforts and insights.

The report identifies imperatives for industry stakeholders, both from business and regulatory perspectives. The impact of these imperatives will enable greater prosperity for millions of farmers and drive future growth of the industry in domestic and international markets, while contributing towards food and energy security for India.

We appreciate the contribution of the KPMG team in developing this roadmap and the industry stakeholders and policy makers now need to work together to enable its successful implementation.

P. Ramababu  
President, ISMA

Jayanthil B. Patel  
President, NFCSF

© 2007 KPMG, an Indian partnership and a member firm of the KPMG network of independent member firms affiliated with KPMG International, a Swiss cooperative. All rights reserved.
Indian sugar industry is a critical industry, as on one hand it services the domestic market, the largest in the world and on the other hand, it supports 50 million farmers and their families. It is the second largest agro based industry in India.

Emerging businesses like fuel ethanol and structural changes globally including the removal of EU subsidies have provided new horizons for the sector. The sector today has transformational opportunities that would enable it not only to continue to service the domestic markets but also emerge as a significant carbon credit and power producer and support an ethanol blending programme of E10 and beyond.

However the sugar regulations would have to evolve to facilitate the transformation of the sector. We believe in the potential of the sector and have therefore partnered with ISEC in conceptualizing the sector roadmap 2017.

In the past, while there have been major studies conducted on the regulatory aspects of the sector, there have been none which have provided a comprehensive roadmap incorporating both the business and regulatory perspectives. This study aims at providing that comprehensive roadmap.

It has been a challenging task, but we’ve received tremendous support from the industry in developing this study. We are confident of the potential of the transformation opportunities and if the sector were to traverse the recommended roadmap, it would move towards the shared vision.

We are grateful to ISEC for giving us the opportunity and to all stakeholders who contributed to this study.

Arvind Mahajan
Executive Director, KPMG Advisory Services Pvt. Ltd.
## Contents

1. Executive Summary .................................................. 1

2. Objectives and Approach ............................................ 20

3. Shared Vision .......................................................... 24

4. Indian Sugar Industry - Sector Snapshot ......................... 28

5. Global Sugar Industry - Key Comparative Analysis ......... 52


7. Predictable Patterns - Learning From Other Industries .... 116

8. Regulatory Roadmap .................................................. 126

9. Implementation Plan .................................................. 184

10. Way Forward .......................................................... 198

Abbreviations ............................................................ 199

References .................................................................... 202
In an era where there is a need for inclusive growth, the sugar industry is amongst the few industries that have successfully contributed to the rural economy. It has done so by commercially utilizing the rural resources to meet the large domestic demand for sugar and by generating surplus energy to meet the increasing energy needs of India. In addition to this, the industry has become the mainstay of the alcohol industry. The sector supports over 50 million farmers and their families, and delivers value addition at the farm side. In general, sugarcane price accounts for approximately 70 percent of the ex-mill sugar price.

The sector also has a significant standing in the global sugar space. The Indian domestic sugar market is one of the largest markets in the world, in volume terms. India is also the second largest sugar producing geography. India remains a key growth driver for world sugar, growing above the Asian and world consumption growth average.

Globally, in most of the key geographies like Brazil and Thailand, regulations have a significant influence on the sugar sector. Perishable nature of cane, small farm landholdings and the need to influence domestic prices; all have been the drivers for regulations. In India, too, sugar is highly regulated. Since 1993, the regulatory environment has considerably eased, but sugar still continues to be an essential commodity under the Essential Commodity Act. There are regulations across the entire value chain – land demarcation, sugarcane price, sugarcane procurement, sugar production and sale of sugar by mills in domestic and international markets.

However, fundamental changes in the consumer profile and the demonstrated ability of the sector to continuously ensure availability of sugar for domestic consumption has diluted the need for sugar to be considered as an essential commodity. According to a recently conducted nation wide survey, nearly 75 percent of the total non-levy sugar is consumed by industrial, small business and high income household segments. Further, even for a low income household, 10 percent increase in sugar price would result in less than 1 percent increase in the monthly food expense.

---

1 Source: ISMA Indian sugar year book 2005-06
2 Source: KPMG Analysis
3 Source: AC Nielsen, KPMG Analysis
Madras School of Economics (MSE) has also raised the need to reassess the weightage of sugar in the wholesale price index (WPI). As per MSE, the share of expenditure within a basket of consumption and investment goods can be used as an indicator for assessing the suitability of WPI weights. While the current weight for sugar and Gur is 3.68 percent, MSE suggests that the appropriate weight for sugar should be 2.02 percent as per the current basis of WPI calculation that excludes services. MSE further suggests that services should be included in the WPI calculation, and in that case the appropriate weight for sugar would be 1.04 percent.\(^4\)

While the sector grows in stature and continues to play a key role in the economy, it is expected to face some significant challenges. There is lack of alignment between sugarcane and sugar prices. As a result, it leads to cane payment arrears and induces cyclicality. The arrears typically result in the eventual need for government support packages, while the pronounced cyclicality destabilizes the sector revenues. The average sugarcane yields have also, at best, stagnated, and the average recovery is amongst the lowest in comparison with key sugar producing nations. Large sugar inventory exposure and sugar price volatility also results in high sugar price risk for the sector. In the past ten years, on an average basis, even the large listed sugar firms have struggled to generate Return on Invested Capital (ROIC) over and above their cost of capital. This is primarily due to high mandated fixed cane prices and volatile sugar prices.\(^5\)

---

\(^4\)Source: Household sugar consumption and income segments as per AC Nielsen survey. Monthly household income less than INR 5000 considered as low income household. Total non levy sugar consumption estimated at 17.52 million MT annually.

\(^5\)Source: Madras School of Economics

\(^6\)Source: Prowess, KPMG Analysis
In line with its shared vision, going forward, the sector has a number of transformational opportunities. These opportunities have remained largely untapped. The industry has the potential to cater to the large and growing domestic sugar consumption and emerge as a significant carbon credit and power producer. It is also in a position to support the ethanol blending programme of E5 and beyond. Further, the industry can improve its cost competitiveness through higher farm productivity and by managing the domestic production variations through international trade with a focus on countries in the Indian Ocean. Thus, the transformed sector would be less cyclical with greater alignment between sugarcane and sugar prices, and will have stable diversified sources of revenue.

In the past, industries of significant relevance to national economy have traversed on the transformation path. These industries include cement, textile, power, fertilizer, telecom and insurance, amongst others. Moreover, the path seems to follow well researched “Predictable Patterns”, which are marked by distinct set of business and regulatory activities. Sugar has transformational opportunities that are similar to many of these industries and can seize the same through appropriate business and regulatory initiatives.

However, there are number of key questions that need to be addressed.

- **Business perspective:** How realistic are the opportunities? Which of the opportunities are high on priority? How can experiences of other sugar producing countries be leveraged? What are the required business imperatives? What should be the regulatory environment to facilitate realization of the opportunities?

- **Regulatory perspective:** What are the regulatory modifications required? What are the key learnings from regulatory changes in key sugar geographies? What are the potential risks involved in undertaking the modifications? What are the appropriate macroeconomic conditions, prerequisites and risk mitigation steps? What should be the implementation plan?

Sector roadmap 2017 addresses all these issues. The sector roadmap comprises business and regulatory roadmap that lay out the respective perspectives. The key features of the sector roadmap are discussed below.
1.1 Shared Vision

The sugar industry’s shared vision is a reflection of the aspirations of key stakeholders: farmers, millers, consumers and the government. The sector has a vision for achieving high economic growth, minimizing risks, enhancing farmer-miller relationships, meeting growing domestic demand and contributing to the nation’s food and energy needs. The shared vision provides the direction for the 2017 sector roadmap.

![Diagram of Shared Vision]

**Figure 2: Shared vision for the sugar industry**

*Source: Industry interactions, KPMG Research*
1.2 Business Roadmap 2017

Business Roadmap 2017 aims at transforming the sector to unlock its potential by realizing the key opportunities by 2017. Transformation opportunities are critical for achieving the vision, and are also largely untapped.

Source: KPMG Analysis

The sugar sector is impacted by induced cyclicality, since high sugar and sugarcane prices lead to increase in production at the cost of other crops. The resulting low prices for sugar impact the ability of mills to pay the farmers, thus leading to creation of arrears. High arrears lead to a significant fall in cane cultivation in the next year, leading to high sugar prices and increased attractiveness of cane.

Cyclicality management is the opportunity to minimize arrears, thereby reducing the need for any financial support from the government. The removal of arrears would also remove induced cyclicality; thereby reducing the incidence of surplus and deficit production phases. Economically, this would translate into reducing the incidence of excess inventory build up in surplus phases and the need for potentially costly imports and government support during deficit phases.

Figure 3: Opportunity matrix - Transformation opportunities

Cyclicality management opportunity

The sugar sector is impacted by induced cyclicality, since high sugar and sugarcane prices lead to increase in production at the cost of other crops. The resulting low prices for sugar impact the ability of mills to pay the farmers, thus leading to creation of arrears. High arrears lead to a significant fall in cane cultivation in the next year, leading to high sugar prices and increased attractiveness of cane.

Cyclicality management is the opportunity to minimize arrears, thereby reducing the need for any financial support from the government. The removal of arrears would also remove induced cyclicality; thereby reducing the incidence of surplus and deficit production phases. Economically, this would translate into reducing the incidence of excess inventory build up in surplus phases and the need for potentially costly imports and government support during deficit phases.

* Cyclicality management refers to cane and sugar price alignment
Thus, ensuring the alignment between sugarcane and sugar prices would be the key policy imperative for managing cyclicality.

**Domestic demand opportunity**

In 2007, the domestic sugar consumption is estimated to be 19.5 million MT. It is expected that the drivers for consumption i.e. the GDP growth and population growth would continue to grow at current rates. Based on the past ten years' growth in consumption and estimates from various independent sources, it is expected that in 2017, the domestic sugar consumption would be approximately 28.5 million MT. Given the high cost of imports and the strategic importance of food security, India would need to target its production in excess of domestic consumption. Given the past trend in production cyclicality, sugar equivalent to 1.5 months of consumption i.e. an additional 3.5 million MT of sugar would need to be produced by 2017.

**International trade opportunity**

International trade is of strategic importance to India as it can help maintain stability in the domestic market, despite the cyclicality in production. If there is a sugar surplus either due to excess production or due to greater economic attractiveness of cane for ethanol and cogen in the future, exports could be used if the surplus cannot be managed in the domestic market. Acceptability as a credible exporter will provide the Indian sector an alternate set of markets for diverting surplus production. Similarly, in case of deficits, raw sugar imports could help bridge the supply gap.

---

*Note: All references to years are for sugar year (October to September) unless otherwise specified
*Source: ISMA
India has the potential to export to major Indian Ocean markets, due to freight competitiveness with respect to key competitors, Brazil and Thailand. With EU exports reducing by 4.5 million MT, world prices per MT of sugar are expected to increase in the range of USD 50 to USD 100\(^7\). This could potentially make exports more viable for India. However, due to the increasing emergence of destination refineries, key markets are importing greater share of raw sugar, and India’s competitiveness for raw exports is relatively lower as of today. Currently, India’s competitiveness is higher in markets, where share of white sugar imports as percentage of cumulative imports is higher. Going forward, India would need to build the capability to produce raw sugar and refined sugar of international quality standards, in order to leverage the export opportunity.

The target markets are estimated to import 10 million MT of sugar by 2017\(^8\). India would be able to leverage this opportunity through productivity improvements and alignment of cane and sugar prices in the domestic market. India’s competitiveness can also be increased by enhancing export infrastructure like loading rates and draft in Indian ports. Since the current cost structure of the Indian industry is uncompetitive for exports, in case of a large sugar surplus, the government could consider using WTO compliant subsidies to enable exports while creating stability in the domestic market. The industry could also explore ways of collectively sharing losses due to exports, if any, since exports would enable lower stocks in the domestic market, thus benefiting both mills and farmers through higher sugar realization.

\(^{10}\)Source: Centre for International Economics
\(^{11}\)Bubble size represents the estimated sugar imports in 2017 in MT
\(^{12}\)Source: KPMG Analysis
Productivity improvement opportunity

Given the projected growth in domestic and international markets, the sector would need to produce at least 28.5 million MT of sugar by 2017. Increase in sugar production would be primarily through productivity improvements and increment in milling capacity of existing mills.

The sector has the potential to improve sugarcane yields by 10 percent and also improve the recovery by 50 basis points by 2017. This would enable the sector to produce additional 4.1 million MT of sugar. Assuming constant drawal, to meet the targeted demand, the area under cane would need to increase by 0.2 million hectares. This would be possible by better utilization of existing cane demarcated areas. This would also ensure minimal impact on other crops. A higher drawal or greater increase in farm productivity will also enable the target demand to be met, without any increase in cane acreage. In order to crush the additional cane, the crushing capacity would need to increase by 0.23 million TCD by 2017. This can be met through expansion of the existing units rather than new mills being established.

Water management would be a key focus area since sugarcane is a water intensive crop. The adoption of advanced techniques like drip irrigation would help achieve sustainable growth for the sector.

Encouraging efficiency at the mill side, quality improvement at the farm side and strengthening the farmer-miller relationship would be the key policy imperatives. Greater investments in research and development of seed varieties and adoption of improved farm practices will be key imperatives for improving farm productivity.

By-products opportunity

Fuel ethanol and surplus power production through cogeneration provide the two key by-products’ related opportunities.

Globally energy security and environmental concerns are driving the adoption of fuel ethanol across countries. Leading countries including Brazil, U.S., Europe, Australia, Canada and Japan have established fuel ethanol programmes. In the future, global fuel ethanol demand is likely to grow exponentially. Global ethanol exports, currently at 6.5 billion litres are expected to increase to 50 to 200 billion litres by 2020. This increase would largely depend on world crude prices and regulatory evolution.

---

13 Source: KPMG Analysis
14 Source: McKinsey Quarterly
India also faces similar environmental concerns and an increasing energy demand and would need to consider developing fuel ethanol programmes with high levels of blending.

In 2017, based on molasses availability, E5 is clearly feasible. E10, too, is achievable, but would need to be supported by ethanol production through B molasses or through direct conversion from cane juice. E20, on the other hand, would also need a stable blending policy and consensus between oil companies, auto majors and sugar industry. From a distillery capacity perspective, in 2017, additional 96 million litres would be needed for E5 and for the projected increase in industrial and potable alcohol, while 965 million litres would be required in case of E10.

The regulatory environment will need to facilitate the transition to higher blending programme through necessary changes that would be made to the Sugarcane Control Order. Higher levels of blending will also need mills having the flexibility to shift from sugar to ethanol, based on market dynamics.

For the cogeneration opportunity, in 2017, there is a total exportable power potential of approximately 9,700 MW. This can fulfil almost 6 percent of the additional power requirement of 128 GW by 2017. The sector can also generate 48 million carbon credits through cogeneration.

**Figure 6: Potential for alcohol (2017)**


---

15 KPMG Analysis
16 KPMG Analysis
Consistent policies for cogeneration at the central and state levels would be the key policy imperative.

**Sugar price risk management opportunity**

Seasonal production of sugar along with year long consumption, results in large inventory. Such large inventory in a volatile price environment causes high sugar price risk for the sector. The total value of sugar inventory at risk over a year at 95 percent confidence interval is estimated at approximately INR 3,000 crore\(^{\text{17}}\).

A viable commodity exchange for sugar would be essential for effective hedging and price risk management.

---

\(^{\text{17}}\) KPMG Analysis
The potential, impact and investments related to the various opportunities are summarized below.

**Summary of opportunities**

**Domestic consumption**
- 5 million MT of additional sugar
- Food security
- Investment - INR 6,000 crores for domestic demand

**International trade**
- Manage domestic surplus by exporting to Indian Ocean markets
- Raw sugar imports to address deficits

**By products**
- 3,000 million litres of ethanol
- 9,700 MW of exportable power
- 48 million carbon credits
- Energy security through green sources
- Investment - 320 crores to sustain E5 and INR 52,000 crores for cogen

**Cyclicality management**
- Alignment of cane and sugar prices
- Lower arrears for farmers
- Inventory cost savings
- Lower cost of lost sales

**Productivity improvements**
- 4.1 million MT of sugar
- Ability to meet future sugar demand with marginal acreage increase
- Investments in R&D, farm practices and infrastructure

**Sugar price risk management**
- Use of hedging for managing VaR of INR 3,000 crores
- Greater use of commodity exchanges

**Product Innovation**
- Production of a range of sugar and sugar based products
- Alignment with consumer needs

---

*Figure 8: Summary of opportunities*

*Source: KPMG Analysis*
Appropriate policy environment features

The policy environment would need to protect farmers and enable mill viability and sector attractiveness. It would also need to align protection of consumer interests with the existing consumption pattern. To facilitate the realization of the opportunities, the evolved policy environment would need to:

- Ensure level playing field
- Ensure efficient usage of resources - Incentivize efficiency and yields
- Strengthen farmer-miller relationship
- Reduce cyclicality and ensure better management of downturns
- Ensure better sugar price risk management instruments
- Enable greater linkage with international market

1.3 Regulatory Roadmap 2017

Complete deregulation would expose the farmers, millers and consumers to significant risks including risk of sugarcane off-take, sugarcane availability and sugar availability, respectively. Such a scenario, in the current context, is likely to result in sub-optimal growth for the sector. Hence, it is imperative that an appropriate regulatory environment is created to facilitate the implementation of the business roadmap.

Sugar is regulated at the central and state levels. Hence, it is also subject to conflicts that arise from diverse perspectives at the two governance levels. Some of these conflicts relate to announcement of the Statutory Minimum Price (SMP) and State Advised Price (SAP), incentive schemes, molasses control and cogeneration (MNES Act). For establishing a level playing field and for removal of regulatory distortions, such conflicts need to be resolved.

For the key sugar regulations, modifications have been suggested. The suggested modifications are broadly in line with the Mahajan committee recommendations. The modifications are also broadly in line with the views of LMC, an international agency focusing on sugar. The regulatory modifications are evolutionary in nature. Regulations, with recommended changes are:
Command area

- Government mandated command area with reviews on an exception basis
- Distance between mills to be determined based on regional variations with a national minimum benchmark of 25 km

Cane pricing

- Formula-based pricing – Cane price linked to prices of sugar and primary byproducts (molasses and surplus bagasse) and to average recovery
- Prices to be determined using a fixed formula based on region specific variations
- Incentives to be given for varieties with high sucrose content and for early and late maturing varieties
- Minimum support prices to be announced to protect farmers from subsistence risk

Monthly release mechanism

- Monthly release mechanism needs to be removed
- Creation of a strategic stock which will be managed by an independent organization and will aim at maintaining the sugar price in a sustainable band. This would ensure that cane price can be realized from the sugar price after accounting for all costs and taxes.

International trade

- Removal of non-tariff trade restrictions

Levy sugar

- Levy sugar to be discontinued
- Sugar for PDS requirements to be sourced from the free market

To ensure that modifications occur with minimum disruption to the sector, especially to farmers, it is suggested that the market side regulations’ modifications occur in the latter half of the sugar season. Domestic and international prices are desired to be at a sustainable level, while changes are being implemented, so short term variations do not adversely impact the ability of mills to pay the farmers. The supply side modifications need to occur before any sowing decisions are made by the farmers.

Consensus amongst central and state governments on cane pricing, creation of a strategic stock, establishment of a regulatory body and creation of a dispute resolution body with legal standing are some of the key prerequisites.
Implementation Plan

The implementation plan for bringing in regulatory changes would be implemented after the sugar industry recovers from the current situation of unsustainable low prices. The prerequisites can be initiated immediately, but the market side and supply side modifications should be initiated once sugar prices are at a sustainable level. The implementation plan is aimed at minimizing the transition risk for all stakeholders, specifically farmers. During the transition period, the government could also consider keeping the existing regulations in abeyance, and these can be relied on in case the implementation is not successful or in case of exigencies.

Currently the sugar industry is passing through a phase of surplus production and there is an expected surplus of 7.8 million MT of sugar. This has been largely due to the remunerative sugar cane prices that are prevalent for the last two years as well as the inability of the sugar industry to export sugar when the world prices were viable last year. As a result, the sugar stocks in India are at an all-time high which has depressed the domestic sugar prices making it difficult for the mills to pay the farmers. A host of factors, including a coincidental surplus in the international market, has intensified the seriousness of the situation.

While this report has discussed several long-term proposals for the growth and development of the industry, there is a need for immediate measures to help keep the industry viable. These could include:

- Exports can be used to reduce the domestic stock to manageable levels. India is not competitive in white or raw sugar exports as seen earlier. Also, the markets for white plantation sugar have decreased, while the markets for refined 45 ICUMSA and raw sugar have increased. India has the capability to produce raw sugar, while its competitiveness is low. The government needs to extend full support to the industry for enabling exports through appropriate subsidies and policy measures. Hence the government can consider extending the WTO compliant support to reduce stocks so that sugar prices recover in the domestic market.

- The government can create strategic stock which will help in reducing the stocks in the market. Reduced stocks will lead to price recovery and enable payment of cane prices to farmers. The industry will thus maintain its viability for subsequent years.
Reduced sugar availability does not imply reduced cane availability. The industry and the government can explore ways of processing sugarcane into products other than sugar. One major product which can be produced in this manner is ethanol. The government can also explore the feasibility of using surplus cane to produce ethanol directly from cane or through the B molasses route thus allowing sugar prices to recover to sustainable levels.

The government with the help of the industry can initiate the linkage between the cane and sugar prices at the earliest so that the current situation does not recur in the future. The central and state governments will have to work together to modify the sugarcane pricing mechanism to ensure the long term viability of the industry and the farmers.

Another feature of the industry currently is the subsidies / incentives allowed by certain state governments to the sugar mills located within these states. Such distortions interfere with free competitive forces. The impact of such distortions gets amplified in crisis situations. There is a need for the centre to evolve uniform policies for the industry across the country.

The Indian government’s policies would need to support the sugar industry, considering its massive impact on the agro economy and associated social objectives encompassing large masses.

Both central government as well as the state government regulate and legislate cane pricing, sometimes causing avoidable aberrations through conflicting laws. A consensus between central and state governments on cane pricing is therefore an essential prerequisite for successful implementation of the roadmap.

In the year 2000, a five member division bench of the Supreme Court (3:2) upheld the validity of the power of the state govt to fix the price of sugarcane, notwithstanding the regulatory framework of the central government in this regard. In contrast to this judgement, an earlier five bench unanimous judgement of the Supreme Court in 1956 had held that the state governments do not have the power to fix cane prices.18

---

18Ch. Tikaramji & others vs. state of Uttar Pradesh & others, 1956
Sugarcane is covered under the Essential Commodities Act due to its perishable nature and the need for regulation on cane supply and pricing. Given the large number of farmers with small landholdings involved in farming cane, sugarcane needs to be regulated. Cane is also increasingly being viewed as a strategic crop due to the emergence of ethanol and cogeneration. Since cane is produced primarily in nine states but cane based products are consumed across the country, it needs to be regulated in a unified manner. Moreover, for a sustainable price band to be effective across the country, it is necessary that cane pricing be done consistently across states. The independent regulator could play this role in the future.

The central government could also explore making suitable modifications to the Essential Commodities Act in order to implement the cane pricing regulatory modifications by defining a fair price for cane in addition to a minimum price. In case of monthly release mechanism, the key pre-requisites would be creation of a strategic stock and definition of a sustainable price band for sugar.
In case the roadmap is not implemented successfully, the sector’s ability to leverage the transformation opportunities may be limited. Lack of a level playing field may lead to growth of the sector in specific areas, but at the expense of others. Continued high cyclical and low mill profitability may reduce the investment attractiveness of the sector. All of this may have adverse impacts on the social objectives for farmers, mills and consumers. In the absence of improvement in farm productivity, cane expansion may continue to be driven by horizontal growth at the expense of other crops.

Going forward, the sector would also need to periodically review the roadmap and realign it with the changing business dynamics. The key trends that could necessitate realignment include:

- Future growth of Brazil and its influence on the global sugar trade
- Future evolution of WTO regulations for sugar
- Growth of ethanol and emergence of alternative ethanol production techniques like cellulosic ethanol
- Development of cane quality measurement systems
- Growth of alternate sweeteners as sugar substitutes
- Emergence and success of contract farming within India
- Impact of biotechnology
Objectives and Approach
Objectives and Approach

2.1 Objectives of the study

In the past, the Indian sugar industry has commendably kept pace with the growing domestic sugar demand. As a result, the Indian domestic market became the largest in volume; the sector became the second largest sugar producing geography. Thus having established itself as a key sugar producing geography, it now aspires for greater frontiers. The sugar industry aspires to continue to service the domestic demand, while it also aims to enhance the value addition from sugarcane by focusing on emerging by-products through integrated sugar complexes.

However, the entire value chain of the sector—farm side, mill side and market side—is confronted by significant business and regulatory challenges. Many of these challenges not only impact the sugar business but also impair the high potential by-products’ businesses. The sector, thus, requires a comprehensive sector road map to guide it towards achieving its potential.

The study aims at drafting such a sector road map, which will identify requisite business and regulatory initiatives for unlocking the sector’s potential over the next ten years. The sector road map 2017 will comprise business and regulatory roadmaps.

Business roadmap 2017 is guided by the sector’s shared vision. It aims at evaluating transformation opportunities, identifying business imperatives for realizing the opportunities, incorporating learnings from other industries that have undergone similar transformation and visualizing the appropriate policy environment.

Regulatory roadmap highlights regulatory modifications in prevailing sugar-related regulations for creating the required policy environment thereby facilitating the successful implementation of the business roadmap. It also captures the status of sugar regulations in key international sugar geographies. The regulatory roadmap also presents the implementation plan, incorporating the prerequisites, risk mitigation measures and phases of implementation for ensuring minimum adverse impact on the sector during the transition period.

The business roadmap focuses on opportunities related to by-products and identifies the policy imperatives, while the in-depth regulatory analysis has been restricted to sugar-related regulations.
2.2 Study approach

There are five cornerstones of KPMG’s approach, which are crucial for developing the sector roadmap. These are:

- **Structured interactions with stakeholders** - Extensive interactions were held with representatives of all the key stakeholders including farmers, millers, traders and policy makers. The interactions were held with farmer associations, millers across states, private and cooperative mills’ associations, international traders and key policy makers. The interactions were used in articulating the shared vision and in assimilating sector insights.

- **Primary survey** - A nation wide consumer survey was conducted by a leading professional market research group. The survey covered 5,000 retail households, 286 industrial users and 250 small businesses. The survey results were primarily used in consumer profile analysis.

- **Extensive secondary research**  - Sugar is a well researched sector. The key publications, reports, thought leadership articles, both in public and proprietary domain were accessed. For the key information and data points, multiple sources were used.

- **Sector analysis** - KPMG tools and analysis frameworks were utilized for the analysis. The key frameworks included vision articulation, sector performance analysis, value chain analysis, opportunity evaluation and projections and industries’ transformation analysis.

- **Regulatory analysis**  - The key KPMG tools and analysis frameworks that were used included regulatory transition analysis, risk evaluation, scenario analysis and implementation plan formulation.
Shared Vision
Shared Vision

The sugar industry’s shared vision is a reflection of the aspirations of key stakeholders: farmers, millers, consumers and the government. The sector has a vision for achieving high economic growth, minimizing risks, enhancing farmer-miller relationships, meeting growing domestic demand and contributing to the nation’s energy needs. The shared vision provides the direction for the 2017 sector roadmap.

To synthesize the aspirations, extensive primary interactions were held with various stakeholders’ representatives. The interactions were primarily held with farmer associations, farmer representatives, miller associations, private and cooperative millers, international traders and key policy makers. The study was also supported by a nationwide consumer survey.

3.1 Stakeholder aspirations
Farmer and miller aspirations can be broadly classified into two distinct heads: increasing economic profit and minimizing risks.

Farmers aspire for increasing yields, higher cane prices and timely payment of cane prices to drive higher economic profit at the farm side. For minimizing crop risks, farmers aspire for effective extension services, crop off take assurance, accessibility of timely finances and improved harvesting and transport infrastructure.

Millers aspire for increasing economic profit through higher availability of cane, better sucrose content in sugarcane, better sugar realizations in domestic market, flexibility to export sugar, higher value addition from by-products including alcohol and removal of competition distorting policy interventions. At the same time, millers in general are looking to reduce sugar price risk through hedging. Overall, millers aspire for ease of regulations and greater influence over business levers.

Consumers’ primary aspirations appear to be the availability of quality sugar at affordable prices. Both household and industrial consumers also seem to aspire for availability of sugar variety in terms of sugar forms like liquid sugar and processed sugar products, albeit on a lower priority.

The government or specifically sugar sector policy makers aspire that the sector continues to be self sufficient in meeting domestic demand, assumes a bigger role in meeting the growing energy needs of India, continues to address the social needs of stakeholders including farmers, millers and consumers and that the sector increase its contribution to the exchequer.

\*Economic profit is being defined as returns from operating assets over and above capital costs
3.2 Shared Vision

The aspirations cutting across the stakeholders, from a sector perspective provide distinct themes or vision components for the sector to achieve. Aspirations of farmers and millers related to increasing economic profits and risk minimization manifests into sector themes of high economic profit driven growth, risk minimization and collaboration between farmers and millers. This would translate into increased sector attractiveness for investors as well.

Consumers’ aspirations provide another component of the shared vision in the form of fulfilling consumer needs.

Policy makers’ expectations from sector results in remaining components of shared vision, namely, self sufficiency in sugar, enhanced contribution to nation’s energy requirement and social welfare of stakeholders.

Figure 10: Shared vision for the sugar industry

Source: Industry interactions, KPMG Research
Indian Sugar Industry
Sector Snapshot
Indian Sugar Industry —
Sector Snapshot

Sugar is a sector of significant importance to the national economy. While consumption has been growing historically, the production has been cyclical. At present, the sugar industry is regulated across the value chain. Investments in by-products are at a nascent stage, and the sector has struggled to generate a return on invested capital in excess of its cost of capital in most years, primarily due to a high mandated fixed cane price and a volatile sugar price.

Sugarcane is primarily grown in nine states of India: Andhra Pradesh, Bihar, Gujarat, Haryana, Karnataka, Maharashtra, Punjab, Uttar Pradesh and Tamil Nadu. More than 50 million farmers and their families are dependent on sugarcane for their livelihood. The sugar industry caters to an estimated 12 percent of rural population in these nine states through direct and indirect employment. Effectively, each farmer contributes to the production of 2.9 MT of sugar every year\(^\text{19}\).

In addition to farmers, an estimated 0.5 million workers are directly employed as agricultural labour involved in cultivation and harvesting. The sugar industry also supports diversified ancillary activities and skills that support the local economy. The dependent population creates substantial demand for local goods and services.

In addition to the sugar industry’s contribution to the rural economy, it has significant social and economic impact for the nation as well. The sugar industry is a green industry and is largely self sufficient in energy needs through utilisation of bagasse for generating electricity and steam. In fact, the sugar industry generates surplus exportable energy through cogeneration and contributes in reducing the energy deficit that India is currently facing. The sugar industry is also the primary source of raw material for the alcohol industry in India. The annual economic contribution of the sugar industry to the exchequer through principal indirect taxes amounts to more than INR 2800 crores\(^\text{20}\).

\(^\text{19}\) Average rural household size of 5.37 is assumed. Source: AC Nielsen, Business World Marketing White book 2006. Sugar production for the year 2007 has been estimated to be 27 million MT. Source: ISMA

\(^\text{20}\) Cane purchase tax, sugar excise duty, molasses excise duty and cess on sugar have been considered. Source: ISMA Indian Sugar Year book 2005-06.
4.1 Production

Sugar is produced in India primarily in nine major states. In 2006, the six states of Andhra Pradesh, Gujarat, Karnataka, Maharashtra, Uttar Pradesh and Tamil Nadu produced more than 1 million MT of sugar per annum each, with the three states of Bihar, Punjab and Haryana producing less than 1 million MT of sugar. In 2006, these states accounted for 94 percent of the total sugar production in India with Maharashtra and Uttar Pradesh leading with 27 percent and 30 percent of the total production.

Source: ISMA Hand book of sugar statistics Sep 2006, KPMG analysis

Figure 11: Indian sugar producing states (2006)**

Source: ISMA Hand book of sugar statistics Sep 2006, KPMG analysis

**Map not to scale and illustrative
The Indian sugar production has grown at a CAGR of 4.9 percent over the last 46 years. Sugar production has been increasing steadily but there have been periods of low production, due to a variety of reasons including pests and drought. Production has been cyclical, with the typical cycle duration ranging between 4 to 6 years. 

Source: ISMA Hand book of sugar statistics Sep 2006, KPMG analysis

The Indian sugar sector is composed of three distinct categories - public mills, private mills and cooperative mills. Public mills account for around 6 percent of the total mills in operation while the private mills account for approximately 40 percent and the cooperative mills account for approximately 53 percent. In the recent past, the number of operational private mills has been increasing as a percentage of the total number of mills.

Figure 12: Indian sugar production (1961 - 2007)
Source: ISMA Hand book of sugar statistics Sep 2006, KPMG analysis

Private Mills have increased their share of production while the share of cooperative mills has reduced

The Indian sugar sector is composed of three distinct categories - public mills, private mills and cooperative mills. Public mills account for around 6 percent of the total mills in operation while the private mills account for approximately 40 percent and the cooperative mills account for approximately 53 percent. In the recent past, the number of operational private mills has been increasing as a percentage of the total number of mills.

Sugar production for the year 2007 has been estimated to be 27 million MT. Source: ISMA.
Also, the share of sugar production by private mills has been increasing. At present, the sugar production from the private mills accounts for more than 54 percent of the total production while the share of production from the cooperative mills has come down to 43 percent from 57 percent in 2001. This is due to the fact that the number of operational private mills has been steadily increasing since 2001, while the number of cooperative mills has remained stagnant. Also, the states of Maharashtra, Karnataka and Tamil Nadu, which have a high concentration of cooperative mills, were affected by woolly aphid pest attacks in 2003-04 apart from the drought that affected almost all cane producing states.
Sugarcane is the primary raw material for sugar production and adequate sugarcane availability is a prerequisite for mill viability. The sugarcane production in India is unique in various aspects. One such aspect is the land holding size. The landholding size of 4 hectares or more is present in only 25 percent of the area under sugarcane cultivation. The bulk of the land under sugarcane is between 1 and 4 hectare. This land holding structure is a key structural feature of the sugar industry in India.

There are more than 50 million farmers and families involved in the sugarcane cultivation and these farmers supply sugarcane to almost 500 mills in various parts of the nine sugar producing states. Therefore, on average, each mill procures cane from 18000 farmers which is one of the highest in the world. This increases the complexity of managing cane procurement, quality control and cane development.

The small landholdings also limit the extent of mechanization and reduce the ability of the farmer to invest in farm productivity. The ability of a farmer to sustain himself in the event of a crop failure or lack of crop off take or non-payment of dues is also limited by the size of the land holding.

---

**Source:** ISMA Indian Sugar Yearbook 2005-06

**Note:** Average rural household size of 5.37 is assumed. Source: AC Nielsen, Business World Marketing White book 2006
4.2 Consumption

The Indian sugar consumption has steadily increased at 3.5 percent since 1996. Typically, sugar consumption is driven by the GDP growth and this has been the case for India as well. The per capita consumption has seen a steady growth of 2.1 percent CAGR over this period, while the population has grown at a CAGR of 1.4 percent.

Source: ISMA Handbook of sugar statistics Sep 2006, Reserve Bank of India

Figure 15: Distribution of area under sugarcane for different size of landholding
Source: ICRA sector analysis “The Indian Sugar Industry” July 2006, AC Nielsen, KPMG analysis

Figure 16: Sugar consumption and GDP (1996 - 2006)
Source: ISMA Handbook of sugar statistics Sep 2006, Reserve Bank of India
Increase in per capita sugar consumption has led to decrease in the share of Gur and Khandsari

Gur and Khandsari are the major alternate sweeteners that are consumed in India. The increase in per capita sugar consumption has been at the expense of Gur and Khandsari consumption. The usage of sugarcane for producing sugar as compared to Gur and Khandsari is a relevant indicator of the shift in consumption trends.

In 2006, the drawal rate (which indicates the use of sugarcane for sugar production as a percent of total sugarcane production) was 68 percent which was an all time high. This has been a reversal in trend from the 1960’s, when the drawal rate was at 30 percent. The percentage of cane used for chewing and other purposes has remained largely constant over the years.

![Figure 17: Utilisation of sugarcane (1988-2006)](source)

As per the recently concluded nationwide survey, industrial, small business and high income household segments account for 74 percent of total non levy sugar consumption

Of the total sugar sold in the free market, an estimated 61 percent is accounted for by the industrial and small business segment, also referred to as indirect consumption of sugar. The household segment, which consumes sugar directly, accounts for an estimated 39 percent of the total free sale (non-levy) sugar consumption. The total non-levy sugar consumption is estimated at 17.52 million MT of sugar.

---

*For 2005 and 2006, the percentage of cane used for seed, feed and chewing has been assumed to be 11.9 percent based on historical average and the percentage of cane used for Gur and Khandsari has been calculated based on the same.*
The low income households, with a monthly income of less than INR 5,000, account for an estimated 4.51 million MT every year, contributing to 25.8 percent of total non-levy sugar consumption. The high income households, with a monthly income of more than INR 5,000, account for an estimated 2.24 million MT of consumption every year with a share of 12.8 percent of non-levy sugar consumption.

The industrial consumer segment accounts for an estimated 5.26 million MT of sugar consumption, with a share of 30 percent of the total non-levy sugar consumption. The small business segment accounts for an estimated 5.51 million MT of sugar consumption, with a share of 31.5 percent of the total non-levy sugar consumption. Consequently, high income household, industrial and small business segments account for an estimated 13 million MT or 74 percent of the total estimated non-levy sugar consumption of 17.52 million MT in 2006-07.

---

**Figure 18**: All India non levy sugar consumption (2006-07)
Source: AC Nielsen survey conducted in March 2007, KPMG analysis

---

**Figure 19**: All India non levy sugar consumption by segments (2006-07)\(^2\)
Source: AC Nielsen survey conducted in March 2007, KPMG analysis

---

\(^2\) Household sugar consumption and income segments are as per AC Nielsen survey. Households with monthly income less than INR 5,000 are considered as low income households.
Per capita consumption of low income segments is nearly half that of high income segments

Figure 20: All India non-levy household monthly sugar consumption by income levels (2006-07)\textsuperscript{17}

Source: AC Nielsen survey conducted in March 2007, KPMG analysis

The per capita sugar consumption increases with rise in income. At the lowest income levels, the average household sugar consumption is at 2.2 kg per month, while at the highest income levels the average household sugar consumption is at 5.11 kg per month.

Even for low income households, a 10 percent increase in sugar price results in less than 1 percent increase in the monthly food expense

The impact of sugar price variation is minimal on the monthly household expense, in case of direct consumption. At the lowest income level, a 10 percent increase in sugar price increases the household expense by approximately INR 4 per month. At the highest income level, a 10 percent increase in sugar price increases the household expense by approximately INR 10 per month. This translates to less than 1 percent increase in the monthly food expense for any segment.

\textsuperscript{17} Household sugar consumption and income segments as per AC Nielsen survey
A wide range of industries consume sugar as a raw material. The dairy processing industry consumes an estimated 1.27 million MT of sugar consumption, accounting for 24 percent of the total industrial consumption. Confectionary, bakery and carbonated beverages are the other leading sugar consumers that account for an estimated 19 percent, 15 percent and 15 percent share, respectively.

Figure 21: Impact of 10 percent increase in sugar price on monthly household expense (2006-07)

Source: AC Nielsen survey conducted in March 2007, KPMG analysis

Dairy, confectionary, bakery and beverages account for 75 percent of industrial consumption

A wide range of industries consume sugar as a raw material. The dairy processing industry consumes an estimated 1.27 million MT of sugar consumption, accounting for 24 percent of the total industrial consumption. Confectionary, bakery and carbonated beverages are the other leading sugar consumers that account for an estimated 19 percent, 15 percent and 15 percent share, respectively.

---

Total household expense estimated using savings rate for different income segments. Source: IMRB. Food expense for urban segments assumed at 42.5 percent and for rural segments at 55.05 percent of total expense. Source: NSSO. The sugar retail price assumed to be INR 18 per kg. Household sugar consumption and income segments as per AC Nielsen survey.
Sweet meat vendors are the largest consumers of sugar amongst small businesses

Sweet meat vendors account for an estimated 58 percent of the total sugar consumption, amongst small business. Restaurants and tea/coffee shops account for an estimated 22 percent and 17 percent of the sugar consumption, with the rest being accounted for by juice centres, candy shops and similar establishments.
4.3 Domestic Trade

Sugar is consumed across the country, leading to significant trade volumes from the key producing states. The nine sugar producing states supply sugar to the rest of India. Figure 24 indicates the movement of sugar from sugar surplus states to sugar deficient states within India. Karnataka and Tamil Nadu supply sugar to Kerala. Maharashtra, Gujarat and Uttar Pradesh supply sugar to Western and Central India. Uttar Pradesh, Punjab and Haryana supply sugar to North India. Uttar Pradesh, Karnataka, Andhra Pradesh and Tamil Nadu supply sugar to Eastern and North-Eastern India.

Figure 24: Domestic sugar trade in India (2006) \[30\]
Source: AC Nielsen survey conducted in March 2007, KPMG analysis

Map not to scale and illustrative
4.4 International Trade

India has been, both, a net importer and exporter of sugar in the past. During years of deficit production, India has imported sugar from Brazil, Australia and South Africa. India has exported sugar to EU, Persian Gulf, Somalia, Sri Lanka, Indonesia and Bangladesh during its years of surplus production. India has also occasionally exported and imported sugar from Pakistan in the past.


Figure 25: Indian sugar trading partners (2001 - 05)\textsuperscript{11}


\textsuperscript{11} Map not to scale and illustrative
4.5 Value chain of the sugar industry

The value chain of the sugar industry has significant variations across regions due to different cane pricing models and different tax structures. Illustrative examples have been provided for UP and Tamil Nadu.

The cost of cane procurement accounts for 70 percent of the ex-mill sugar price and is the largest cost component of sugar. Thus, given the different taxes across the value chain, in case of western UP, the government earns approximately INR 1,100 per MT of sugar sold, while millers’ margins are typically in the range of INR 1,000 per MT of sugar. In case of western UP, due to a high SAP, farmer margins are approximately INR 5,200 per MT of sugar. The retail sugar price needed to sustain the current price in western UP would be approximately INR 21 per kg.

Figure 26: Value chain for sugar (Illustrative) - Production in West UP, retail sale in Delhi (2007)

Source: ISMA, SBI Capital Markets Limited report on sugar sector August 2006, Industry sources, KPMG analysis

The Indian Sugar Industry - Sector Roadmap 2017
In case of Tamil Nadu, the government earns approximately INR 1,574 per MT of sugar sold due to higher cane taxes, while millers’ margins are typically in the range of INR 1,000 per MT of sugar. Due to a lower cane price, farmer margins are approximately INR 3,000 per MT of sugar. The retail sugar price needed to sustain the current price in Tamil Nadu would be approximately INR 19.5 per kg.

The distribution of sugar is typically done through various channels and the cost differential between ex-mill price and retail price could vary widely based on the market being addressed and the channel being utilized.

Sugar industry is a significant contributor to the economy through various taxes levied across the value chain

The sugar industry contributes to the exchequer through a number of taxes levied across the value chain. When the mills purchase sugarcane, a purchase tax is levied by the respective state governments. This purchase tax varies across states. Haryana and Bihar have the lowest purchase tax, while Tamil Nadu and Karnataka have the highest purchase tax. In 2006, the total purchase tax collected by the state governments amounted to over INR 530 crores.

---

**Figure 27:** Value chain for sugar (Illustrative) - Production in Tamil Nadu, retail sale in Chennai (2007)

Source: ISMA, SBI Capital Markets Limited report on sugar sector August 2006, Industry sources, KPMG analysis

---

6 Average cost of cane cultivation assumed to be INR 73.63 per quintal. Transportation cost of INR 8.12 per quintal of cane is assumed based on industry interactions. Average western UP recovery of 9.26 percent used to estimate cane cost per MT of sugar. Cane margin calculated is based on Western UP SAP in 2006. Cane taxes are assumed at INR 2 per quintal of cane. The conversion cost varies from INR 3,500 to INR 5,500 per MT of sugar produced. For the purpose of this illustration, a cost of INR 4,000 per MT of sugar has been assumed. Normative miller margin of INR 1,000 per MT of sugar produced is assumed based on industry interactions. Duties and taxes of INR 875 per MT of sugar sold in free market are assumed. The average transport cost of INR 400 per MT of sugar is assumed. Margins for trade and retail are assumed at INR 200 and INR 1,000 per MT of sugar based on industry interactions.
The sugar produced by the mills attracts an excise duty and a cess. The total duty is INR 523.3 per MT on levy sugar and INR 875 per MT on free sale sugar including the sugar cess. In 2006, this amounted to more than INR 1610 crores.

The mills also pay an excise duty on molasses. This excise duty amounts to INR 750 per MT in addition to a 3 percent cess. In 2006, the total duty paid by the mills amounted to more than INR 645 crores.

In addition to the various taxes discussed above, the industry also pays direct taxes to the government. Additional taxes also accrue from other value added products like alcohol, chemicals, paper boards, and so on.

### Tax Structure (2006)

<table>
<thead>
<tr>
<th>Tax Structure</th>
<th>Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchase tax Varies with state</td>
<td>INR 534 crores</td>
</tr>
<tr>
<td>Excise duty on molasses INR 750 per MT &amp; 3 percent cess</td>
<td>INR 645 crores</td>
</tr>
<tr>
<td>Duty on levy sugar INR 525.3 per tonne</td>
<td>INR 101 crores</td>
</tr>
<tr>
<td>Duty on free sale sugar INR 875 per tonne</td>
<td>INR 1512 crores</td>
</tr>
<tr>
<td>Total revenue</td>
<td>INR 2792 crores</td>
</tr>
</tbody>
</table>

**Source:** ISMA Handbook of sugar statistics 2006, KPMG analysis

**Figure 28:** Tax Structure (2006)

**Figure 29:** Purchase tax across states INR per MT (2006)

**Source:** ISMA Handbook of sugar statistics 2006, KPMG analysis
4.6 By-products

The sugar industry is beginning to diversify into multiple by-products, to enhance the value addition for every MT of cane that is crushed.

Source: KPMG Research

Bagasse based cogeneration for exportable power is an emerging trend in the sugar industry. Bagasse generated by a sugar mill enables the mill to export power after meeting its captive power and steam requirements. The realization from the exportable power is dependent on the long term power purchase agreements with government and power companies. Cogeneration also has proven revenue potential in Clean Development Mechanism (CDM) based carbon credits. The present exportable power generated by the sugar industry is 847 MW.

Source: ISMA Hand book of sugar statistics Sep 200

Ethanol and cogeneration have emerged as key by products for the sugar industry in India

Bagasse based cogeneration for exportable power is an emerging trend in the sugar industry. Bagasse generated by a sugar mill enables the mill to export power after meeting its captive power and steam requirements. The realization from the exportable power is dependent on the long term power purchase agreements with government and power companies. Cogeneration also has proven revenue potential in Clean Development Mechanism (CDM) based carbon credits. The present exportable power generated by the sugar industry is 847 MW.

Source: ISMA Hand book of sugar statistics Sep 200
In India, alcohol is currently produced from molasses. Alcohol is used as a raw material for industrial uses, for production of potable alcohol and as fuel ethanol. Fuel ethanol can be used as a substitute for gasoline. The realization from fuel ethanol is dependent on the government mandated price, which is paid by the oil marketing companies. In addition to this, fuel ethanol has the potential to generate revenues through carbon credits, as is the case with bio-diesel.

*Figure 32: Ethanol producing units (2005)*

*Source: ISMA Hand book of sugar statistics Sep 2006*
4.7 Regulatory evolution

Sugar has historically been classified as an essential commodity and hence it has been regulated across the value chain. However, since 1993 the regulatory environment has been progressively eased. The key regulatory milestones include de-licensing of the industry in 1998 and the removal of control on storage and distribution in 2002. There have been two detailed studies in the past decade on the sugar industry, initiated by the government Mahajan Committee in 1998 and Tuteja Committee in 2004.

**Figure 33**: Regulatory evolution of the Indian sugar industry

**Source**: KPMG research

Due to its current status as an essential commodity, the sugar industry is regulated across the value chain.

The pricing and supply of cane is regulated through reservation of cane area and the mandatory cane price is fixed by the government. On the market side, the monthly release mechanism restricts mills from controlling the quantity of sugar that can be sold. International trade is controlled through tariff and non-tariff restrictions, while 10 percent of the mill’s production is bought by the government for distribution through the PDS at a price that is typically below the free market price.

The by-products of sugar are regulated as well. There are state specific restrictions on the movement and sale of molasses, while realizations from by-product value additions are partially dependent on the government influenced prices.
Sugar is regulated both at the central and state levels, and is exposed to conflicts in terms of policies and government regulations. This also leads to distortion of the level playing field across states.

**Central regulations**
- Announcement of Statutory Minimum Price
- Policy on incentive schemes for new and existing capacities
- Molasses decontrolled, national blending programme
- Cogeneration MNES Act

**State regulations**
- Announcement of State Advised Price by individual states
- State governments announce incentive schemes to incentivize sugar capacities in their state
- States continue to restrict utilization, the sale and movement of molasses
- Individual states have their own power purchasing agreements

**Areas of conflict**
- SAP is higher than SMP, and may not be linked to recovery.
- SAP varies across states leading to state level distortions
- Incentive schemes distort the level playing field, typically through fiscal benefits, capital expense subsidies or transport subsidies
- Distortion of level playing field through wide regional variations in molasses prices and returns from molasses based value added products
- State level tariffs are typically lower than tariffs, as per MNES Act
4.8 Financial performance

If the large listed sugar firms are considered and their performance is evaluated over the past ten years, their margins have been lower than other farm-based comparable firms, though their revenue CAGR have been among the best. The top ten firms in each industry have been taken to arrive at the average revenue and margins for the industry. Thus, the comparison is for a representative set of the top tier companies in each industry, and is not a representation of the industry as a whole.

While sugar has grown at a fast pace, its average margin is below the peer industry average. Its growth is comparable to dairy and coffee. However, in the past, tea and coffee have had better margins than sugar. In fact sugar’s margin is comparable to paper, which has traditionally been a low margin industry. Therefore while large sugar firms and to some extent, the industry as a whole have grown in line with demand and new capacities have continuously been added, the growth has not been as profitable as some of the other industries.

![Figure 36: 12 month revenue margin matrix (1999-TTM 2007)](image)

**Source:** Prowess, KPMG Analysis

---

Margin = EBITA/ Revenue. EBITA does not include other revenue and revenue is net of excise. TTM is twelve month trailing ending Dec’ 2006. Tea comprises Tata tea and Jayshree tea. Paper comprises BILT, TNN, Star, Sirupur, Seshasayee, AP West Coast and JK. Dairy comprises Heritage, Vadilal, Milkfood, Modern Dairies. Coffee comprises Tata, CCL. Sugar comprises Balmampur, Bajaj, Dhampur, EID, Shakti, Banniari and Oudh.
Only at peak 2006 ROIC, on an average basis, large listed sugar firms could barely cover their cost of capital.

The ROIC trends of some of the major listed companies in the sugar industry shows the variation in the return on invested capital of those companies. It can be seen that some of the major companies have posted zero returns during 2003-04. Assuming an average weighted average cost of capital (WACC) of 13 percent, even the large listed companies have failed to produce economic profit in almost all years. The low ROIC has been primarily driven by the lack of alignment between the cane and sugar prices. Cane price, which accounts for approximately 70 percent of the mill realization is mandated by the government, Sugar price, on the other hand is volatile and therefore mill margins are under pressure in case of low sugar prices.

Only the top listed companies have been considered for this analysis. The cooperative sector and smaller sugar mills account for a significant proportion of the total sugar production. Their ROIC is typically lower than that of the large listed companies.

Figure 37: ROIC trend for sugar (1998-TTM 2007) 

Source: Prowess, KPMG Analysis

**EP = IC*ROIC-WACC**

IC = Equity + Debt + Deferred tax liability, WACC assumed to be 13 percent

ROIC = EBITA*(1-marginal tax rate @ 33 percent)/IC

Best of large listed companies reflects the yearly maximum ROIC from the set of companies considered. The minimum of large listed companies reflects the minimum ROIC from the set of companies considered.
Global Sugar Industry — Key Comparative Analysis
Globally, India is a key sugar geography, since it is the largest consumer and the second largest producer. The global landscape is highly influenced by Brazil, given that it is the least cost producer and the largest exporter of sugar. Ethanol has had a significant influence on the global sugar market. Worldwide, the sugar industry is regulated. This is because of the perishable nature of cane, the need to influence domestic prices and the landholding structure; though the instruments of regulation vary across geographies.

5.1 Production

The world sugar production has been increasing steadily at a CAGR of 1.5 percent. Currently the total world sugar production stands at 150 million MT of sugar. Brazil, India, China and U.S.A are the major sugar producing countries accounting for 45 percent of the total sugar production. EU collectively produces around 14 percent of the total sugar production. Brazil is the largest producer of sugar and has increased its production by 5.7 percent CAGR over the last 7 years since deregulation in 1999-2000. India is the second largest producer and its sugar production has increased consistently except in years which were drought affected.

Figure 38: World sugar production (1999-2006)

Source: F.O. Lichts World Sugar Yearbook 2007, KPMG analysis
Brazil's growth as a sugar producer has been driven by an increased acreage supported by the conducive regulatory environment and a strong focus on ethanol.

The Brazilian success story can be attributed to a variety of reasons. Some of the key reasons are:

- **Deregulation** - Sugar price controls were eliminated in 1999-2000, which encouraged higher sugar production. Private participation was encouraged in exports and the government mandated sugarcane prices were eliminated.

- **Proalcool programme** - The nationwide ethanol programme reduced Brazil’s dependence on oil imports, due to domestic ethanol production and blending. The programme leveraged the sugar sector by developing alternative sugarcane based fuel.

- **Availability of fertile land** - Brazil has the ability to expand cane acreage by farming unutilized fertile land, without adversely impacting other crops. The increasing acreage resulted in increasing cultivation of cane. The cane acreage grew at 10 percent CAGR from 1996-2005.

- **Cost leadership in sugar production** - Brazil is the cost leader in sugar production, due to high mill and farm scale. The devaluation of its currency has made Brazilian sugar more competitive globally for exports. Brazil has also adopted a dynamic management of product mix between sugar and ethanol, which enables it to respond to global shifts in demand and supply. The rapid modernization of ports and investments in transport infrastructure have also been key drivers for low cost.

*Source:* FAPRI Commodities Database

*Figure 39: Brazil acreage and sugar production (1995-2006)*

*Source:* FAPRI Commodities Database
5.2 Consumption

India and China are the largest consumers of sugar and are growing above the world average in terms of consumption.

The total world consumption is at 146 million MT of sugar. India is the largest consumer of sugar followed by China, Brazil, USA and the Russian Federation. Consumption in China, India and Brazil is growing at a higher rate than the world average of 2.2 percent. Consequently, these geographies are expected to play a larger role in the global sugar trade in the coming years.
Asia, Africa and South and Central America have the highest consumption growth rates of above 2 percent CAGR. This is aided by high GDP growth rates and an increasing population. The consumption growth in developed economies like North America and Europe are the lowest at 0.7 percent and 0.6 percent CAGR respectively. Given that the largest producers of sugar, except for EU, are also in these regions, it is expected that these geographies would become more critical in the future.

5.3 International trade
While all major sugar producers rely on exports, India is unique because of its large domestic market

![Figure 42: Exports as a percentage of total production (2006)](source: F.O. Lichts World Sugar Yearbook 2007, KPMG analysis)

The major producers of sugar in the world are also the leading exporters, and are highly dependent on the world trade. Australia exports around 72 percent of its production, while Brazil exports 56 percent of its production. India is however unique, as it has the world’s largest consumption market. India’s dependence on the world trade is marginal and therefore, it is largely insulated from the global price variations. In case of a global surplus though, domestic prices tend to get influenced by low global prices since exports from India are less viable. Historically, India has used the world trade to manage its surplus and deficit, as it is typically self sufficient in sugar. At no point in the last 7 years has India imported or exported more than 2 percent of the total world sugar trade.
The world sugar trade accounts for around 36 percent of the global sugar production. India is a marginal player in the world sugar trade market. The average volume of preferential trade is around 10 million MT of sugar annually. The world sugar trade is dominated by Brazil and EU. Australia and Thailand are the other major sugar exporting countries.

**Figure 43:** India's role in global trade (1999 - 2006)

*Source: F.O. Licht’s World Sugar Yearbook 2007, ISMA Handbook of Sugar Statistics September 2006, KPMG analysis*

**Figure 44:** Major sugar exporting countries (2006)

*Source: F.O. Licht’s World Sugar Yearbook 2007, ISMA Handbook of Sugar Statistics September 2006, KPMG analysis*
Large exporting nations typically have a high domestic price as compared to world prices

The world raw and refined sugar prices usually move in sync with an average USD 60 differential between the raw and the refined prices. There are two major sugar exchanges that support global trade and serve as price benchmarks. These are NYBOT for raw sugar and LIFFE for white sugar. The world sugar prices are highly influenced by Brazil, as it is the largest exporter and the least cost producer among the major exporting nations.

![Figure 45: World raw and refined sugar prices (2004 - 2007)](image)

Source: Bloomberg, ISMA

Thus, given the high influence of Brazil, large sugar exporters typically generate higher margins from domestic sales as compared to the exports. Government intervention and regulations are used to maintain high domestic prices in these countries, when compared with the current world sugar price. This is a key feature of the sugar trade worldwide. India is unique in this respect, due to its low reliance on exports, and has one of the lowest retail prices of sugar amongst the key geographies.
While Brazil’s influence in global trade flow is expected to increase, EU is expected to become a marginal player

The world sugar trade is dominated by Brazil and EU. Brazil supplies large quantities of sugar to all the continents. Brazil expects to increase its sugar production to 125 million MT by 2013\(^\text{37}\) and thereby increase its share of exports in the world trade. Consequently, Brazil’s influence on the global trade flow would increase further. On the other hand, the role of EU in the sugar trade is expected to reduce as it is expected to become a marginal exporter over the period 2006 to 2010\(^\text{38}\). This is mainly due to a WTO ruling that has led to reduction in EU subsidies for sugar production. In fact, EU may even become a net importer subsequently.

\(^{36}\) USD to INR conversion assumed to be INR 44.5 per USD

\(^{37}\) Source: Future production modelled by Brazil’s Ministry of Agriculture, Livestock and Supply (MAPA), Sugarcane and Aeroenergy Department and as quoted by Sugar Industry Oversight Group, Australia

\(^{38}\) Source: CLSA Indian agribusiness sector outlook May 2006
The major sugar producing countries are also the major ethanol producers, as sugarcane is a major raw material for ethanol production. Brazil and USA together produce more than 68 percent of the total world ethanol production. USA and Brazil are the major consumers of ethanol as well.

5.4 By products – Emergence of ethanol

The major sugar producing countries are also the major ethanol producers, as sugarcane is a major raw material for ethanol production. Brazil and USA together produce more than 68 percent of the total world ethanol production. USA and Brazil are the major consumers of ethanol as well.
Amongst the by-products, ethanol has had the most positive influence on the sugar trade. Ethanol can be produced directly from cane or as a by-product of sugar production. It is therefore, an alternate use for cane. Fuel ethanol substitutes gasoline, hence is a substitute for crude oil. Consequently, a linkage between sugar and crude oil prices has been established. This linkage is primarily driven by Brazil’s policy of dynamic management of its share of ethanol and sugar production.

Figure 49: Linkage between sugar and crude oil prices (1998 - 2006)
Source: U.S. Department of Energy, Energy Information Administration

Ethanol’s impact on sugar is only expected to magnify with increase in ethanol adoption. Brazil, USA, Canada and France have already established ethanol programs while a number of countries are in the process of doing the same. These programs primarily address environmental concerns and work towards reducing the dependence on crude oil imports. The key geographies that are on the path to ethanol adoption include Japan, South Korea, Australia, EU countries, India and Argentina.
A number of factors have necessitated the need for regulations in the sugar industry, globally. They are

- **Perishable nature of cane** - Given the perishable nature of cane, there is a need for advance contracting between the farmer and the miller. The inability to store or transport cane for long durations necessitates that the cane offtake is assured and price discovery happens pre-harvesting. This is because, after harvesting, the farmer has low bargaining power and may not find buyers in the feasible delivery area. On the other hand, mills need to be assured of cane supplies in order to invest in milling and refining capacities and to invest in farm productivity. There is also a need to align the crushing schedule with cane deliveries.

**Figure 50:** Ethanol adoption status across the globe (2003)

*Source: ISO, FO Licht: World Ethanol Markets outlook to 2012, KPMG analysis*

### 5.5 Regulatory environment

A number of factors have necessitated the need for regulations in the sugar industry, globally. They are
- **Landholding structure** - Fragmented landholdings lead to low bargaining power for individual farmers and expose them to high subsistence risk. At the same time, mills need to manage large number of farmers, necessitating a structured legal mechanism for cane supplies.

- **Domestic price intervention** - In case of structural exporters, domestic prices are maintained at high levels either through price intervention or tariff structures. It ensures industry viability even if world prices are low. Consumer protection can also be a driver for maintaining sugar price at a desired level. Regulations may also be required to maintain steady availability of sugar in the domestic market, despite seasonal production.

However, the objectives and instruments of regulation vary across geographies. Though geographies like Australia have minimal regulations, India, China and Thailand are amongst the highly regulated markets. Brazil has deregulated the sugar industry since 1999-2000, but regulations are still present to influence the product mix of ethanol and sugar. Countries like Brazil and Australia do not have fragmented landholdings and are structural exporters. Thus, they do not have regulation for mitigating risks for farmers or for protecting the consumers. Detailed case studies for each of these countries have been discussed in the section on Regulatory Roadmap.
Figure 51: Regulatory environment in key geographies (2006)\(^a\)

Source: LMC, KPMG Research

---

*Cane pricing in Australia is done through free market pricing though a formula is available for reference to mills and farmers*
Business Roadmap
Transformation Opportunities
Business Roadmap — Transformation Opportunities

The business roadmap identifies and evaluates those opportunities that could enable the sector to move towards its shared vision. The roadmap also identifies the business and policy imperatives for all stakeholders for leveraging these opportunities.

The sugar sector has evolved over the years, and India is the second largest producer and largest consumer of sugar in the world. In order to fulfill the stakeholder’s aspirations, there is still a long way to go. Thus, going forward, the stakeholders would need to influence their business drivers so that the sector can move towards its shared vision. The sector would also need to identify and exploit opportunities that would enable this future growth, while benefiting all stakeholders.

6.1 Critical business drivers

The stakeholder aspirations discussed above, are dependent on specific critical business drivers which will enable the sector to fulfill the aspirations. The business drivers may impact more than one stakeholder. Therefore, in some cases, influencing a business driver could involve a trade-off between stakeholder aspirations.

Figure 52 outlines some of the major business drivers for farmers and millers that have a direct impact on their individual aspirations.

---

*Source:* KPMG Analysis
As can be seen, the farmer’s economic profit is impacted by the cane price, farm productivity and the cost of cultivation. The key controllable risks for farmers are the risks related to offtake of cane and non-payment of dues by the mills. The farmer-miller relationship can have a significant impact on both these risks.

For mills, the drivers for economic profits are the sugar prices in domestic and international markets and by-product realizations. The inventory cost has a negative impact, and also influences the extent of price risk. The mill efficiency influences the milling costs, hence the overall economic profit. The risk of cane availability is significant for mills, and is influenced by the farmer-miller relationship.

There are interdependencies between farmer and miller business drivers. A high cane price benefits farmers, but leads to lower profits for mills, for a given sugar price. Cane price and mill realization, if misaligned, can lead to arrears, that would negatively impact both the mills and farmers. Higher mill efficiency on the other hand leads to better recovery, with the benefits being shared by both farmers and millers. As discussed, the farmer-miller relationship is a key mitigating factor for both millers and farmers.

Figure 53 outlines some of the major business drivers for consumers and the government that have a direct impact on their individual aspirations. Some of these also have a strong linkage with farmer and miller aspirations.

Figure 53: Business drivers for consumers and government
Source: KPMG Analysis
For consumers, the availability of a range of sugar-based products is a driver of product variety. Industrial consumers use sugar in various forms including liquid sugar. The availability and affordability of sugar is dependent on domestic production and prices, which are also driven by the stocks that are held by the mills.

For the government, food security is the key aspiration. It is influenced by domestic production as well as India’s linkages with international trade. Energy security is driven by the extent of investments that mills have made in byproduct capacities. Fiscal revenue for the government is directly related to the mill realizations.

The social objectives of the government highlight a key conflict area. From a social perspective, the cane price should be high, so that it benefits the farmer. For the benefit of the consumers, the price of sugar should be low. In case both of these events occur together, as was seen earlier, they would lead to arrears leading to default of payments to farmers and reduced availability for consumers in the subsequent years.

Therefore, the critical business drivers that can be leveraged by the sector to move towards the shared vision are:

- Domestic demand
- International trade
- Byproducts value addition
- Productivity improvement
- Cyclicality management
- Cane and sugar pricing
- Sugar price risk management
- Product innovation

These business drivers need to be leveraged in such a way that the sector is able to fulfil its aspirations, without diluting its social objectives. Each of these drivers also translates into an opportunity that could become the enabler for future growth. These enablers are discussed in the subsequent sections.

If the sugar sector is able to leverage these opportunities, it will be able to move towards its shared vision. From the current state of being a large producer and consumer, with low participation in international trade and a low return on invested capital for most years, the sector could become a significant food and energy producer, with strong linkages with global trade. This can be achieved through self-sufficiency in sugar and through investments in ethanol and cogen. The sector could also benefit from lower cyclicality and more sustained revenues.
There is a wide range of estimates for the projected growth in India’s domestic consumption. Some of the studies that have projected the future consumption for India are:

- FAPRI estimates the domestic consumption in India to grow at a CAGR of 1.9 percent over the next ten years.
- USDA estimates the domestic consumption in India to grow by 4 percent from 2005-06 to 2006-07.
- The Planning Commission estimates that the demand for sugarcane would grow at a CAGR of 3.6 percent in the period 2006-2011.
- The Centre for Industrial and Economic Research estimates the sugar consumption to grow at approximately 5.4 percent CAGR for the period of 2004 to 2015.

### 6.2 Growth in Domestic Demand

**Assuming the domestic consumption continues to grow at a CAGR of 4 percent, India will consume 28.5 million MT of sugar by 2017**

There is a wide range of estimates for the projected growth in India’s domestic consumption. Some of the studies that have projected the future consumption for India are:

- FAPRI estimates the domestic consumption in India to grow at a CAGR of 1.9 percent over the next ten years.
- USDA estimates the domestic consumption in India to grow by 4 percent from 2005-06 to 2006-07.
- The Planning Commission estimates that the demand for sugarcane would grow at a CAGR of 3.6 percent in the period 2006-2011.
- The Centre for Industrial and Economic Research estimates the sugar consumption to grow at approximately 5.4 percent CAGR for the period of 2004 to 2015.
Given the range of growth rates (1.9 to 5.5 percent) the estimated sugar consumption in 2017 is expected to be between 22.8 million MT and 33.3 million MT of sugar. The drivers for consumption are growth in the GDP and population growth. GDP growth is expected to be high, while the population growth is expected to stay at the current levels. Given the high variability in estimates for consumption, historical CAGR growth has been used as an indicator and a CAGR of 4 percent has been assumed for projecting future demand.

Using the assumed growth rate of 4 percent, the projected domestic sugar consumption is estimated to be at 28.5 million MT in 2017. This sugar demand can be met either through increase in domestic sugar production or through sugar imports.

**Domestic sugar consumption will have to be met primarily through domestic production as import of sugar is a costly option for India**

The table below demonstrates the feasibility of raw sugar imports from Brazil and Thailand, at the current international prices. India has imported from these geographies, during its years of deficit production. Raw sugar imports can be used to produce refined sugar to augment the domestic sugar production to meet the future consumption demand. Given the existing and planned refining capacity in India, in case of deficit production, raw imports are a preferred option as compared to white imports for India.
However, even at the current low international prices, landed cost of imports is higher than the typical ex-mill price range for sugar, which is produced domestically. With the EU subsidized sugar easing out of the world market, the average world prices were expected to increase and CIE estimated the increase to be in the range of USD 50 to USD 100 per MT. Thus, sugar imports are expected to be a costlier option than the locally produced sugar. In case of white imports, the freight rates are also expected to increase, thus further increasing the cost of imported sugar.

Given the large domestic market and the changing international landscape, food security is a key concern. Hence, the domestic sugar consumption will have to be met primarily through domestic production.
In the past, domestic sugar deficit has typically not been more than 1.5 months of consumption. Given the cyclicity in sugarcane production, from a long term capacity planning perspective, India would need to target an excess production equivalent to approximately 1.5 months of consumption; i.e. an additional 3.5 million MT of sugar by 2017. This would ensure that domestic demand is met in most scenarios. In case of exigencies, if there is a deficit in production, it can then be addressed through raw sugar imports. At the same time, surplus may need to be handled through exports or through structural mechanisms like a strategic stock. Producing the required quantity of sugar would need adequate capacity expansion at the farm and mill side.

6.3 International trade

International trade can be used for managing the surplus and deficits in the domestic market

International trade has the potential to enable stability in the domestic market. Exports can help in managing surplus sugar production. At the same time, marginal deficits can be addressed by raw sugar imports.

Apart from cyclicity in production, a sugar surplus could also occur if the future economic attractiveness of ethanol or cogen leads to excess cane cultivation. In such a scenario, international trade will enable India to manage the surplus production with relatively lower impact on the domestic market.
India is a major sugar producer geographically situated close to deficient countries

India is located close to major sugar deficient markets. The Indian Ocean countries of Indonesia Bangladesh, Sri Lanka, Pakistan, Saudi Arabia, UAE and some East African countries are sugar deficient and import sugar regularly.


India has a natural freight advantage to these countries due to its geographical proximity. Historically, India has exported sugar to the identified deficient countries. In case of surplus domestic production, India can expect to export to these geographies.

At present, these countries import primarily from Brazil, Thailand, EU and Australia. Thailand, Australia and South Africa are present in only a few of the target countries, while Brazil and EU supply sugar to most of these deficient markets. These geographies would be the key competitors for India in the future.

Figure 58: Major sugar importing countries near India (2006) 44


44 Map illustrative and not to scale
Countries like Bangladesh and Sri Lanka primarily import white sugar while countries like UAE, Saudi Arabia and Indonesia are major importers of raw sugar due to the presence of destination refineries in these countries.

Figure 59: Major sugar importing countries: source of imports

Source: F.O. Licht’s World Sugar Yearbook 2007, ISO Sugar Yearbook 2005

UAE is assumed to be the major importer in the Persian Gulf region and hence the exports to Persian Gulf region are assumed to be that of UAE. The constituent countries of East Africa are Ethiopia, Kenya, Somalia, Sudan and Tanzania.

Figure 60: Major sugar importing countries: source of imports

Source: F.O. Licht’s World Sugar Yearbook 2007, ISO Sugar Yearbook 2005

UAE is assumed to be the major importer in the Persian Gulf region and hence the exports to Persian Gulf region are assumed to be that of UAE. The constituent countries of East Africa are Ethiopia, Kenya, Somalia, Sudan and Tanzania.
Pakistan is an occasional importer. It imports only if domestic production is inadequate to meet consumption in a given year. UAE is a large importer due to the presence of refineries that import raw sugar and export white sugar. All the other countries are structural importers with imports accounting for 50 to 75 percent of consumption. These countries are expected to continue to be net importers since structural changes in their domestic agriculture patterns would be needed for these countries to become self sufficient in sugar.

**With EU vacating 4.5 million MT of exports from the world market, the export opportunity for India has increased**

In 2005, EU exported sugar to more than 100 countries across the world including 1.5 million MT to countries in Asia and East Africa including Pakistan, Bangladesh, Indonesia, UAE, Kenya and Sri Lanka. The reduction in EU exports, which started in mid 2006 as a result of a WTO ruling, is scheduled to continue till 2010. It is expected to lead to redistribution of global trade and players like India could benefit.

![Figure 61: Major Indian ocean importers of sugar from EU (2005)](image)

*Source: ISO Sugar Year Book 2005*

---

*Map illustrative and not to scale*
CIE estimates that world sugar prices would increase in the range of USD 50 to USD 100 due to the withdrawal of EU from the export market in the period of 2006 to 2010. This would in turn make Indian exports more viable. While world prices did increase due to reduction of EU exports, however, currently the world prices are low due to a spurt in production leading to a global surplus. EU exports were of the 45 ICUMSA variety, whereas the Indian production is typically 100 to 150 ICUMSA. For India to be able to benefit from the space vacated by the EU, either Indian mills would need to develop the capability to produce 45 ICUMSA or else buyers would need to migrate to 100 ICUMSA, which would be a long term phenomenon.

Within the identified deficient markets, India’s competitiveness depends on the comparative freight rates

Figure 62: Major Indian Ocean importers of sugar along with freight rates from major exporters (2006)\(^a\)

Source: Industry sources, KPMG research

At present, Thailand has the most competitive freight rates for Indonesia and near by countries, while India is competitive in case of neighbouring markets like Pakistan and Sri Lanka as well as in the Middle East and East Africa markets. The freight advantage can be further enhanced by improving the port infrastructure through improvements in the loading rates and draft. Some ports in India have already initiated dredging projects to enable the same, but given the large investments needed, the government may need to play a larger role in the future.

\(^a\)Map illustrative and not to scale. Raw sugar shipped in bulk, white sugar shipped in PP bags.
Globally, the share of raw sugar trade is expected to increase as compared to white sugar. Destination refining volumes are expected to increase given the lower freight for raw sugar and the increasing consumption in the target countries. However India’s competitiveness for raw exports is currently lower as compared to white sugar. This is because the cost differential between white and raw sugar production in India is around USD 25 per MT while the price differential is higher at approximately USD 60 per MT of sugar on average.

To be able to export to the target markets, India would need to improve its cost structure through productivity and efficiency improvements in the long term. In addition, to export raw sugar, mills would need to make the necessary investments. Currently, India only produces plantation white sugar. Considering that export demand for raw sugar and refined sugar of 45 ICUMSA will increase going forward, India would need to develop the capability to produce these varieties in order to leverage the export opportunity.

Figure 63: Refineries in Asia\[1\]

Source: Industry sources, KPMG research

\[1\] Map illustrative and not to scale
Given India’s current cost of production, white exports may become a viable option only above FOB USD 335 and raw exports above FOB USD 310.

Given the current cost structure, the Indian white sugar exports are typically viable above USD 375 per MT on a total cost basis and USD 335 per MT on a variable cost basis. The world prices have stayed above this level for a considerable period of time only in case of global deficit production. In the past, the long term sugar price was around USD 270 per MT and it is expected to increase with the reduction in EU exports. At this price the Indian sugar exports on a variable cost basis could become relatively more competitive.

In case of a surplus that cannot be managed in the domestic market, Indian mills can consider exporting at variable price basis, since their profitability is primarily dependent on the large domestic market and exports account for a small part of revenues. In case of a surplus, if the mills have to export at a loss, then the industry could consider developing a mechanism whereby the loss is shared by the industry as a whole since the benefits of higher prices in the domestic market would accrue to all mills and farmers.
At the current cost of production and world raw sugar prices, the Indian exports of raw sugar looks unviable. However, the reduced cost of production and a sustainable cane price can improve India’s competitiveness for global trade.

**India’s cost of production is high primarily due to high farm cost**

India’s mill cost is comparable with major sugar producers. On the other hand, India’s farm cost, especially in case of SAP, is higher than all major sugar producers. Overall, India’s cost of production is higher than the major exporters like Brazil and Australia whereas it is comparable to China and Thailand.

**Figure 65**: London raw sugar prices (2004-2007)

Source: Industry sources, Bloomberg, KPMG analysis

Indian raw exports are viable above USD 350

Indian raw exports on variable basis are viable above USD 310

---

**Figure 66**: Cost of white sugar production

Source: LMC

---

Cost of raw sugar production in India is assumed to be USD 25 per MT of sugar lesser than cost of white sugar production. Source: Industry interactions
Thus, India needs to increase its overall cost competitiveness in order to be a competitive exporter with specific focus on farm productivity.

**India has the potential to export to key Indian Ocean markets**

<table>
<thead>
<tr>
<th>Low</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Africa</td>
<td>Sri Lanka</td>
</tr>
<tr>
<td>Indonesia</td>
<td>Bangladesh</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>Pakistan</td>
</tr>
<tr>
<td>UAE</td>
<td></td>
</tr>
</tbody>
</table>

Freight advantage

White sugar import potential as percent of total import potential

*Figure 67: India’s potential export markets*

*Source: KPMG analysis*

India’s export potential for the target markets is dependent on two key parameters -

- India’s relative freight advantage for the target countries. A higher freight advantage would imply greater competitiveness for Indian exports as compared to Thailand and Brazil, its major competitors in the target markets.

- White sugar imports in these countries as a percentage of the total projected imports in 2017. Since India is more competitive for white sugar exports as compared to raw, higher percentage of white imports would imply greater competitiveness for India.

---

*The bubble size represents the estimated sugar imports in 2017. Due to the divergent data available on imports and consumption for Bangladesh, Sri Lanka, Iran and Saudi Arabia, the average consumption growth rate for Asia has been assumed to be the growth rate for imports for these markets. Since these markets are structural importers, it is assumed that the growth rate of imports would be at least equal to the growth rate of consumption. It is assumed that UAE imports would be dependent on the consumption growth rate of countries that import white sugar from the UAE based refineries. Therefore, the average consumption growth rate for Asia has been assumed to be the growth rate for imports for UAE. For Indonesia, imports as a percentage of consumption have been consistently reducing over the last few years and hence no future growth has been assumed for Indonesia imports. For East Africa, divergent data is available on imports over the last few years and hence the average consumption growth rate for Africa has been assumed to be the growth rate for imports. Pakistan is an occasional importer and has also been a net exporter in the past. The proportion of raw and white sugar in imports for these countries is assumed to remain the same in 2017.*
It can be seen that in comparison to Brazil and Thailand, India has the maximum freight advantage to its neighbouring countries of Sri Lanka, Bangladesh and Pakistan, whereas its freight advantage is the least to Indonesia. UAE and Indonesia are expected to be the major Indian Ocean sugar importers in 2017, while Sri Lanka and Bangladesh would be comparatively smaller. Also, Sri Lanka and Bangladesh are currently the major white sugar importers whereas UAE and Saudi Arabia import a large percentage of raw sugar.

The target markets are expected to import 10 million MT of sugar per annum by 2017. The key imperatives for India to be able to leverage this opportunity would be productivity improvements in the long term, investments for producing raw sugar and white sugar of international standards and a policy environment which encourages international trade with minimal non-tariff restrictions. Given the strategic role that exports can play for maintaining stability in the domestic market, the government could also consider extending WTO compliant support to the industry for exporting sugar, in case of a surplus that cannot be managed in the domestic market. As a developing country, India has been allowed under WTO norms to extend these subsidies till 2013. Further extensions may also be considered as part of subsequent rounds of WTO negotiations.

### 6.4 Productivity improvements

To meet the projected sugar demand in 2017, India will need to produce an additional 5 million MT of sugar.

![Diagram](image-url)

*Figure 68: Drivers for mill and farm side capacity expansion*

*Source: KPMG analysis*

*Infrastructure includes cultivation, harvesting and transportation infrastructure*
India needs to produce an additional 5 million MT of sugar by 2017 to address the domestic demand\(^2\). This can be achieved through capacity expansion both at the farm side and the mill side.

The farm side capacity expansion can be driven by increasing the area under cane as well as farm productivity improvements. The farm productivity improvements would be enabled through increased yields, as well as increased sucrose content of cane. Both of these would be driven by research and development, which will focus on developing seed varieties, advanced farm practices and improved infrastructure for cultivation, harvesting and transportation.

The mill side capacity expansion will be driven by improved mill efficiency as well as necessary increase in mill capacities.

**India’s yields compare favourably with global yields but there is high variability across regions**

![Figure 69: Global yields (2006)](image)

*Source: FAPRI 2006 Agricultural Outlook, ISMA Handbook of Sugar Statistics Sep 2006*

There is a high variability in yields across regions in India, due to climactic conditions and variability in farm practices. Tropical areas have higher yields as compared to sub tropical areas. Tamil Nadu has the maximum yield in India, and is in fact higher than all the other major sugar geographies. On the other hand, India’s minimum yield is in Bihar, which is amongst the lowest in the world.

\(^2\) Sugar production for 2007 assumed to be 27 million MT. Source: ISMA. Projected domestic sugar demand for 2017 is 28.5 million MT and India would target producing an additional 3.5 million MT equivalent to 1.5 months of consumption from a food security perspective.
India’s yield has steadily increased, but this growth has tapered in the last 10 years. Since the 1950’s, yields have consistently increased by more than 10 percent every decade. In the last decade, however, yields have dropped partly due to climactic conditions like droughts.

At a state level, Tamil Nadu has increased its yield by more than 10 percent during the last decade. However, yields in other states have not seen similar improvements.

Given the historical trend in yield improvement, India can aspire to increase the yield by 10 percent over the next ten years to an average all India yield of 72.2 MT per hectare.

Figure 70: Average yield in India (1951 - 2006)
Source: ISMA Handbook of Sugar Statistics Sep 2006

Figure 71: Average yield in states (1997 - 2006)
Source: ISMA Handbook of Sugar Statistics Sep 2006
The sucrose content of cane in India, as measured by average recovery, is the lowest amongst key geographies

Recovery is a function of cane sucrose content as well as mill efficiency. India has the lowest recovery of sugar amongst the major sugar producers. Adoption of better seed varieties and farm practices can improve sucrose content leading to an increased recovery. Also, minimization of mill losses can improve mill efficiency; thereby increasing the overall sugar recovery.

![Recovery rate (2005)](image)

**Source:** F.O. Lichts World Sugar Yearbook 2007, ISMA Handbook of Sugar Statistics 2006

There is high variability in recovery across states

Maharashtra has the highest recovery in India, and Bihar is amongst the lowest. As seen in the case of yields, the best in India is comparable with the best in the world, but there is high variability across states. This variability is partly due to climatic conditions and farm practices.

Recovery in Tamil Nadu, Maharashtra and Karnataka has improved by 40 to 50 basis points over the last decade.
Mill efficiency has high variation across states and adoption of best practices for sugar production can lead to lower losses. Again, Tamil Nadu has the lowest mill losses; while Bihar has the highest. Mill losses are a function of the technology and processes used for sugar production. Therefore, it is not impacted by climatic variations across states.
If adoption of high sucrose varieties is encouraged, given the historical trend for recovery, India can aspire to improve its recovery. It could be improved by 50 basis points over the next ten years to an average recovery of 10.75 percent. To enable this aspiration, policy needs to encourage efficiency at the mill side and quality improvement at the farm side.

Farm practices can play a key role in increasing farm productivity

The key focus areas for farm practices are pre-cultivation, cultivation and harvesting. In the pre-harvesting stage, land preparation techniques could have an impact on productivity.

During cultivation, inter cropping pattern and inter row planting are critical variables. Adoption of best practices for integrated nutrient management and insect control has been proven to improve yields.

Sugarcane is a water intensive crop, and therefore water management plays a key role. Across most of the country, irrigation is currently being done through traditional means, leading to a significant wastage of water. The availability of subsidized water and power for agriculture, also leads to distortion of economic incentives for conservation of water in some cases. Increase in sugarcane cultivation, therefore, is perceived as being detrimental to the availability of water in a given region.

The adoption of advanced techniques like drip irrigation can address this constraint. Drip irrigation offers the potential to enable water conservation while increasing farm productivity. Drip irrigation can reduce water consumption for cane cultivation by 20 to 50 percent. Since establishing the drip irrigation infrastructure would require investments, policies would need to encourage these through the farmer-miller relationship and through government financing.

Over the longer term, productivity can also be significantly increased through better ratoon management. Again, sharing and adoption of best practices across states can contribute to this effort.

Harvesting efficiency is a function of the mode of harvesting manual v/s mechanical. The extent of automation that is possible in India is limited given the small landholdings, while partly automated mechanical implements can be used for improving the harvesting efficiency. Premature harvesting has been the practice in some states, since it enables the farmers to generate an additional crop between two successive cane plantings. This has a negative impact on both the yield and recovery. The reduction in transportation loss can also play a critical role for improving recovery.

---

Source: Irrigation management in sugarcane with special emphasis on drip irrigation by Dr. C Kailasam, Principal Scientist, Sugarcane Breeding Institute, Coimbatore.
At present, mills are responsible for encouraging adoption of advanced farm practices in their respective command area. Thus going forward, the policy would need to sustain and strengthen this farmer-miller relationship. Central research institutes can also play a key role in the development of advanced farm practices as well as sharing of best practices across states.

**One of the key outputs of R&D, cane variety development, has reduced over the last 16 years**

![Figure 75: Number of seed varieties developed by SBI (1990-2005)](image)

*Source: Sugar Breeding Institute, Coimbatore, KPMG research*

Seed development is currently restricted to few institutes including Sugarcane Breeding Institute, Coimbatore, Vasantdada Sugar Institute, Pune and Sugarcane Research Institute, Lucknow. The varieties of seeds that are developed are tested in individual states and notified for use by the state government. Mills are responsible for cane development in their command area.

In the recent past, the number of seed varieties being developed by the research institutes has been decreasing. This is further compounded by the fact that the current role of the Indian sugar industry is limited to encouraging adoption of varieties developed by these institutes. There is no direct linkage between the research institutes and industry, unlike the leading producers.
Worldwide, in most key sugar geographies, the research and development activities are carried out in consultation with the sugar industry. In Australia, the Sugar Research Development Corporation (SRDC) promotes innovation in the sugar industry. This is done through targeted investment in R&D. SRDC works in partnership with the industry, government, R&D partners and associated farmer communities. SRDC is funded through levies paid by the sugar industry and matching funds from the Australian government and invested AUD 9 million in 2005-06 on R&D activities. On average, the Australian sugar industry spends 2 percent of its annual revenue on research and development. In Brazil, Ridesa (Inter-university Network for the Development of the Sugar and Ethanol Sector) is a national programme for seed research, which involves the government, industry and universities. Ridesa has successfully been able to produce varieties in 6 to 7 years, as against a typical duration of 10 to 12 years. Brazil also provides good illustration of direct involvement of industry in research. Copersucar, a large sugar producer, has been responsible for innovations through its research arm, Copersucar Technological Centre, in the past.

Government funding for agriculture as a percentage of GDP has stagnated. Since inception, SDF allocation for research projects has only been 0.7 percent. Since 1999, the share of investments in agriculture, as well as, the total investment in agriculture as a percent of GDP has been stagnant. The overall investment in agriculture has remained at 1.9 percent of the total GDP. Also, the share of private investment in agriculture has reduced, since 2002.

![Figure 76: Investments in agriculture (1999-2006)](image)

*Source: KPMG research, Economic Survey 2006-07*

---

55Source: KPMG Research, Industry interactions
56Source: KPMG Research, Industry interactions
Low industry investment in cane research is evident from the fact that the amount of funds disbursed from SDF towards research has been 0.7 percent of the total fund (till date since 1983-84).

Going forward, the sugar industry would have to play a greater role in funding research initiatives for cane, and work closely with research institutes for setting the research agenda. It will also have to identify relevant future research opportunities. Also, the government’s share of investment in agriculture in the areas of irrigation technologies, pest and disease management and seed variety development needs to increase.

<table>
<thead>
<tr>
<th>Category</th>
<th>Percent of total funds allocated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loan for modernization and rehabilitation</td>
<td>42.8</td>
</tr>
<tr>
<td>Loan for cane development</td>
<td>15.8</td>
</tr>
<tr>
<td>Loan for cogeneration plants</td>
<td>4.9</td>
</tr>
<tr>
<td>Loan for production of ethanol</td>
<td>0.9</td>
</tr>
<tr>
<td>Buffer stock subsidy</td>
<td>29.0</td>
</tr>
<tr>
<td>Subsidy for export incentives</td>
<td>3.6</td>
</tr>
<tr>
<td>Administration of SDF</td>
<td>1.9</td>
</tr>
<tr>
<td>Grants-in-aid for research projects</td>
<td>0.7</td>
</tr>
<tr>
<td>Others</td>
<td>0.5</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
</tr>
</tbody>
</table>

*Figure 77: Application of funds of SDF (From 1983-84 till Oct 2009)*

*Source: ISMA, KPMG research*

Productivity improvements will enable India to meet more than 80 percent of the projected additional domestic demand

*Figure 78: Demand for sugar (2017)*

*Source: ISMA, KPMG analysis*

---

*Total loans from SDF towards research and cane development is INR 541.07 crores since 1983-84*

*Domestic consumption growth rate assumed at 4 percent CAGR.*
As a result of increased domestic consumption and the need for maintaining food security, the total sugar demand that India would need to meet by 2017 would be an estimated 32 million MT

**Source:** Ministry of Agriculture Government of India, ISMA, KPMG analysis

The increased demand for sugar can be largely met through vertical improvements, including yield and recovery improvements. Assuming a 10 percent yield improvement and a 50 basis points improvement in recovery, the total sugar production in India will reach an estimated 31.1 million MT in 2017. This would leave an unmet demand of an estimated 0.9 million MT of sugar.

An additional acreage of 0.2 million hectares will address the unmet demand. This would be a marginal increase in current area under cane and can be enabled by better utilization of the existing cane demarcated areas, thus minimizing any adverse impact on other crops. The unmet demand can also be addressed through further increasing the farm productivity and increasing drawal.

**A strong and long term farmer-miller relationship will be essential for productivity improvements**

Given the small landholding structure, the farm productivity improvement will happen only in the presence of a strong farmer-miller relationship. The relationship will help drive productivity improvements by enabling the mill to drive adoption of better seed varieties and advanced farm practices. It will also incentivize the mill for investing in extension services for improving the farm productivity.

---

60 Total sugar production in 2007 assumed to be 27 million MT. Base yield and recovery rates for 2007 assumed to be same as 2006 figures. Drawal assumed constant at 2006 levels.

61 Base yield and recovery rates for 2007 assumed to be same as 2006 figures. Drawal assumed constant at 2006 levels.
The farmer-miller relationship will also enable risk mitigation for farmers and millers. The off take risk for farmers will be addressed through assured cane off take by the mill, and mills on the other hand would be assured of cane supplies. The relationship will enable farmers to access credit from banks based on offtake guarantees provided by the mills. The availability of crop insurance to protect against crop failure risk would also be encouraged by mills and may be partially funded as well.

Apart from all of these, the relationship would incentivize the mill for investing in rural development, over and above the cane related investments.

**To convert the additional 35 million MT of cane generated through horizontal and vertical expansion into sugar in 2017, investments in sugar capacities will be needed**

Assuming an average crushing period of 150 days\(^1\), an additional crushing capacity of 0.23 million TCD would be required to crush the 35 million MT of additional cane\(^2\), which is produced through vertical improvements and horizontal expansion in cane production.

Assuming an average of INR 130 crores investment for a 5,000 TCD standalone sugar mill\(^3\), estimated investment of INR 6,000 crore would be required. Currently, the milling capacity in India is adequate for production of 27 million MT of sugar and further capacity expansion is already in progress. It can be assumed that the additional capacity requirement of 0.23 million TCD would be fulfilled through capacity utilization balancing and expansions by existing mills. Given that the average mill size in India is low, this would also enable existing mills to attain a viable economic scale, which has been estimated at 5000 TCD for India\(^4\) in case of standalone sugar mills. The viable economic scale is expected to be much lower in case of integrated mills.

Further investments would be needed in farm productivity improvements. The policy would need to sustain and strengthen the farmer-miller relationship, and would need to encourage improvements in mill and farm efficiency. The investments and a supporting regulatory environment will enable India to meet the additional demand through capacity expansion, both at the farm and mill side.

\(^1\)Weighted average crushing period. Source: ISMA Handbook of Sugar Statistics November 2006.

\(^2\)Recovery for 2007 assumed to be at 2006 levels (10.24 percent). Recovery for 2007 assumed to be 10.74 percent. Sugar production in 2007 assumed to be 27 million MT. Source: ISMA. Sugar production in 2017 assumed to be 32 million MT as per demand projections.

\(^3\)Source: Industry sources, KPMG Research

\(^4\)Source: Tuteja Committee
6.5 Byproducts

In most scenarios, mills can improve their profitability by adopting an integrated model.

<table>
<thead>
<tr>
<th>Byproduct</th>
<th>Sugar Molasses</th>
<th>Sugar Molasses</th>
<th>Sugar Ethanol</th>
<th>Sugar Ethanol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bagasse</td>
<td>24%</td>
<td>23%</td>
<td>10%</td>
<td>11%</td>
</tr>
<tr>
<td>Power</td>
<td>22%</td>
<td>21%</td>
<td>4%</td>
<td>1%</td>
</tr>
<tr>
<td>Sucrose content</td>
<td>17%</td>
<td>17%</td>
<td>10%</td>
<td>9%</td>
</tr>
<tr>
<td>Yield</td>
<td>17%</td>
<td>17%</td>
<td>10%</td>
<td>9%</td>
</tr>
<tr>
<td>Area under cane</td>
<td>13%</td>
<td>14%</td>
<td>1%</td>
<td>10%</td>
</tr>
<tr>
<td>Mill efficiency</td>
<td>13%</td>
<td>14%</td>
<td>1%</td>
<td>10%</td>
</tr>
<tr>
<td>Recovery</td>
<td>13%</td>
<td>14%</td>
<td>1%</td>
<td>10%</td>
</tr>
</tbody>
</table>

Figure 81: Return on capital employed for various scenarios

Source: Cris Infac Report November 2006
If the return on capital employed is evaluated in three scenarios: normal cycle, up cycle and down cycle, for various models of sugar production, it can be seen that the integrated model provides greater stability of returns and higher profits under most scenarios. Though the stand alone model is the most profitable in an up cycle, it is also the least stable and least profitable in a down cycle. Hence, an integrated model is a better option.

It can also be seen that the incremental investment in the integrated mills also provides a higher return during the various scenarios. Thus, investing in ethanol and cogeneration can provide higher profitability and greater stability under various scenarios of the sugar cycle.

Assuming that mills adopt the integrated model, ethanol has the potential to substitute up to 10 percent of the current fuel demand, at the current level of resources and efficiencies.

---

Figure 82: Return on incremental capital employed for various scenarios

Source: Cris Infac Report November 2006

---

ROICE = Incremental PBIT/Incremental Capital Employed. Assumption: Plant capacity - 5000TCD; Days of operation - 182 days at 90 percent capacity utilization; Process 50 percent of molasses into alcohol/ethanol and 75 percent of bagasse into power. Ethanol and cogen prices are not cyclical.
At present, the total sugarcane produced in India can be used to support the E10 requirements of the country using the molasses route. The current distillery capacity is 2,900 million litres of alcohol, of which 1,300 million litres are attached to the sugar industry. Thus, given the adequate availability of molasses and viable economic returns, the present distillery capacity attached to the sugar industry is adequate for meeting the estimated (current) E10 demand.

**E5 levels of blending can continue to be supported in 2017**

---

**Figure 83: Alcohol potential and molasses based surplus and deficit (2007)**


---

**Figure 84: Alcohol potential and molasses based surplus and deficit (2017)**


---

Total sugar produced in 2007 assumed to be 27 million MT. Cane crushed for sugar assumed to be 263 million MT in 2007. Source: ISMA. Molasses conversion assumed at 4.5 percent of cane crushed. Ethanol conversion assumed at 225 litres per MT of molasses. The demand for ethanol, potable and industrial alcohol and distillery capacity as given by the Planning Commission.

Total cane crushed for sugar in 2017 assumed to be 298 million MT assuming recovery at 10.74 percent. Molasses conversion assumed at 4.5 percent of cane crushed. Ethanol conversion assumed at 225 litres per MT of molasses. The demand for ethanol, potable and industrial alcohol as given by the Planning Commission.
By 2017, an additional 35 million MT of cane would be available, due to increase in demand for sugar. Based on the additional molasses availability, E5 would continue to be sustained, while for E10, additional alcohol would be needed. This can be made available through the B molasses route or the direct cane to ethanol route or through diversion of molasses from other uses, given the strategic importance of the ethanol programme. Using B molasses, 1.6 million MT\textsuperscript{63} of sugar could be substituted for additional production of alcohol to meet the E10 requirements. Given the volatility in production, India could also explore a model similar to that of Brazil, where the blending ratio could be varied between E5 and E10 on an annual basis depending on the availability of molasses and the economic and environmental rationale for ethanol production.

**Energy security and environmental concerns are driving the adoption of ethanol across countries and global ethanol demand is expected to increase exponentially**

Global ethanol exports, currently at 6.5 billion litres are expected to increase to 50 to 200 billion litres by 2020, depending on world crude prices and regulatory evolution\textsuperscript{71}. A number of countries have established their ethanol programmes or are in the process of doing so. The aim of these programmes is to address concerns regarding the energy security and environment\textsuperscript{72}.

**Brazil Proalcool programme:** In 1975, the first Proalcool programme was launched in response to the 1974 oil price rise. At that time, Brazil was the third most dependent country on oil imports. In 1996, the Brazil government announced Proalcool II, which was aimed at deregulating the markets for alcohol. Over the period from 1975 to 2002, fuel ethanol was used to help replace 55 billion gallons of gasoline saving the country around USD 52 billion. Brazil uses an ethanol blend of 18 to 26 percent depending on crude and sugar prices. Brazil has also pioneered the use of flex fuel vehicles that can run on any blend of ethanol and gasoline.

**US ethanol program:** In the U.S., security concerns for U.S. energy supplies during world oil crises of 1973 and 1979 marked the beginning of ethanol’s use as a gasoline extender in ‘gasohol’. At present, the U.S. uses a 10 percent blend for ethanol and 2003 consumption was 10 billion litres. Environmental concerns and the need to add oxygenates to fuel have also driven the demand for ethanol. Ethanol produced from corn accounts for 90 percent of the production in the U.S., and is incentivized by federal tax exemptions. Individual states offer additional incentives for ethanol production. In 2003, new markets like California encouraged the production of ethanol by banning MTBE, the most widely used oxygenate.

\textsuperscript{63}Assuming that reduction of 1 MT of sugar production will lead to production of 600 litres of alcohol using the B molasses route. Source: ISMA

\textsuperscript{71}Source: McKinsey Quarterly

\textsuperscript{72}Source: ISMA, FO Licht World Ethanol Markets Outlook to 2012
Europe ethanol markets: Environmental concerns have led the European Union to encourage all members to derive 2 percent of fuel consumption through bio-fuels by 2006 and 5.75 percent by 2011. Tax exemptions have been created for renewable fuels, including ethanol. Major ethanol markets in Europe include Germany, France and Italy.

Other major markets: Parts of Australia have adopted a 10 percent blend to address environmental concerns. Canada is building up its ethanol programme so that E10 blending can achieve 35 percent market penetration by 2010. This is in compliance with the Kyoto protocol. In response to large energy and industrial requirements, Japan produces both synthetic and fermentation alcohol and regularly imports 4 million litres of alcohol a year, making it one of the largest net importing countries in the world. Japan has also introduced E3 blends and may extend it to E 20 levels.

The key drivers for ethanol adoption across these geographies have been the environmental concerns and increasing need for energy. The reduction in dependence on crude imports has been another major driver. The success of the ethanol programme across geographies has typically been driven by government mandate for adoption of appropriate blending levels. Another feature has been continued government support for these programmes through subsidies or other incentives for adoption.

India faces similar concerns as its energy needs increase and India needs to consider adoption of ethanol for higher blending levels.

India can consider increasing blending to levels beyond E5

Figure 85: Alcohol potential and molasses based surplus and deficit (2017)

Blending up to E 10 levels can be supported through existing engine technology. For higher level of blending, the involvement of the automotive industry for redesign of engine technology will be needed. Given India's energy needs and the environmental benefits of ethanol, the country needs to aspire for blending levels of up to E 20. Alcohol availability for E20 would be possible through additional acreage of cane and direct conversion of cane juice to alcohol, B molasses route or through diversion from other user industries. If direct conversion of cane juice into ethanol is possible, then an additional acreage of 0.38 million hectares would be needed to support E20. Alternative sources for alcohol could also include other non food crops.

The regulatory environment will need to facilitate this transition through necessary changes to the sugarcane control order and a consistent policy on blending. Higher levels of blending will need to be supported through increased cane acreage and direct production of ethanol from cane juice. For this, mills would require the flexibility to shift from sugar to ethanol, based on the market dynamics. The increase in the blending ratio would need to be done in a consultative manner between the government, the sugar industry and the automotive industry.

Higher levels of blending beyond E-5 would need to be initiated once the blending program has stabilized

The potential of higher levels of blending would be indicated by the success of the current E 5 blending programme and its ability to scale up. The rationalization of tax and duty structures across states to enable easy movement of ethanol and molasses would be needed. Since molasses is also controlled by the state governments in some cases, a consensus will need to be reached between the central and state governments. This would also include addressing the commercial impact on the state revenues due to possible diversion of molasses from potable alcohol. A clear, consistent and milestone based policy both at the centre and state levels on blending to encourage investments in distilleries would be critical and a consultative approach would be required with the automotive industry for technology support. Distribution and storage networks will need to be established between the sugar mills and oil marketing companies.

Ethanol offers significant benefits

Ethanol blending would lead to savings for the national economy, through lower dependence on crude oil imports and reduction in subsidy expense for gasoline. Savings for oil marketing companies through lower excise duties on ethanol and lower cost of ethanol as compared to motor spirit would also be accrued. The environmental benefits caused due to green fuel and lower emissions would benefit the national economy in the long term.

---

Total cane crushed for sugar in 2017 assumed to be 298 million MT. Recovery assumed to be at 10.74 percent in 2017. No diversion of cane assumed for the additional acreage. Molasses conversion is assumed at 4.5 percent of cane crushed. Ethanol conversion assumed at 225 litres per MT of molasses. Demand for ethanol, potable and industrial alcohol as given by Planning Commission.
To realize these benefits, investments would be needed. In 2017, to meet E-5 needs, additional distillery capacity of 96 million litres would be needed at an estimated investment of INR 320 crore\(^6\). To meet the additional alcohol requirement for E-10, additional distillery capacity of 965 million litres would be needed at an estimated investment of INR 3200 crore.

**There is a significant untapped cogen potential. This can help to partially bridge the energy gap that India faces**

At present, the total installed power capacity in India is 128 GW, and the requirement is expected to increase to 306 GW in 2016-17\(^7\). Presently, the bagasse based exportable power is 847 MW, but this could increase to approximately 9,700 MW by 2017. The bagasse based cogeneration is currently less than 0.6 percent of the installed capacity, but can fulfill 6 percent of the additional future requirement.

---

\(^6\) For a 80 KLPD distillery, an investment of INR 80 crore is assumed including zero pollution systems. 300 day operations assumed for the distillery.

\(^7\) Total cane crushed for sugar in 2007 assumed to be 263 million MT. Drawal and recovery assumed at 2006 levels. Drawal is assumed to be 67.7 percent and recovery at 10.24 percent. Total cane crushed for sugar in 2017 assumed at 298 million MT with a recovery of 10.74 percent. Bagasse conversion from cane assumed at 30 percent of cane crushed. 87 atm pressure boiler is assumed. 2.4 MT of steam assumed to be produced from 1 MT of bagasse. 1 MWhr assumed to be produced from 4.7 MT of steam. Potential in 2017 based on 280 million MT of cane crushed. 150 days of operation assumed. 36 units of power per MT of cane are assumed to be used for captive consumption.

**Source:** KPMG India Energy Outlook
Cogeneration can enable India to meet the goals for “green energy” from renewable and sustainable biomass. Cogeneration can be a small, but certain step to bridge the availability gap for power. Consistent policy would be needed to encourage investments in cogeneration capacities.

**Cogen offers significant benefits**

In 2017, Cogen potential for exportable power is estimated to be at approximately 9,700 MW. The total carbon credit potential from cogen is in the range of 48 million credits per year, which is worth approximately INR 2,150 crore per year\(^7\). The captive power generation would also enable mills to save on power costs. The sugar industry can also support the decentralized generation of power leading to greater availability for rural electrification through cogeneration. In 2007, investment worth approximately INR 37,000 crore\(^8\) would be needed to realize the cogen potential of cane crushed by mills. Further, an additional estimated INR 16,000 crore would be needed to realize the cogen potential in 2017. However, the total investments in cogen would be lower due to synergy benefits between cogen and sugar mills.

- For existing standalone mills, if high pressure cogen is used, the investments in boilers and turbines would benefit the sugar mill as well.
- In case of new integrated mills, the total investment would be lower as compared to stand alone sugar mill and cogen plant.

**6.6 Cyclicality management**

*The Indian sugar industry is characterized by the cycle of high and low sugar production, typically resulting in surplus and deficits over a period of five to seven years.*

A typical sugar cycle in India lasts between five to seven years. This cycle is caused by natural cyclicality like climatic variations, pest, drought etc, as well as induced cyclicality. The key reason for the induced cyclicality is the high sugarcane arrears.

---

\(^7\)Carbon credit potential of 5000 credits each year for every MW of generation capacity at US$10/credit. USD/INR exchange rate assumed at 44.50

\(^8\)For each MW of cogen, an investment of INR 4.5 crore is assumed. Days of operation assumed to be 150.
### Natural cyclicality
- Climatic variations
- Water availability
- Pest attacks

### Induced cyclicality
- Higher sugar production
- Decline in sugar prices
- Lower Profitability

### Implementation
- **Cooperative model**
  - Multi stage payment
  - Advance payment typically set by the state government based on SMP
  - All payments are made by the end of season
  - Actual mill profits distributed amongst members as cane price
- **SMP**
  - Announced by the central government
  - Linked to average recovery of sugar
  - Based on cost of production, sugar prices and returns from alternate crops
  - First payment of SMP and second payment based on Bhargava formula as per the 5A clause
- **SAP**
  - Announced by the state government
  - Not based on any specific parameter
  - Typically higher than SMP

### Key states
- **Co-operatives in Maharashtra, Gujarat**
- **South India**
- **UP, Punjab, Haryana, Tamil Nadu**

### Benefits and drawbacks
- **Cooperative model**
  - Price signal to farmers since the cane price is linked to mill profits
  - Low arrears since final cane price is dependent on mill realization
  - Linked to estimated sugar price and not current sugar price
  - Aimed at equitable distribution of profits
  - Delays in calculation and payment of second installment weaken the price signal
- **SMP**
  - Linked to estimated sugar price and not current sugar price
  - Aimed at equitable distribution of profits
  - Delays in calculation and payment of second installment weaken the price signal
- **SAP**
  - Not linked to sugar price

---

**Figure 87:** The sugar cycle: Cyclicality in domestic cane production  
*Source: KPMG Analysis*

**Figure 88:** Cane pricing models currently being used in India  
*Source: KPMG research*
The cane pricing model can impact the level of arrears.

The arrears created are significantly influenced by the cane pricing model that is being used. If the arrears across states are compared, states that use the cooperative model or SMP, have lower arrears than states following the SAP model. Since the cooperative model ensures that cane price is implicitly linked to sugar price and it is paid based on the realization of mills, it leads to low arrears.

In case of SMP, the cane price is fixed after taking into consideration the expected sugar price. Hence, the arrears are lower as compared to SAP.

Arrears have been relatively low in cooperative cane pricing states like Maharashtra and Gujarat while it has been high in SAP states like UP, Haryana and Punjab.
Sugar in the domestic market is priced the lowest amongst key geographies and has a significant weight in WPI.

Figure 90: Sugar prices USD/MT (2006) \(^7\), Weights in wholesale price index (Base: 1994-95) (2007)
Source: ISMA, Office of the Economic Adviser, Ministry of Commerce and Industry, Government of India, CMIE Database

India has the lowest sugar prices amongst the major sugar consuming countries. At the same time, it also has high WPI weightage for sugar. These reflect the need to protect consumer interests. However, the sugar price multiple hasn’t moved as much as the other products in WPI, including essential commodities like rice and wheat since 1993-94.

The weight of sugar in the WPI needs to be reassessed

Figure 91: Share of expenditure for sugar in a commodity basket of consumption and investment goods (2004-05)
Source: Madras School of Economics

\(^7\) Sugar prices at Rs 18/kg & USD/INR of 44.50 assumed
According to a Madras School of Economics (MSE) study, the share of expenditure within a basket of consumption and investment goods can be used as an indicator for assessing the suitability of WPI weights. The present weight for sugar and Gur is 3.6 percent, but MSE suggests that the appropriate weight would be 2.02 percent as per the current basis of WPI calculation that excludes services. MSE also suggests that services should be included in the WPI calculation, in which case the appropriate weight would be 1.04 percent. If Gur is excluded and only the sugar expenditure is considered, the WPI weightage would be even lower. Consequently, there is a case for re-evaluating the weightage of sugar in the WPI and aligning it with the expenditure pattern as well as the current consumer profile since almost 75 percent of the sugar is consumed by industrial, small business and high income household segments.

**High cane prices and low sugar prices lead to arrears**

The cane price has been steadily increasing in the past, especially in case of SAP. However the sugar price has witnessed cyclical trends and is driven by the supply and demand for sugar in a given year.

![Cane and sugar price trends (1999 - 2006)](image)

**Figure 92: Cane and sugar price trends (1999 - 2006)**

*Source: ISMA Handbook of Sugar Statistics Sep 2006, NCDEX*

Whenever the difference between the cane prices and the sugar prices reduces, the cane arrears rise. Arrears are created since mills with a low realization due to low sugar price are unable to pay high cane prices, which is typically 70 percent of the ex-mill realization. An additional impact of high cane prices is the fact that excess cane is produced at the expense of other crops.

---

*Assumption: Cane costs at SMP and SAP are calculated using the recovery rates of Western U.P to arrive at cane cost per MT of sugar. Computation based on 2006 data.*
Figure 93: Profile of arrears (1999-2006)

Source: ISMA Handbook of Sugar Statistics Sep 2006, NCDEX, Cris Infac, Directorate of Sugar Ministry of Agriculture GOI

Figure 93 shows how the cane and sugar prices have moved in the past few years. The cane prices have been plotted on per MT of sugar basis. Cane prices have consistently increased though sugar prices have been volatile. When cane price and sugar price have moved in tandem, the arrears have been low. However, whenever the margin between cane and sugar price is reduced, the total arrears have shot up drastically.

Hence there is a need for a policy to create a link between cane and sugar price to maintain their alignment. This would ensure that arrears are minimized and possibly eliminated, thus reducing the induced cyclicality in the sugar sector.

**Linkage of cane price with sugar price would link the farmer and consumer social objectives**

<table>
<thead>
<tr>
<th>CP</th>
<th>Ceiling price level required to ensure realistic price for consumers</th>
</tr>
</thead>
<tbody>
<tr>
<td>FP</td>
<td>Floor price level to ensure adequate realizations for mills and minimal arrears for farmers</td>
</tr>
</tbody>
</table>

**Sustainable sugar price band**

If price > CP, intervention by the government needed

If price < FP, intervention by the government needed

Figure 94: Sustainable price band definition

Source: KPMG analysis

Assumption: Ex factory price assumed to be equal to wholesale price less duties and levies, margins and transport cost. Cane costs at SMP and SAP are calculated using the recovery rates of Western U.P. to arrive at cane cost per MT of sugar. Computation based on 2006 data.
Once the cane price and sugar price are aligned, high cane prices would imply high sugar prices and it would impact the consumer interests. Also, low sugar prices would imply low cane price and it would impact the farmer interests. A sustainable price band would therefore be required, which could balance the consumer and farmer interests on a long term basis. Intervention would be needed in case the sugar price moves outside the band.

The floor price would protect the interests of the mills and farmers to ensure that the cane price can be realized from the sugar price and adequate returns are available for farmers and mills, irrespective of the demand and supply situation. Ceiling price would protect the interests of the consumers to ensure that adequate availability is maintained in line with the consumption pattern. Government policy would therefore need to balance both the farmer and consumer interests.

**Aligning the cane and sugar price can lead to significant gains for the sector**

**Figure 95: Benefits of cane and sugar price alignment**

Source: KPMG Analysis

Aligning cane and sugar prices will improve the financial viability of mills and reduce the need for government support. In the past, government support was required to address high cane arrears in the form of rehabilitation packages, both at the central and state levels. Also, in surplus years, there has been a high inventory build up, leading to high inventory holding costs for the sector. During the deficit years, India imported sugar to address domestic demand. This led to opportunity cost in terms of lost sales for farmers and mills, while negatively impacting government revenues through import duty reductions.

In additional to the losses described above, the sustainability of the sector has also been at risk. This is primarily due to the high amount of arrears and the involvement of a large number of farmers and mills.
6.7 Sugar price risk management

Seasonal production implies that sugar mills carry large inventories that are exposed to a price risk.

Value at Risk (VaR) is one of the tools that estimate the potential risk of loss due to the price risk. VaR helps assess the monetary value of the worst expected loss, on a portfolio over a given time period with a given confidence level.

In case of sugar, the production timing is not aligned with consumption timing that leads to high inventory. While the production is seasonal, the consumption is almost evenly spread throughout the year. Thus, the sector needs to maintain high inventories that peak towards the end of the crushing season.

The market prices for sugar are volatile, and therefore there is a price risk for the inventory. In the absence of any risk management techniques, mills can potentially lose significant amount of value through erosion of inventory value.

VaR is calculated as the average value of stock which is held over the specified duration multiplied by the volatility to which the stock is exposed.

In case of sugar, VaR is estimated at INR 3140 crores at a sector level for a year\(^2\). The VaR is estimated at a 95 percent confidence level.

\(^2\) \(\text{VaR} = \text{INR} \times 375590 \times \text{Crores Days} \times \text{average inventory} \times \text{average price} \times \text{no. of days} \times \text{0.51 percent (std. deviation)} \times 1.64 \times 95\text{ percent confidence interval} = \text{INR} \times 3140 \text{ crores} \)
The risk can be managed by using hedging, thus leading to lower variability in cash flows and a lower price risk.

Hedging is possible for sugar since sugar contracts are being actively traded on the commodity exchanges.

The risk protection offered by hedging depends on the hedge ratio, i.e. the proportion of the inventory that is being hedged. Hedging does not enable speculation. It is a mechanism for managing risk that can protect the inventory value from being eroded.

**Figure 97:** Price hedging illustration for mills

*Source: KPMG analysis*

FPI = INR 15,500 per MT

FP2 = INR 14,000 per MT

SP2 = INR 14,000 per MT

SP1 = INR 15,000 per MT

3 Months Payoff Profiles

Excess Inventory

Miller buys the hedge contracts

Underlying Exposure (Inventory) = 1000 MT

Hedge Ratio = 50 percent

Future Contract Amount = 500 MT

Losses on underlying exposure = (15-14) x 1000 = INR 1000

Gains on hedge contract = (15.5-14) x 500 = INR 750

Net Loss = (1000) - 750 = (250)

Loss Reduction = 75 percent

Miller sells a hedge contract for 3 months

**Figure 98:** Hedgers as a percentage of total traders on the exchange: Share of end-users in business (2007)

*Source: NCDEX*

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pepper</td>
<td>21</td>
</tr>
<tr>
<td>Mustard seed</td>
<td>24</td>
</tr>
<tr>
<td>Wheat</td>
<td>38</td>
</tr>
<tr>
<td>Soy Oil</td>
<td>39</td>
</tr>
<tr>
<td>Sugar</td>
<td>40</td>
</tr>
<tr>
<td>Soy bean</td>
<td>67</td>
</tr>
</tbody>
</table>
The ratio of hedgers in case of sugar is high as compared to other commodities. It also indicates a high degree of participation from the end user. This is an indicator of the degree of market participation in the commodity exchanges.

![Figure 99: NCDEX Volumes vs. Sugar production in India (FY 2005 - FY 2007)](image)

**Source:** NCDEX, ISMA Handbook of Indian Sugar Statistics Sep 2006

The ratio of volumes that are traded on the exchange to sugar production has been increasing, indicating increasing depth of the market. Though this indicator has been increasing, it is still low as compared to the total volume of sugar produced in India and there is significant room for greater participation. Higher participation from stakeholders across the value chain would enable greater depth in the market, thus increasing the hedging capability for the sector and ensuring greater confidence in market operations.
Future prices for sugar move in line with spot prices, enabling effective hedging

The hedging capability offered by the exchange is dependent on the linkage between future and spot prices. As long as the spot and future prices are correlated and reflect the underlying demand and supply situation, they can be used for successful hedging. As can be seen from the trend of future and spot prices in NCDEX in the last year, the future price is traded at a premium to the spot price during the sugar season. But as the production increased, the future prices started trading at a discount, due to the expected increase in supply. At present, the future prices are being traded at a discount as there is a continuous build up of stocks and a surplus of sugar is expected in the future.

Exchanges have adopted various checks and controls to ensure a fair market

In order to enable greater participation on the commodity exchanges, fair market operations would be the key factor and the exchanges are working towards ensuring the same though various checks and control[1]. These include -

- Real time position limit monitoring (PRISM) - The exchange monitors positions held by members on a daily basis.
- Value at Risk (VaR) - VaR based margin setting ensures that the risk of defaults is minimized and the volatility in prices reflects in the margins for trading.

---

[1] Source: NCDEX
• Initial margins and exposure margins - Margins are set after taking into consideration various market factors. Also, these are set at various levels to ensure that the risk of defaults is minimized.

• Daily mark to market - Margins are marked to market prices daily to ensure that the margins are in line with price variations.

• Trade surveillance for price manipulation / collusions - Apart from position monitoring, the exchanges also use various methods to track the spot markets. This is to ensure that price manipulation and collusion between market participants does not happen.

• Settlement Guarantee Fund for contingencies - A settlement guarantee fund has been created to cover the settlement risks for market participants and can be used in case of exigencies.

Going forward, several initiatives are planned for increasing the participation and for further strengthening the market. The key to the future growth of the exchanges would be greater participation by stakeholders and higher confidence in market operations. In order to achieve the same, several initiatives are being undertaken:

• Awareness and training programmes with mills, buyers and corporate across the country for enabling greater participation

• Greater promotion of use of hedging by participants under the hedging policy

• Long term futures contracts in sugar - 18 month sugar contract is being evaluated and can provide an alternative price discovery mechanism for farmers and mills

• Higher position limits as current limits do not suffice in providing complete coverage for the sugar production of mills

• Opening futures trading to foreign participation - focus on SAARC nations and south east Asia

*Source: NCDEX*
6.8 Product innovation

India currently produces only white sugar, though demand for sugar exists in multiple forms

Traditionally Indian sugar mills have produced only white sugar of specified grades, but the changing consumption patterns have led to demand for various forms of sugar.

In case of industrial consumers, sugar is used in the form of liquid sugar and concentrates, apart from white sugar. Similarly, household consumers are also starting to use various sugar varieties like demerrera and icing sugar. For the export markets, India will need to start producing raw sugar as well as white sugar of 45 ICUMSA varieties.

While opportunities exist to tap the industrial and household markets, the potential is expected to be limited since these are currently emerging niche segments. For export markets, the potential will be dependent on India’s ability to be a cost competitive exporter.
6.9 Summary

All the opportunities discussed above offer varying levels of potential for future growth in line with the shared vision. Stakeholders would have to work in a collaborative manner, and need to be supported by an appropriate policy environment to tap these opportunities.

Figure 102: Summary of transformation opportunities

Source: KPMG Analysis

The above discussed opportunities have the potential to enable the sector to move towards its shared vision. These opportunities could have varying degrees of impact on the sector due to their criticality towards achieving the vision and the value of the opportunity. While some of these opportunities are currently being tapped, some of them are largely untapped and offer significant potential in the future.
The following opportunities can be classified as transformational opportunities because they have a high level of criticality for achieving the vision. These opportunities also have high value potential and are largely untapped by the sector as of now:

- Cyclicality management
- Byproducts
- Productivity improvements
- Sugar price risk management
- International trade

While the domestic demand is critical and offers large opportunity, it is currently being addressed by the sugar industry. Similarly, while product innovation is largely untapped, it is expected to be a relatively small opportunity since it is expected to be targeted at specific segments.

The future policy environment would need to enable the sector to leverage these opportunities. The regulatory roadmap would define the regulatory modifications needed for creating the appropriate policy environment.

---

Note: Cyclicality management refers to cane and sugar price alignment.
Predictable Patterns
Learning From Other Industries
Predictable Patterns — Learning From Other Industries

As seen, the sugar industry is indeed at the cusp of unlocking tremendous potential through realization of transformational opportunities. However, is the sugar industry in a unique situation or is there a precedence to draw learnings from?

Evaluating the evolution of six other industries, with similar socio-economic relevance to that of sugar, highlights that there are indeed instances where industries have seized such transformational opportunities. More so, there seems to be a predictable pattern that can be observed in the evolution of industries. The predictable pattern establishes that for successful evolution of industries, it is imperative that at all stages of evolution, the regulatory environment needs to constantly realign with the sector objectives.

Predictable Patterns is a researched framework, which traces the evolution of industries. The framework classifies the evolution in five distinct phases: State Control/Monopoly phase, Reforms emerge, State of flux, Refocus and Dynamic Competition in a sequential manner.

State Control/Monopoly phase is marked by limited competition and high extent of state control on firms. The next phase in the evolution journey is Reforms Emerge, where the regulatory regime is initiated and competition intensifies. The third phase is that of State of flux, which is a high growth phase for the sector, where the traditional assumptions are challenged and state influence dwindles, hostile competitors emerge, significant investments are made and the culture is characterized by a ‘beat the regulator’ approach. The fourth phase is that of Refocus, where the industry settles and consolidates, customer segmentation is of importance, core competencies are refocused, impact of regulation further subsides and culture is ‘beat the competition’. The fifth and the final leg of the overall evolution journey is Dynamic competition, where regulatory influence is largely limited to natural monopoly, complex partnerships and alliances are forged, customers and markets are highly segmented and businesses challenge the ‘efficient frontier’.

Globally, one can see instances of industries being at various stages of evolution. In the 2000s, the oil industry in Bulgaria and Czech Republic were at the state of flux, while the Australian oil industry seemed to have reached dynamic competition phase. In United Kingdom, water, electricity and gas were at state of flux, while telecom seems to be in the dynamic competition phase. In United State of America, gas, telecom and railways also seem to have achieved the dynamic competition phase.
Specifically, in India, predictable patterns have been used to evaluate six highly relevant industries: Cement, Textile, Power, Telecom, Fertilizer and Insurance. All these industries have a significant social impact and are of national significance. The selected industries also span the spectrum from goods to services and have traversed the transformation path in the recent past.

**Figure 104: Predictable patterns - Phases**

*Source: KPMG Research*
7.1 Predictable Patterns - India case studies

Various key industries have now entered into the growth phase or the state of flux phase. However the evolution objectives and the chronological spread of the evolution journey across the state control/ monopoly and reforms emerge phases has been different.

In each of the industries under consideration, like sugar there were transformation objectives. The fulfilment of the same brought in investments, ushered in improvement in sector performance, provided opportunities to both public and private players and addressed social objectives.

As is evident from the industries’ transformation case studies, the key imperative was the evolution of regulations that facilitated the successful transition.

Sugar also has similar transformational opportunities and can seize the same through appropriate business and regulatory initiatives.

---

*For all industries, initiation of state control/ monopoly phase is abridged. All other phases are chronicled as per actual years.*
Figure 106: Case 1: Cement transformation from scarcity to surplus  
Source: KPMG Research  
- Extensive regulations; price distribution  
  - In early 1982 companies allowed to sell 33 percent in open market  
- Regulations eased; proportion of free market sale increased to 50 percent  
- Licensing, price and distribution regulations removed  
- Private investments and significant capacity additions  
- Entry of foreign players - Lafarge, Italcementi  

Evolved current state  
- Evolution objective(s)  
  - Induce growth - transform from scarcity to surplus  
- Sector requirements  
  - Ability to meet growing domestic demand  
  - Emerged as the 2nd largest cement producer in the world  
  - Turnover of the industry has increased by 50 percent during 2001-06  
  - 6 million MT - Middle East, Sri Lanka and Nepal  
- Social Impact  
  - Greater domestic availability  

Figure 107: Case 2: Textile transformation for competitiveness  
Source: KPMG Research  
- In 1970, Cotton Corporation of India established - Purchase, sell and distribute cotton, agency for international trade & stabilize cotton prices  
- Textile reform initiated through Textile Policy of 1995  
  - Removal of cotton export quotas  
  - Initiated cotton futures trading  
  - Cotton procurement in Maharashtra opened to private traders  
  - Elimination of cotton control & transport orders  
  - Reduce competition distortion- hank yarn review, removal of SSI reservation for apparel manufacturing  
  - 100 percent FDI allowed in Textile  

Evolved current state  
- Evolution objective(s)  
  - Promote modernization and enhance competitiveness  
- Sector achievements  
  - Significant capacity expansion - INR 300 billion investment in spinning expected in next 5 years  
  - 8 percent increase in cotton yield during past 5 years  
  - Globally competitive  
  - Take advantage of abolition of multi fibre agreement quotas- exports to USA and EU  
- Social Impact  
  - Cotton yarn expected to grow at a 7.3 percent CAGR in the next five years - support to million farmers  

The Indian Sugar Industry - Sector Roadmap 2017  119
• Government ownership and control  
  • Established state electricity boards to act as owner, operator and regulator  
  • Established Central Electricity Authority to advise on policy, sector planning, data collection and research and project clearance

• Formulated IPP policy to encourage private participation  
  • Introduction of Orissa reform act  
  • Established of Central electricity regulatory commissions  
  • Established state regulatory commissions in many states

• Formulated Electricity Act to enhance competition and trading  
  • State electricity board unbundled - AP, Delhi, Haryana, Karnataka, Orissa, Rajasthan, UP  
  • Distribution privatization - Delhi & Orissa

Evolution objective(s)
• Increase financial viability - Promote efficiency and reduce losses  
• Encourage private sector participation  
• Improve customer service levels

Sector achievements
• In 2006 Private generation capacity of 13,000 MW; 10 percent of cumulative cap  
• Andhra Pradesh  
• Financial turnaround  
• GoAP subsidy reduced by INR 1,700 crs in 7 years  
• T&D losses reduced around 20 percent  
• Entry of private players - REL, Tata Energy

Social Impact
• AP - Increase customer service levels; implement standards of performance

Figure 108: Case 3: Power transformation to greater financial viability
Source: KPMG Research

Evolved current state

• Public sector monopoly  
  • Tele density growth marginal

• National telecom policy of 1994 initiated reform  
  • Established TRAI - level playing competition and consumer interest  
  • National telecom policy of 1999 - fixed annual license fee changed to revenue sharing, BSNL separated from DoT  
  • Establish Telecom Dispute Settlement & Appellate Tribunal  
  • NLD opened to competition

• VSNL privatized in 2002  
• ILD opened to competition TRAI initiated ‘competition regulation’  
• Interconnect Usage Charges regime established  
• Unified license regime established in 2004  
• Lowered access deficit charges  
• FDI ceiling increased to 74 percent  
• In 2006, 5 million subscribers added per month

Evolution objective(s)
• Increase competition  
• Poised to tap the continuing high growth phase  
• Increased competitiveness - 6 to 7 operators per circle, in general  
• Large PSU and private players - BSNL, Bharti, Reliance, Hutch, Idea  
• USD 8 billion of capital expenditure likely to be incurred

Sector achievements
• National telecom policy of 1994 initiated reform  
  • Established TRAI - level playing competition and consumer interest  
  • National telecom policy of 1999 - fixed annual license fee changed to revenue sharing, BSNL separated from DoT  
  • Establish Telecom Dispute Settlement & Appellate Tribunal  
  • NLD opened to competition

Social Impact
• AP - Increase customer service levels; implement standards of performance

Figure 109: Case 4: Telecom transformation to enhance competition
Source: KPMG Research
Fertilizer consumption growth increased significantly post 1975.

- In 1992, decontrol of phosphatic and potassium fertilizers.
- In 1997, Retention pricing scheme introduced for Urea.
- In 2001, Group pricing scheme instead of RPS formulated.
- Urea distribution regulation partially relaxed-sale outside Essential commodities Act.
- Regulation on pricing, capacity addition, feedstock, international trade regulated.
- Awaited NPS stage III - update energy & conversion costs, basis for computing retention pricing, liberalized sale of co-products, guidelines for conversion of gas based urea plants.
- DAP - New policy underway for promoting balanced nutrient.

Social Impact:
- No change in farm gate price of Urea since 2003.
- Contribution in increasing fertilizer application.

In 1992, decontrol of phosphatic and potassium fertilizers.

- Fertilizer consumption growth increased significantly post 1975.
- In 1992, decontrol of phosphatic and potassium fertilizers.
- In 1997 Retention pricing scheme introduced for Urea.
- In 2001 Group pricing scheme instead of RPS formulated.
- Urea distribution regulation partially relaxed-sale outside Essential commodities Act.
- Regulation on pricing, capacity addition, feedstock, international trade regulated.
- Awaited NPS stage III - update energy & conversion costs, basis for computing retention pricing, liberalized sale of co-products, guidelines for conversion of gas based urea plants.
- DAP - New policy underway for promoting balanced nutrient.

Social Impact:
- No change in farm gate price of Urea since 2003.
- Contribution in increasing fertilizer application.

In 1997, Retention pricing scheme introduced for Urea.

- In 1992, decontrol of phosphatic and potassium fertilizers.
- In 1997 Retention pricing scheme introduced for Urea.
- In 2001 Group pricing scheme instead of RPS formulated.
- Urea distribution regulation partially relaxed-sale outside Essential commodities Act.
- Regulation on pricing, capacity addition, feedstock, international trade regulated.
- Awaited NPS stage III - update energy & conversion costs, basis for computing retention pricing, liberalized sale of co-products, guidelines for conversion of gas based urea plants.
- DAP - New policy underway for promoting balanced nutrient.

Social Impact:
- No change in farm gate price of Urea since 2003.
- Contribution in increasing fertilizer application.

In 2001, Group pricing scheme instead of RPS formulated.

- In 1992, decontrol of phosphatic and potassium fertilizers.
- In 1997 Retention pricing scheme introduced for Urea.
- In 2001 Group pricing scheme instead of RPS formulated.
- Urea distribution regulation partially relaxed-sale outside Essential commodities Act.
- Regulation on pricing, capacity addition, feedstock, international trade regulated.
- Awaited NPS stage III - update energy & conversion costs, basis for computing retention pricing, liberalized sale of co-products, guidelines for conversion of gas based urea plants.
- DAP - New policy underway for promoting balanced nutrient.

Social Impact:
- No change in farm gate price of Urea since 2003.
- Contribution in increasing fertilizer application.

The Indian Sugar Industry - Sector Roadmap 2017 121
7.2 Key learnings for the sugar industry

In all the industries discussed above, the growth of the firms in the sector led to benefits for all the stakeholders. There are some key learnings that can be used as guidelines for the future evolution of the sugar industry.

- Rationalization of regulations led to increased attractiveness for investments and led to sector growth. Each of the sectors discussed above have seen significant inflows of investments as they traversed the path of transformation. These investments enabled them to leverage the available opportunities and drive sector growth.

- The transformation of the industry has led to new opportunities for both private and public players. In sectors like telecom, insurance and power, state owned companies have evolved and are successfully competing with private players.

- Evolution of the industry has not resulted in smaller players being marginalised. In telecom, regional players focussing on specific geographies have been able to build a sustainable business model while competing with national players. Similarly, in textiles, removal of SSI reservation for apparel manufacturing has not led to the small scale industry exiting the sector.

- Evolution of regulations has led to greater social benefits for all stakeholders. In case of sectors like telecom, insurance, power and fertilizer, evolution of regulations has led to greater degrees of freedom for the firms and the benefits have accrued to investors, consumers and producers.

- The sustainable growth of the firms was made possible by aligning the market forces for supply of raw materials and sale of end products. In case of textiles, government intervention for cotton has been limited to declaration of a support price while there is no intervention in the price of cotton textiles. In case of power, most large power projects are based on power price being indexed to the key raw material price e.g. coal and natural gas. In case of the fertilizer industry, the pricing policy has been structured to enable firms to earn a minimum return on invested capital, while government subsidies enable the availability of fertilizers at an affordable price to farmers.

- Rationalization of regulations has led to increased efficiencies across the value chain. In sectors like telecom and power, these efficiencies have led to greater benefits for consumers and service providers,
The growth of some of these industries has also been driven by the growth in demand for the specific products and services. In the cement industry, while government intervention still exists for cement prices, the high growth of domestic demand due to infrastructure growth has enabled the players to achieve economies of scale. The textile industry also has been able to tap into the high growth export markets due to its cost competitiveness and quality.

The sugar industry also has the opportunity to evolve along this path supported by a rationalized policy environment that will protect stakeholder interests, while enabling sustainable growth for the industry.
Regulatory Roadmap
The regulatory roadmap highlights modifications in the prevailing sugar related regulations for creating the required policy environment. These modifications facilitate the successful implementation of the business roadmap. It also captures the evolution of relevant sugar regulations in some of the key international sugar geographies. The regulatory roadmap also forms the basis for the implementation plan incorporating the prerequisites, risk mitigation measures and phases of modifications for ensuring minimum adverse impact on the sector during the transition period.

As discussed in the section on Key Comparative Analysis, globally, the sugar industry is regulated through various instruments given the perishable nature of cane and the need for market intervention for consumer and farmer protection.

In India, currently the regulations are prevalent across the sugar value chain. While the command area enables legal enforcement of supply of cane within the mill’s allocated catchment area, it also restricts new mills from being set up within 15 km of existing mills. While the cane price is mandated by the central government, there are few states that also declare state specific cane prices. Mills also need to deliver a maximum of 10 percent of sugar produced to the government for distribution through the Public distribution system (PDS), at a price that is often lower than cost of production. For the remaining sugar produced, the sale is usually as per the release orders given by the Central government, unless exemptions are allowed through legal intervention. Also, international trade is regulated through import tariffs and through non-tariff restrictions on exports that may also include temporary export bans.

8.1 Need for regulations

While any regulation restricts the business decision making ability of individual stakeholders, the removal of all regulations may not be the optimal scenario, particularly in the context of the Indian sugar industry.

Assuming the absence of any regulations, all stakeholders would have the freedom to take business decisions, in line with their respective aspirations.

If all regulations were to be removed, there would be no intervention to protect any set of stakeholders, leading to no distortion of demand or supply. All players within the industry would, therefore, be able to compete on purely economic factors.
Every stakeholder’s actions would also be determined solely through economic parameters. The subsequent paragraphs highlight the likely impact of complete deregulation on key stakeholders.

**Farmer**

Farmers would be able to sell cane to the highest bidder and not necessarily be restricted to sell to any particular mill. Besides the cane price offered, millers’ investments in farm productivity and in other facets of farmer - miller relationships would also influence the farmers’ choice of miller for selling the produce. Further the cane price would be driven primarily by the demand and supply of cane on a year-to-year basis.

**Miller**

Mills would be free to buy cane from any farmer and the cane price offered by a particular mill would depend on:

- Prices of sugar and by-products
- Financial strength of the mill
- Internal efficiencies as compared to competing mills
- Intensity of competition from other mills, Gur and Khandsari producers and returns offered by competing crops

The mill capacity would not be restricted by the availability of cane within the allocated command area, but would also depend on the ability to procure cane from longer distances. Mills would typically weigh the cost of procuring cane from longer distances against the benefits of economies of scale. The cost benefit analysis would include:

- Benefits of scale - Procuring more cane from longer distances would support bigger capacities and would lead to lower fixed costs per unit
- Additional cost of cane procurement - Procurement of additional cane from longer distances would imply a greater transportation cost
- Additional cost due to inversion loss - Procurement of cane from longer distances would lead to longer transit times and greater inversion losses
- Duration of campaign - Higher capacities may enable mills to reduce crushing periods for a given cane availability. While this may increase average recovery, the capacity utilization may be adversely impacted
Further, the investments that mills would make in farm productivity would depend on the quantity and duration of assured cane supplies that mills could expect from the farmers.

Also, the sale of sugar by mills would be driven by the mill’s view on future and current prices, both in the domestic and international markets. It also depends on the inventory holding cost, which is likely to be incurred by the mill.

**Consumer**

For the consumer, the lack of regulation would imply that the sugar price and availability would be driven by demand and supply conditions both in the domestic and international markets. There would be no assured availability at affordable prices.

- Hence if all stakeholders were to act solely on the basis of economic parameters, they would also be exposed to significant risks.
- Farmers may not be able to get assurances of offtake and given the perishable nature of cane, their ability to negotiate post harvesting would be severely restricted. Also, the availability of credit against offtake guarantees from mills would be affected, and it may lead to subsistence risk for farmers.
- The mill viability would be at risk due to lack of assurances for cane supply. Mills would be unable to align the crushing and harvesting schedules and higher inversion losses may occur.
- Due to the lack of supply assurance, mills would be reluctant to invest in farm productivity through extension services and research and development support.
- The relationship between farmers and millers would not develop with a long term perspective and would tend to be more opportunistic on a yearly basis. In the absence of this relationship, farmers would face a higher risk due to their marginal size, which may even translate to a subsistence risk. Mill capacity decisions would also be exposed to significant risk, due to lack of cane supply assurances for the long term.
- Mills would need to negotiate with thousands of farmers for cane supply, which may not be feasible on an annual basis.
- Mills and farmers would be exposed to the threat of lower cost imports in the absence of a favourable tariff policy.
- Specific low income consumer segments may be exposed to sugar affordability risk if prices are determined solely by the demand and supply in the domestic and international markets.
Therefore, the complete absence of all regulations involves significant risk for all stakeholders and may lead to suboptimal growth for the sector. As a result, the complete absence of regulations may not be the ideal scenario for the sector. Therefore, there is a need to develop an appropriate regulatory environment.

**While there is a need for an appropriate regulatory environment, there is also a need to re-evaluate the inclusion of sugar in the Essential Commodity Act**

The typical factors that drive the need for classifying an agro commodity as an essential commodity are: need for consumer protection and risk of availability.

- **Consumer protection is needed:**
  - If the commodity is essential to meet the nutritional requirements of a majority of the population
  - Sustenance risk for consumers exists and the impact on consumer health could be significant in case of high prices of the commodity resulting in low affordability

The risk of availability is high if there is high dependence on imports. Therefore, there is a risk of low availability in case of high world prices.

In case of sugar, the relevance of these factors has progressively decreased over the years. Levy sugar ensures availability at a reasonable price for households that are below poverty line while 75 percent of non-levy consumption is either for industrial or for high income households. Even for low income households that are not covered under PDS, a 10 percent increase in sugar prices has an impact of less than 1 percent on monthly food expense. Therefore, the need for ensuring availability at low prices is limited for sugar.

Also, given the growth in production, India is expected to remain self sufficient in sugar in the years to come. The increased attractiveness of sugarcane due to emergence of ethanol and cogeneration will further enable greater sugar availability. In the past, even in years of deficit production, the availability gap has not been more than 1.5 months of consumption. This has been effectively bridged through the import of raw sugar. The cumulative sugar imports in the past 10 years account for less than 3 percent of the total domestic sugar consumption. Given the adequate availability of refining capacity in India, raw sugar imports can be used in the future as well, if domestic production is less than consumption.
Consequently, there is a need to re-evaluate the classification of sugar as an essential commodity. As part of the mid-term review for the ninth plan, the Planning Commission has recommended that sugar should be removed from the Essential Commodity Act. Also, the Essential Commodities Amendment Bill (2005), currently pending with the Standing Committee on Food, Consumer Affairs and Public Distribution recommends that sugar be removed from the Essential Commodities Act.

The weightage of sugar in the WPI also needs to be re-evaluated

The present weight for sugar in the WPI is 3.6 percent, but Madras School of Economics suggests that the appropriate weight for sugar would be 2.02 percent as per the current basis of WPI calculation that excludes services. MSE also suggests that services should be included in the WPI calculation, in which case the appropriate weight for sugar would be 1.04 percent. An appropriate regulatory environment would therefore need to ensure that the interests of the stakeholders are addressed in an equitable manner. While farmer interests need to be protected, protection of consumer interests needs to be aligned with the consumption pattern.

8.2 Policy imperatives

The business roadmap would need to be supported with a facilitative regulatory environment. The regulatory environment would need to enable the sector to achieve the transformational opportunities and move towards its shared vision. The regulatory environment would also need to ensure that the social objectives of the sector are not diluted in pursuit of the transformational opportunities and stakeholder interests are not adversely affected.

The policy environment for the future would need to consider the reduced need for sugar to be considered an essential commodity, thus enabling greater degrees of freedom for the industry, while protecting stakeholder interests, to a reasonable extent.

Developing the policy environment would necessitate addressing trade-offs between stakeholder aspirations. Given the structural nature of the Indian sugar industry i.e. small landholdings and the current consumption pattern, farmer protection would need to be given the highest priority. Mill viability is a key driver for farmer viability and ensuring mill viability would therefore be a key objective for the policy environment. This would enable future growth of the industry through continued attractiveness for investments and lead to fulfilment of aspirations for farmers and millers.
While the PDS system would provide for protection of consumer interests in case of households below the poverty line, the upper end of the sustainable price band would protect consumer interests for other segments. This upper end of the price band would need to be defined keeping in mind the current consumption pattern.

In order to implement the business roadmap outlined above, the key objectives for the regulatory environment would be to facilitate

- **Level playing field** - The regulatory environment should enable all firms within the sector to compete effectively without any distortions either in cane supply or in sugar marketing. The distortions may be due to state level policy variations or due to conflicts between the regulatory provisions at the central and state levels. These could be because of policies related to cane pricing, incentive schemes for capacity addition or restrictions on movement of byproducts like molasses, amongst others. Distortions may also be present in the form of restrictive barriers to entry or exit for players.

- **Efficient use of resources** - The regulatory environment would need to incentivize efficiency both at the farm and mill side. Given that agricultural land is a scarce commodity, as far as possible, the future growth of the sector would need to rely on productivity and efficiency improvements. Similarly, efficiency improvements at the mill side will enable greater production without added pressure on scarce resources.

- **Strengthen the farmer-miller relationship** - The farmer-miller relationship would be a key driver for the future growth of the sector and the regulatory environment would need to protect and incentivize this relationship. Given the small landholdings in India, this relationship would need to be the basis for inclusive growth for farmers and millers.

- **Reduce cyclicality and ensure better management of downturns** - As discussed above, the cyclicality in the sugar industry is partly natural and partly induced. The regulatory environment would need to minimize the induced cyclicality and promote mechanisms that would enable better management of the downturn.

- **Better sugar price risk management** - Given the seasonal production and resultant large inventories, the regulatory environment would need to enable and promote the adoption of risk management mechanisms, including commodity exchanges.

- **Linkage with international markets** - International markets have a high strategic value for India for managing the surplus and deficits that cannot be managed in the domestic market. The regulatory environment would need to enable and incentivize greater participation in international trade by the Indian industry.
Social objectives - The regulatory environment would need to continue to ensure that the social objectives of farmers, mill sustainability and consumer protection are adequately addressed in the course of implementation of the business roadmap.

The current regulatory environment in India for sugar is composed of five major regulations. Further modifications to these would need to be evaluated for developing the regulatory roadmap. These regulations are:

- Reservation of cane area
- Cane pricing
- Monthly release mechanism
- International trade regulations
- Levy sugar

Apart from these regulations, policy imperatives identified as part of the business roadmap, such as byproducts policy and resolution of central and state policy conflicts would also need to be addressed.

8.3 Imperatives for the cooperative sector

The cooperative sector is the largest component of the sugar industry and includes millions of farmers and over 200 operational mills. It has played a key role in the development of the sugar industry and has been a critical component of rural development in India. As the sugar sector attempts to move towards its shared vision, the cooperative sector would play a key role.

At present, the cooperative sector is constrained by several regulatory provisions that restrict its ability to leverage the transformation opportunities. These include:

- Access to funds - The cooperative sugar mills are not allowed to access capital markets. They are also not allowed to build reserves for future expansion, since all the profits are distributed amongst shareholders in the form of cane price. This constraint has been partially relaxed under the Multi State Act. Cooperatives covered under this act can allocate not less than 10 percent of profits as reserves. This is over and above 25 percent of profits that these cooperatives need to transfer to a statutory reserves fund. Shareholders for cooperatives comprise farmers with small landholdings, thus constraining access to additional equity for the mills. Access to bank
loans is largely restricted to cooperative banks. Though cooperatives can access other banks as well, they are ineligible for benefits under the restructuring package suggested by the Tuteja Committee in case they have outstanding loans from non-cooperative banks. All these factors constrain the capability of cooperative sugar mills to invest in efficiencies, capacity expansion or byproducts.

- **Access to research and technology** - Cooperatives rely primarily on the government for research and development and technology assistance and as discussed, over the years, government spending on agriculture has been stagnant.

- **Access to markets** - In some cases, cooperatives are restricted from selling sugar outside the state boundaries, thus restricting the ability to maximize returns.

As per the Mahajan Committee, cooperatives are in some cases, working as departments of the state government and not as truly cooperative organizations and there is a need for cooperatives to consider returning the share capital of the government and becoming self reliant.

Going forward, these constraints will have to be addressed. There is a need for a supportive policy environment for the cooperatives to enable them to strengthen their competitiveness. Enabling cooperatives to raise funds from cheaper sources like External Commercial Borrowings (ECB), Initial Public Offerings (IPO) and other market borrowings can allow the mills to modernise and expand. As cooperatives are a state subject, the state governments need to enable investments in the sector. National Cooperative Development Corporation (NCDC) can also play a key role in facilitating access to funds.

A high powered committee led by Shri Shivaji Rao Patil is currently examining these constraints for the cooperative sector in India and is expected to recommend appropriate modifications.

### 8.4 Previous studies

In the past, three major studies have been instituted on the regulatory environment needed for the Indian sugar industry. The recommendations made by these studies were based on interactions with a wide set of stakeholders and have formed the basis for significant regulatory modifications that took place in the sugar industry.
• **Bhargava Commission (1974)** - The Bhargava Commission developed the sugarcane pricing system that has been incorporated as part of the Sugarcane Control Order as clause 5A. The pricing system enables sharing of profits between mills and farmers. At the end of the season, the government is expected to announce the ‘L factor’ that defines the additional payment to be made by mills to farmers over and above the SMP. The ‘L factor’ is dependent on mill realization, and therefore the final payment made to farmers could vary from mill to mill.

• **Mahajan Committee (1998)** - The Mahajan Committee, constituted on the directions of the Allahabad High Court, considered various issues related to the sugar industry. The key recommendations of the committee included modifications to be made to the cane pricing system and phased reduction of levy sugar from 60 percent to nil. The committee also studied the regulatory environment in various international geographies to arrive at recommendations for the Indian sugar industry.

• **Tuteja Committee (2004)** - The Tuteja Committee was constituted by the government to review the status of the sugar industry in the country, identify the problems faced by it and suggest a package for revitalization of the industry to make it vibrant, self-sustaining and globally competitive. Some key recommendations of the committee include: removal of monthly release mechanism and a financial restructuring package for the sugar industry.

### 8.5 Regulatory analysis - Approach

The regulatory analysis approach is based on the analysis of scenarios of end states that will occur, if modifications were to be made to the current instruments of regulations. For the initial analysis, each regulation has been considered independently and the inter linkages between regulations have been addressed subsequently. The analysis approach aims at evolving a regulatory environment conducive for successful implementation of the business roadmap. The key stages of the approach are:

- **Identification of instruments of regulation** - Each regulation is currently implemented through specific instruments e.g. reservation of cane area is being implemented through command area as well as distance restrictions between mills.

- **Identification of macroeconomic factors** - The end state scenarios for specific regulations need to factor varying macroeconomic conditions. These could include intensity of competition, world prices and domestic demand and supply for sugar. The optimal scenario has been evaluated in the relevant macroeconomic conditions.
- **Scenario generation** - For each instrument of regulation, scenarios have been generated by varying the extent of regulation for the instrument. In case there is more than one instrument for a regulation, the inter linkages between the scenarios have also been assessed.

- **Scenario evaluation** - Scenarios have been evaluated against the policy attributes identified as part of imperatives for the business roadmap, since the evolved regulatory environment needs to facilitate the implementation of the business roadmap.

- **Identification of optimal scenario** - The optimal scenario has been identified for each regulation based on the scenario evaluation.

---

8.6 **Reservation of cane area**

The instruments of regulation for reservation of cane area are command area and distance restrictions between mills.

The command area allocates a specific area to a mill for cane procurement. Farmers within the allocated area have the option of registering with the mill for cane supply. In case the farmer registers a specific quantity or acreage of cane, the farmer is legally bound to deliver that quantity, or cane from the registered acreage, to the mill post harvesting. If the farmer does not register, then the farmer is free to sell the cane to any buyer. However, in some parts of India, this may need the permission of the Cane Commissioner, based on a No Objection Certificate from the mill, in whose command area the cane has been produced. The mill cannot register cane from outside the allocated area. The command area is allocated on a permanent basis though the government may reallocate the area, if required.
At present, distance separation between mills is set at 15 km. No new mill can be set up at a distance of less than 15 km from an existing mill. This ensures a minimum availability of cane area for all mills and directly impacts the minimum economically viable mill size, which can be sustained.

**Regulatory levers**

**Command Area**
- Government mandated
- By mutual consent

**Distance between mills**
- National level definition
- Regional level definition
- Does not exist

*Source: KPMG Analysis*

**Figure 113: Scenario definition for reservation of cane area**

**8.6.1 Command Area**

The regulatory modification options that have been considered for command area are -

- **Government mandated command area** - This option corresponds to the current state where the command area would be allocated by the government on a long term basis. The allocation would be dependent on current mill capacity and expansion, which is currently under implementation. It also depends on the availability of sugarcane within the area and the future demand for sugar. The registration option would be available to farmers.

- **Government mandated command area with reviews** - While the government would continue to have the power to allocate the command area, a review would be institutionalized that would consider reallocation of area based on defined parameters. The review would be done on an exception basis for areas, where surplus cane is available or in case of mills that have low performance on the defined parameters. The allocation would be dependent on the current mill capacity and expansion, which is currently under implementation, the availability of sugarcane within the area and the future demand for sugar. The registration option would be available to farmers.

- **By mutual consent** - The supply of cane would depend on mutual agreements between the mills and farmers. The duration and terms of the agreement would be based on mutual consent between the mills and farmers with no government intervention.
The macroeconomic factors that have been considered for generation and evaluation of scenarios for command area are:

- Demand and supply for cane
- Extent of competition

The command area impacts the cane supply as well as the long term relationship between farmers and millers, while restricting their choice of buyer and seller respectively. The relevant evaluation criteria that have been considered are:

- Efficient use of resources
- Incentive for farm and mill efficiency
- Level playing field
- Social objectives - Farmer sustainability and mill viability
- Ease of implementation

**Government mandated command area**

If the command area is mandated by the government for the long term and is legally enforceable, it would enable assured offtake for the farmers and assured availability of cane for the mills on a long term basis. It would also enable the mills to align the harvesting schedule with the crushing schedule, thus reducing the time spent between harvesting and crushing. This would then lead to lower sucrose losses. Since the capacity expansion ability of mills would be restricted by the availability of cane within the allocated command area, mills would have an incentive to invest in farm productivity and to increase land under cane cultivation, in their individual areas. This incentive will be further enhanced since the allocation will be on a long term basis, enabling the mills to recover their investments in the form of higher availability of cane. The long term allocation of command area will incentivize the development of a long term relationship between farmers and millers. While farmers will have access to extension services and research and development support provided by the mills, the offtake guarantees that farmers receive against registered cane, will also enable them to receive credit from third party institutions like banks. The adoption of risk mitigation instruments like crop insurance would also be encouraged by mills, within their allocated area. The mills will also be willing to invest in social development of the entire rural ecosystem in order to strengthen the relationship with the farmers and ensure the availability of cane.
At the same time, the mandatory allocation of area would restrict the farmer’s ability to register with the mill of his choice. Though the farmer would be able to sell cane to any buyer in case of non-registration, that would expose the farmer to risks of crop off-take and inability to access support that is otherwise available through the farmer-miller relationship. Given the small landholding size in India, the ability of farmers to manage these risks would be limited. Once the command area has been allocated, farmers would be unable to shift to an alternate mill even if the allocated mill has low productivity or if the dues are not paid on time or there is no investment in the farm productivity. The only option available to the farmers would be to shift to alternate crops that may have lower returns as compared to cane. This would reduce the incentive for mills to invest in the relationship with the farmer. The mandatory allocation of command area would also increase the entry barriers for new players in the sugar industry, since new capacities can be set up only after the adequate area has been allocated as per the government’s discretion.

**Government mandated command area with reviews**

While the benefits and drawbacks of the mandated command area without any reviews would still be applicable, review of the command area would be aimed at ensuring that consistently inefficient mills are not protected and there is optimal utilization of the available cane area.

The review would be based on comparison of mill performance against benchmarks set at a local level over a minimum period of the sugar cycle. Since the performance review would be over a sugar cycle, which is typically six to seven years, the variance in performance due to macroeconomic conditions would not influence the review decisions. It will also provide mills adequate time to recover the benefits of investments that they may have made in the farm productivity.

The parameters that the review would need to focus on would be:

- Mill efficiency
- Investments in farm productivity
- Timely payments to farmers
- Additional availability of cane since the time allocation of area was done
- Additional demand for cane by new and existing mills including any capacity expansion in progress
- Changes in farming patterns that may have occurred since the time allocation of area was done e.g. emergence of more profitable crops across the region
In case a mill’s performance is found to be consistently below the benchmark, part of the cane area allocated to the mill may be reallocated. This would encourage mills to invest in the relationship with farmers, ensure timely payment and invest in mill productivity. The review will also enable more efficient utilization of land under cane cultivation, since the surplus area, if any, can be either allocated for new capacities or allocated between neighbouring mills that have demonstrated higher performance.

A review for all mills in every review cycle may not be feasible, but a review can be done on an exception basis for areas where surplus cane is available, or if the mill performance has consistently been below the benchmark.

The efficiency of the review mechanism would depend on the ability to objectively set feasible and measurable benchmarks by collating data across mills in a given area. The process for reallocation could be as per the process defined by the Mahajan Committee that involves discussions with the affected mills and provides for a legal recourse for all parties.

**By mutual consent**

Farmers would be free to sell cane either on an opportunistic basis to the highest bidder or farmers and millers could enter into mutually acceptable contracts. If the mutually acceptable contract is legally enforceable, it would enable assured offtake for farmers and assured supply for mills for the contract duration. At the end of the contract duration, both mills and farmers would be free to evaluate other options for cane supply. It can be assumed that the contract duration would be long enough for mills to recover the benefits of investments that they would make in farm productivity and in the relationship with farmers. Contract renewal would be dependent on the farmer’s and miller’s perception of the cane price offered and the benefits of the relationship. The entry barriers for new capacities would be lower since farmers would be able to switch to different mills at the end of the contract durations and there would be no need for the government to allocate area.

If the contracts do not have adequate legal remedies for immediate enforcement, then implementation would be a concern area for both mills and farmers. Further, sustained violations would reduce the stakeholder’s confidence in the system, leading to increase in opportunistic sales rather than long term contracts. There would also be a significant risk of creation of intermediaries, since it will not be feasible for mills to negotiate individually with thousands of farmers and there will be a need for collective bargaining. This has in fact been a major cause of failure of command area removal in Pakistan. Farmers will continue to be free to sell cane without contracts with the associated risks of offtake and low bargaining power post harvesting.
Based on the relative benefits and drawbacks of the above scenarios, the government mandated command area with reviews enables efficient use of resources and facilitates a level playing field, while addressing the social objectives of farmer sustainability and mill viability. However, the risks related to implementation will need to be mitigated. These risks and possible mitigations are:

- Effectiveness of reviews dependent on benchmark definition and calculation: This risk can be mitigated through the creation of an independent national level regulator that can formulate and implement a policy for command area reviews and benchmark definitions. The regulator will be responsible for conducting the reviews on an exception basis and will assess mill performance and reallocate cane area, if needed, in line with the policy.

**Case study – Failure of command area removal in Pakistan**

In Pakistan, the sugarcane growers are free to sell their produce to any mill at any distance for a better price. Marketing of sugarcane was regulated until 1987 through Sugar Factories Control Act. Each sugar mill was assigned a specific area known as zones to procure sugarcane at the price declared by the Government. Only a small quantity of sugarcane could be diverted to the manufacture of Gur. When the official system was abolished in 1987-88, farmers were free to supply cane to any mill. This brought with it added disadvantages, namely:

- The role of the middleman took birth. The middlemen purchases cane from growers before harvest at a price lower than the one at which he eventually sells to the mill. While the role of the middleman is frowned upon by the millers, growers as well as the government, without a suitable alternative this practice persists.
One of the major consequences of this has been that the sugarcane is transported long distances to mills, not necessarily within the grower’s locality. This results in unnecessary strain on the road network, additional costs for fuel and adverse impact on the environment, apart from higher inversion losses.

According to the Pakistan Sugar Mills Association, the freedom of such sale and negotiation may bring short term benefits at the cost of potential technical and financial support extended to growers by the local mills. The help, thus extended to growers who agree to supply their cane in the mill in their locality, could include financing seed, new varieties, fertilizer, pesticides, machinery and expertise services.

Source: ISMA

Case study – Use of captive farms and large landholdings in Brazil and Australia

In Brazil and Australia, cane farming is typically done on large sized plantations. Average landholding sizes are much larger than in India. In Australia, approximately 5,800 independent growers supply bulk of the cane for the entire sugar industry. In Brazil, only 25 percent of the cane is sourced through independent growers, with mills sourcing the remaining cane from plantations owned by them. In both cases, the large size of the farms enables them to effectively bargain with the mills and the capacity of the farmers to sustain risks of crop offtake and crop failure is much higher. The growers are also not entirely dependent on the mills for investments in farm productivity. In both these cases, mutual contracts are established between mills and farmers for cane supply through collective or individual negotiations. The need for regulatory intervention for cane supply is limited, unlike in India, since Indian farmers have low bargaining power and low ability to sustain risks, due to small landholdings.

Source: ISO - Cane and beet payment systems

8.6.2 Distance restrictions between mills

Distance restrictions between mills are relevant for new mills that are being set up in areas where existing mills are present or other new capacities are under implementation. The regulatory modification options that have been considered for distance restrictions between mills are:
Distance restrictions exist and are defined at a national level - This option corresponds with the current state where the extent of distance separation would be based on cane availability per unit area determined as a national benchmark.

Distance restrictions exist and are defined at a regional level - The extent of distance separation would be based on cane availability per unit area determined as a regional benchmark after taking into consideration variations like cane concentration and yield.

Distance restrictions don’t exist - There would be no distance restrictions between mills and capacities can be set up irrespective of location of the current mills.

Since distance restriction between mills impacts the sustainability of the mill through availability of cane, relevant evaluation criteria that have been considered are:

- Social objectives - Mill viability

Distance restrictions exist with national level benchmarks

If distance restrictions between mills are maintained, then the extent of separation would define the minimum cane availability for all mills, and therefore would need to be adequate for supporting the minimum economically viable size for sugar mills. According to the Tuteja Committee, 5,000 TCD should be considered as the minimum viable size for India. The distance separation between mills would also reduce the pressure on the local ecosystem, both in terms of effluent management and the pressure on cropped land. The distance separation would also lead to lower incentives for leakage between command areas of adjoining mills. The entry barriers for new mills would be high as new mills would not be able to set up capacities in areas which have high concentration of mills.

For distance separation to be beneficial to the industry, it would need to be large enough to support the minimum viable size. However, if the separation is too large, then the addition of new mills will not be possible leading to lower competition within the sector. If the distance separation is kept same across the country, the regional variations in cane concentration and yields will not be accounted for and separation may be inadequate in specific areas.
Distance restrictions exist with regional level benchmarks

All the benefits and drawbacks of the previous scenario would continue to be applicable, but the regional level definition of the distance separation benchmark would enable the regional variations in cane concentration and yields to be factored in. Therefore, the benchmarks would be more relevant and would help in achieving the objective of mill sustainability in a better manner.

Distance restrictions do not exist

If distance restrictions do not exist, then the cane availability for all mills located close to each other may be at risk. Cane availability would be more dependent on the competition between nearby mills and their ability to pay and invest on long term relationships. The entry barriers for new mills will be lower since new capacities could be set up irrespective of presence of existing mills. The pressure on the local ecosystem could also be higher and there would be high incentive for leakages between command areas of the adjoining mills.

Source: KPMG Analysis

Based on relative benefits and drawbacks of the above scenarios, the distance separation between mills needs to continue with benchmarks defined at a regional level. This would enable the social objective of mill sustainability. However, the risks related to implementation will need to be mitigated. These risks and possible mitigations are:

Effectiveness of distance separation computations dependent on regional level data collation and assessment of economically viable size of mills: This risk can be mitigated through the creation of an independent national level regulator that can formulate and implement a policy for distance separation between the mills. The regulator will be responsible for defining the distance separation at a regional level in line with the policy.

Figure 115: Scenario evaluation for distance separation between mills

Source: KPMG Analysis
Both Mahajan and Tuteja committee suggested that the minimum distance between mills be increased to 25 km nationally. This was based on the fact that 5000 TCD was considered to be the minimum economically viable size for a sugar mill. To sustain a 5000 TCD mill, at least a 25 km separation was needed. While it is suggested that the distance separation be determined at a regional level, this should be done while keeping a national minimum benchmark of 25 km. In case of areas where this is inadequate, it may be increased by the regulator.

Previous studies including Mahajan Committee have also recommended the continuation of the command area. The Mahajan committee also recommended that the reallocation of command area be done only if surplus cane is available or yield is less than average yield in the given area. A detailed process has also been defined for reallocation. Both Mahajan and Tuteja Committee have recommended that the distance separation between mills be increased to 25 km at a national level. A comparative analysis of recommendations is given in Figure 116.

<table>
<thead>
<tr>
<th>Regulation</th>
<th>Mahajan Committee</th>
<th>Tuteja Committee</th>
<th>KPMG ISEC Study</th>
<th>Rationale for changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Command area</td>
<td>● Continue with government mandated command area</td>
<td>● Continue with government mandated command area</td>
<td>● Cane requirements for capacity expansion under implementation should be taken into account for defining command area</td>
<td>● Encourage mills to invest in farm productivity</td>
</tr>
<tr>
<td></td>
<td>● Cane requirements for capacity expansion under implementation should be taken into account for defining command area</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reallocation</td>
<td>● Reservation of cane area should be done on a permanent basis</td>
<td>● Reservation of cane area should be done on a long term basis</td>
<td></td>
<td>● Enable efficient usage of land for cane cultivation</td>
</tr>
<tr>
<td></td>
<td>● Reallocation to be done only if Surplus cane is available</td>
<td>● Periodic review to lead to reallocation if Surplus cane is available</td>
<td></td>
<td>● Account for regional variations</td>
</tr>
<tr>
<td></td>
<td>● Yield is less than average yield in the area</td>
<td>● Mill performance is below benchmarks</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>● Defined process to be followed for reallocation</td>
<td>● Defined process as per Mahajan Committee to be followed for reallocation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>● One time review of command area to be done in states where systematic allocation of cane area has not been done in the past</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distance restrictions</td>
<td>● Increase distance separation to 25 km</td>
<td>● Increase distance separation to 25 km</td>
<td>● Distance to be defined based on local conditions like cane concentration and average yields</td>
<td></td>
</tr>
</tbody>
</table>

Figure 116: Comparison with previous studies for reservation of cane area

Source: KPMG Analysis
8.7 Cane pricing

The instruments of regulation for cane pricing are the cane pricing mechanism and the payment schedule.

The cane pricing mechanism determines the cane price that the farmer receives. At present, the cane pricing models in India vary by state as discussed in the section on the Sector Snapshot. Some states follow the SMP model with farmers entitled to a share of mill realization at the end of the year. Some states follow the SAP model with a fixed price mandated by the state government, which is typically more than the cane price, as determined using the SMP model. In case of cooperatives, the mill profits are distributed as cane price amongst farmer members.

The payment schedule is a critical aspect of the cane pricing model, since the timing and relative quantum of payment determines the price signalling effectiveness of the cane price.

![Diagram of Regulatory levers]

**Figure 117: Scenario definition for cane pricing**

*Source: KPMG Analysis*
8.7.1 Cane pricing mechanism

The cane pricing mechanism is made up of different components that have a bearing on the final cane price. The regulatory modification options that have been considered reflect these components. At the first level, the options that have been considered are:

- **Free market pricing** - The cane price is mutually set between the farmer and the miller and is based on the demand and supply for cane
- **Formula based pricing** - The cane price is explicitly linked to specific parameters, typically, the output prices i.e. prices of sugar and by-products, quality of cane and mill efficiency
- **Mandated fixed pricing** - The cane price is mandated by the government and may or may not be based on specific parameters

The macroeconomic factors that have been considered for generation and evaluation of scenarios for cane pricing are:

- Demand and supply of cane
- Output prices

Since the cane pricing mechanism impacts the incentives for both farmers and millers to improve efficiencies and also determines the sustainability of farmers and mills, the evaluation criteria for cane pricing are:

- Efficient use of resources - Incentive for farm and mill efficiency
- Reduce cyclical and better management of downturn
- Level playing field
- Social objectives - Farmer sustainability and mill viability
- Ease of implementation

**Free market pricing**

In a free market pricing scenario, cane price would be driven by the demand and supply of cane. The availability of cane for a mill would be dependent on the mill’s ability to pay and the ability to invest in farmer relationships. The cane price would reflect market conditions and act as an effective price signal for farmers. The cane price would incentivize better cane quality.

The free price system would need negotiations between the mills and large number of farmers, thereby enabling the creation of intermediaries. Given the perishable nature of cane, the farmer’s bargaining power post harvesting would be very low. In case a single mill is present in a given area, the farmer may also face a monopsony risk. In years of surplus cane production, cane prices may be very low, causing a subsistence risk for farmers.
**Formula based pricing**

The formula based pricing could enable equitable distribution of profits and risk sharing between farmers and millers. Depending on the structure of the formula, it could also incentivize efficiencies at both the mill and farm side. It could act as an effective price signal for the farmers if a strong linkage is present with output prices.

The implementation of a formula based pricing system would be complex, since there would be a need to:

- Consolidate data across mills to determine share of farmers
- Estimate future prices in order to set an advance price that can be paid at the time of cane delivery
- Ensure transparency in the relevant measurements e.g. recovery measurements at individual mills
- Capture region specific variations in farm costs and productivity to make relevant adjustments for farmer’s share
- Achieve consensus between all the stakeholders

At times when the cane supply is greater than the demand, and the output prices are low, formula based cane price may even be lower than the cost of cane production. This would lead to subsistence risk for farmers.

**Fixed mandated price**

Fixed prices provide farmers with the security of assured prices. The entire risk of output prices is borne by the mills. In case output prices are high, mills would benefit and if output prices are low, mill sustainability may be at risk. Since fixed prices are not explicitly linked to cane quality, they incentivize only yields and not the cane quality. Fixed prices provide an inadequate price signal to farmers since they don’t reflect the market prices for mill outputs. This contributes to higher cyclical for the sector due to higher arrears being created. At times, the sector sustainability could be at risk, and government intervention may be needed. In case the mandated prices have wide variation across regions, it can distort the level playing field by providing non market driven incentives for cane cultivation in a particular region.
Based on the relative benefits and drawbacks of the above scenarios, the formula based pricing model enables efficient use of resources, reduces cyclicality and provides for a level playing field. However, sustenance risk for farmers need to be mitigated and issues related to implementation need to be addressed. These risks and possible mitigations are:

- Farmer sustenance may be at risk in case of low output prices - A minimum support price for cane may be mandated, that would be adequate to cover the cost of production and will enable continued cane production. In case the mandated support prices are higher than the final price as derived by the formula, the government would need to make up the difference. Government intervention may be needed to ensure that sugar prices can sustain the minimum cane support price. The minimum support price would be based only on the cost of production of cane. Earlier, support prices were also based on the returns from alternate crops, in order to incentivize cane cultivation. Given the current scenario, where domestic production is adequate to meet domestic consumption and imports can be used to address deficits, the need to include returns from alternative crops, as a parameter for support price determination is not valid any more.

- Implementation issues related to the data collection and price determination - This risk can be mitigated through the creation of an independent national level regulator that can develop the requisite formula based on negotiations between stakeholders. The regulator will be responsible for determining cane price based on data collated from mills.
If formula based pricing is to be adopted, its linkage with cane quality would need to be determined. The options for linkage with quality that have been considered are:

- Linked to individual farmer cane quality  cane price received by a particular farmer linked to sucrose content of cane delivered by that farmer
- Linked to average cane quality  cane price received by a particular farmer linked to an average sucrose content of cane delivered by all farmers
- Linked to a surrogate for average cane quality (mill recovery)  cane price received by a particular farmer linked to average recovery of the mill to which cane is delivered
- Not linked to quality of cane  cane price independent of the quality of cane delivered

The criteria for evaluation of linkage with cane quality are -

- Efficient use of resources  Incentive for farm and mill efficiency
- Ease of implementation

**Linked to quality of cane - individual farmer cane quality**

There would be a high incentive for farmers to increase cane quality through adoption of better varieties and advanced farm practices. This is because the benefits of increase in quality would accrue to individual farmers. However, the quality would need to be measured as the sucrose content of the delivered cane and would therefore not be impacted by the efficiencies / inefficiencies of the mill. Based on the industry interactions, such a system would be difficult to administer given the large number of farmers that typically deliver cane every year to a mill. Such a system would need advanced sucrose measurement technologies.

**Linked to quality of cane - average cane quality**

The quality would need to be measured as sucrose content of cane and the farmers would be paid based on the average sucrose content of the cane, which is delivered to the mill by all farmers. The quality measurement would not be impacted by the efficiencies/inefficiencies of the mill. There would be lower incentive for individual farmers to increase the cane quality as any benefits due to higher quality, would be shared with all other farmers as well. Based on the industry interactions, such a system would also need to adopt advanced sucrose measurement technologies.
Linked to surrogate for quality of cane - recovery

In this option, quality would need to be measured as the average recovery of the mill and the quality measurement would therefore be impacted by the efficiencies/inefficiencies of the mill and the impact would be shared with the farmers. The system, however, would be easy to administer since recovery is being measured at present as well. There would be lower incentive for individual farmers to increase the cane quality, since any benefits due to higher quality would be shared with all other farmers as well.

Not linked to quality of cane

The cane price is not linked to either sucrose content or recovery and hence there would be no incentive for farmers to invest in improving the quality of cane.

Based on the benefits and drawbacks of the options considered, the cane price should be linked to quality of cane for an individual farmer. Given the lack of technologies at the current time for enabling such a system, cane price can currently be linked to recovery and as and when the sucrose measurement techniques become available, they can be adopted.

If the recovery based pricing system is adopted, incentives would need to be provided to individual farmers for adoption of specific varieties. These can be in the form of variety based incentives that incentivize varieties with higher sucrose content or early and late varieties that would enable the crushing season to be extended. These incentives would not be part of the cane price but would be paid separately, post sowing.
Further, if the formula based pricing is to be adopted, its linkage with output prices would also need to be established. The options for linkage with output prices that have been considered are:

- Not linked to output prices
- Linked to sugar price only
- Linked to sugar and primary by-products price (molasses and surplus bagasse)
- Linked to sugar, primary and secondary by-products price (including ethanol and cogeneration, where applicable)

The criteria for evaluation of linkage with output prices are:

- Reduce cyclicality and better management of downturn
- Social objective of mill and farmer sustainability
- Ease of implementation

**Not linked to output prices**

The farmers would be completely insulated from the cyclicality in output prices. Mills would bear the entire price risk and if output prices are high, mills would get a higher return. On the other hand, if prices are low, mill sustainability may be at risk. The cane price would be an inadequate price signal for farmers, since it would not reflect the market conditions. In case of low sugar prices, arrears may occur and may increase the cyclicality for the sector. In certain years, the sustainability of the sector may be at risk and government intervention may be needed.

**Linked only to sugar price**

The sugar price risk would be shared between the mills and the farmers. The mills would have a high incentive for investing in byproduct capacities, since the incremental returns would not be shared with the farmers. The cane price would be an effective price signal for farmers and would reduce the incidence of arrears, thus leading to lower cyclicality. Farmers would not have any share from the realizations from by-products.

**Linked to sugar and primary by-products price**

Farmers would have a share in surplus bagasse and molasses realizations but mills would continue to have a high incentive for investment in byproduct value add capacities as the incremental revenues would not be shared with farmers. The cane price will be an effective price signal and the farmers will also benefit from the diversified revenue flow through sugar and primary by-products. In case of bagasse, only surplus bagasse, that can be sold after the mill’s captive requirements have been met, will be considered for the purpose of cane pricing. For molasses, the entire production of molasses would be considered.
**Linked to sugar, primary and secondary by-products price**

Farmers would have a share in ethanol and cogeneration realizations and mills would have a low incentive for investing in by-product value add capacities, since incremental revenues would now be shared with farmers. The cane price will be an effective price signal and the farmers will also benefit from the diversified revenue flow through sugar and secondary by-products. The implementation of this system may be difficult since the secondary by-products production may or may not be done in the sugar mill’s complex or under one legal entity.

![Figure 120: Scenario evaluation for cane pricing linkage to output prices](image)

Based on the benefits and drawbacks of the options considered, the cane price should be linked to sugar and primary by-products price (molasses and surplus bagasse). This would enable reduction in cyclicity, while addressing the social objectives of mill and farmer sustainability. It is also relatively easy to implement. In this case, the low output prices may create a sustenance risk for farmers. The mitigation for the same through mandated support prices has been discussed earlier as part of the discussion on cane price linkage to quality.

The minimum sugar price needed to sustain the support price of cane would need to be determined when the support prices are declared. This can be the basis for determining the lower end of the sustainable price band.
It needs to be mentioned that in the future, if ethanol is produced directly from cane, it becomes the primary product rather than a by-product. Thus in that case, the formula would need to be suitably modified to include ethanol price as a factor. The regulator would need to address this issue as and when the market for ethanol evolves.

The formula based pricing can be implemented as either a fixed or a variable pricing system. Both these options have been considered:

- **Fixed pricing** - The sharing ratios between farmers and millers are fixed and benefits of improvement in quality and efficiency are shared in the same ratio.
- **Variable pricing** - The sharing ratios are based on benchmarks for efficiency. If either the farmer or the miller performs better than the benchmarks, the incremental benefits are retained by them and not shared.

The criteria for evaluation are -

- **Efficient use of resources**  
  Incentivize mill and farm efficiency
- **Ease of implementation**

**Fixed formula**

Both farmers and millers have a lower incentive for improving the quality since the incremental benefits would need to be shared in the predetermined ratio. The system is easy to administer since there is no need for collation of data across mills and for benchmark setting. However, the consensus between stakeholders would need to be established for defining the sharing ratios.

**Variable formula**

Both farmers and millers have a higher incentive for improving the quality since the incremental benefits would not be shared. While the sharing ratio for output price would be fixed, the quality and efficiency ratios would be based on benchmarks. The cane price would depend on performance relative to the benchmark. The system is complex to administer since there is a need for collation of data across mills and for benchmark setting. Further, the consensus between stakeholders would need to be established for defining the sharing ratios as well as for setting benchmarks.
Efficient use of resources – Incentivize mill efficiency and cane quality

- High
- Medium
- Low

Figure 121: Scenario definition for cane pricing fixed vs. variable formula

Source: KPMG Analysis

Though fixed formula provides lower incentives for efficient use of resources, given the large number of mills and farmers in India, it would be more feasible to implement as compared to the variable formula.

An independent regulator would need to be created and would be responsible for building consensus amongst the stakeholders for sharing ratios determination. The sharing ratios could be based on the cost structure trends over the past few years, as recommended by the Mahajan committee or could be determined through negotiations.

The formula definition for the formula based pricing could be done either at a national or a regional level. Both these options have been considered:

- National formula - The formula sharing ratios are defined at the national level and are applicable across the country
- Regional pricing - The formula sharing ratios are defined at the regional level and account for regional variations

The criteria for evaluation are:

- Efficient use of resources - Incentivize mill and farm efficiency

National formula

Since the formula sharing ratios would not account for regional external variations like soil conditions, climate and infrastructure availability, farmers in regions with lower productivity would be disadvantaged. The farmers in regions with higher productivity would have a lower incentive for improving productivity.
Efficient use of resources – Incentivize mill efficiency, cane quality

Regional formula
Since regional variations would be considered, farmers would tend to have higher incentives for efficiency improvement. The sharing ratios would be relevant for each region.

High
Medium
Low

Regional formula
National formula

Figure 122: Scenario evaluation for cane pricing national vs. regional formula
Source: KPMG Analysis

Regional formula definition would provide higher incentives for efficiency improvements for farmers.

An independent regulator would need to be created and would be responsible for factoring in regional variations for sharing ratios.

8.7.2 Payment schedule
The key function of the cane pricing mechanism is the price signalling capability of the cane price. Price signals enable the farmer to form a view on the expected price and therefore decide on the acreage to be dedicated to cane. The magnitude and timing of the cane price payments are critical drivers for determining the effectiveness of the price signal. Figure 123 illustrates the impact of cane pricing on price signalling for farmers, assuming a two stage payment mechanism.
The payment made to the farmer just before the start of sowing for the next season has the maximum impact and is the most relevant price signal. The farmers receive two payments at this time. The first one is the advance payment, which the farmer receives for the cane delivered for the current season. The other is the final payment that the farmer receives for cane delivered in the previous season. The advance payment for the current season is the more relevant price signal, since it is based on the expected prices in the coming year, whereas the payment received for last year’s delivery has a distorting impact. This is because it is based on the past prices. An attempt, therefore, needs to be made to increase the relative value of the advance payment for the current season as compared to final payment for the last season. Even then, a one year lag is inevitable in the price signal since ideally, the cane acreage should be determined by expected prices in the season for which the cane is currently being sown.

**Figure 123: Illustration of price signaling capability of cane price**

*Source: KPMG Analysis*
The payment schedule for cane pricing can be structured as either a single stage or in multiple stage payments. Both these options have been considered:

- **One time payment** - The entire cane price is paid to the farmer within a stipulated time after cane delivery.
- **Multi-stage payment** - The cane payments are structured in multiple stages. An advance price is paid at the time of cane delivery and subsequent payments may be made during the season with the final instalment being paid immediately after the end of the season. The advance price would be based on expected sugar prices. The subsequent payments would be used to adjust for the difference between expected and actual sugar price and factor in the impact of relevant performance parameters.

Since the cane payment schedule impacts the price signal and is critical for the farmer to meet the working capital needs for the ensuing season, the criteria for evaluation are:

- Reduce cyclicality and better management of downturn
- Social objectives - Mill and farmer sustainability

**One time payment**

The farmers would be able to manage their working capital requirement better and there would be no distortion of the price signal due to subsequent payments.

The cane cost accounts for almost 70 percent of the ex mill price of sugar, making it difficult for the mills to pay the entire price at the beginning of the season. Also, since the cane price would be paid before the end of the season, it cannot be linked to actual sugar price and would have to be based on expected sugar price only. In case the actual sugar price is much lower, it may lead to margin pressures for mills and in extreme cases may also lead to arrears.

**Multi staged payments**

The payment made to farmers would be based on actual sugar price and the actual performance on the relevant parameters. It will be easier for mills to manage working capital requirements. The relevance of the price signal would be dependent on the relative magnitude of the first payment, as compared to subsequent payments. In case the actual output prices are so low that the final price for cane is lower than the first payment, then millers may face margin pressures.
Based on the benefits and drawbacks discussed above, multi-stage payments would support reducing cyclicality, while addressing the social objectives of farmer and mill sustainability. The risks that need to be mitigated are:

- If final price for cane as per the formula is lower than the advance price paid to farmers at the time of cane delivery: The difference between the price paid to farmers and the actual price would need to be borne by the government. In such a case, interventions would be needed through the independent regulator to ensure that the sugar price is adequate to meet the cane price. The interventions would be triggered by the sugar price dropping below the floor price of a defined sustainable price band.

The cane pricing system would therefore need to be a formula based system that is linked to sugar and primary by-products prices (molasses and surplus bagasse), mill recovery and takes into account regional variations in climate, soil conditions and infrastructure availability. The payments would be made in a multi-stage payment schedule with the final payment being made immediately after the end of the season. The magnitude of the first payment would need to be high, relative to subsequent payments. An independent regulator would be needed for the definition of the formula and for determining cane price on an annual basis. Support prices would be needed for protecting farmers against subsistence risk and would need to be based on cost of production of cane only. The independent regulator would need to intervene in case the sugar price drops to a level that cannot support the minimum support price for cane.
Previous studies have recommended the linkage between mill realization and the cane price. The Bhargava formula that was incorporated in the Sugarcane Control Order as clause 5A recommended that the mill profits be shared in equal proportions by farmers and millers after adjusting for SMP. The Mahajan Committee recommended the linkage with sugar prices rather than mill realization. It also recommended linkage with average recovery and formula definition at a regional level. The Tuteja Committee recommended continuation of the Bhargava formula.

Also, as per LMC, an international agency focusing on the sugar industry, the key regulatory imperatives for India would be:

- Create linkage between cane price and output prices
- Provide incentives for farmers and millers to improve performance
- Use cost data for establishing share of farmers
- Develop a cane price formula that accounts for regional variations

A comparative analysis of recommendations is given in Figure 125:

<table>
<thead>
<tr>
<th>Regulation</th>
<th>Bhargava Commission</th>
<th>Mahajan Committee</th>
<th>KPMG ISEC Study</th>
<th>Rationale for changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Support price</td>
<td>• Support price needed – based on cost of cane cultivation and returns from other crops • To be announced before start of sowing season</td>
<td>• C support price needed – based on cost of cane cultivation and returns from other crops • To be announced before start of sowing season</td>
<td>• Cane price to be linked to average recovery and sugar price • To be linked to sucrose content over long term • Share of farmers to be based on 10 year average cost of cane • Premium for varieties • Final price to be announced by end of season</td>
<td>• Since domestic production is now capable of meeting domestic consumption, the need to include returns from alternate crops as a criteria is not valid any more</td>
</tr>
<tr>
<td>Profit sharing and factors to be considered</td>
<td>• Mill profits over and above the support price to be shared equally between farmers and millers</td>
<td>• Cane price to be linked to average recovery and sugar price • To be linked to sucrose content over long term • Share of farmers to be based on 10 year average cost of cane • Premium for varieties • Final price to be announced by end of season</td>
<td>• Cane price to be linked to average recovery, sugar price and primary byproducts • To be linked to sucrose content over long term • Share of farmers to be determined by regulator • Premium for varieties • Final price to be announced by end of season</td>
<td>• Regulator to replace the Sugarcane Pricing Board – Role of regulator not restricted to cane pricing • Profit share for farmers in primary by-products</td>
</tr>
<tr>
<td>Regional variations</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Role of the government</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Figure 125: Comparison with previous studies for cane pricing*

*Source: KPMG Analysis*
Case study – Fixed formula pricing linked to sugar and molasses in Thailand

The Thai sugar industry is highly regulated, with guaranteed wholesale and retail sugar prices. The cane price is also regulated with guaranteed prices for farmers, who have a share of 70 percent in total revenues from domestic and international sugar sales and molasses. Bagasse is treated as the factories’ property. This is a fixed formula pricing model.

The cane price is linked to cane quality as measured by sucrose content of cane, where the quality and sweetness is measured by CCS (Commercial Cane Sugar). The CCS index prices sugarcane following a combination of weight (40 percent) and sugar content (60 percent) and its calculation involves measurements of Pol, Brix and Fiber in cane.

The system of fixed revenue shares, whereby millers receive 30 percent of revenues, blunts the incentive millers have to make investments to improve sucrose recovery rates at their factories. Since 70 percent of the benefit of such an investment accrues to the growers, this system effectively trebles the payback time on the investment. Instead, the main incentive for millers is to invest to lower their costs, rather than to improve factory performance. As a result, the cane quality in Thailand has stagnated over the years. While this is a drawback of the pricing system, as is the case in India, farmers may not be able to make investments in farm productivity on their own, and cane quality incentives would need to be shared between the farmers and millers.
The fixed division of proceeds also blunts the incentives for mills to invest in additional refining capacity. This is despite the fact that growers do not share in all the value added from the production of white sugar. Nevertheless, millers must still share part of the value added from the sale of white sugar with growers, which has the effect of reducing the returns from investment in new refining capacity. For India, where investments in value added capacities for ethanol and cogeneration are at a nascent stage, sharing of profits from value added realizations can hamper the growth of these capacities.

Thailand also has a quota system that enables it to regulate the domestic price and ensure mill viability as well as farmer viability through guaranteed cane and sugar prices. In case of price changes in the international market, the government intervenes to address the shortfall between the guaranteed cane price and the actual sugar realizations.

Source: ISO Cane and beet payment systems, LMC

Case study – Free market pricing in Australia with a variable formula linked to sugar for reference

At present, the cane pricing in Australia is completely deregulated, while the Queensland pricing formula is still used as a reference by mills and farmers. The formula was used for payment for cane in Queensland, Australia’s largest sugar producing region, prior to the deregulation in 2004. The pricing is structured according to a formula, which was originally designed to allocate net proceeds from sugar sales between millers and growers, so that profits were shared roughly according to the ratio of their assets. The recovery is defined in terms of ‘commercial cane sugar’ (CCS). The formula is based on the assumption that at base levels of efficiency, the proceeds should be split in the ratio of two-thirds to farmers and one-third to the miller for standard production. The formula is an illustration of a variable pricing formula and is defined as:

\[ P_c = P_s \times \left( \frac{90}{100} \right) \times \left( \frac{CCS-4}{100} \right) + 0.578 \]

\( P_c \) refers to cane price, \( P_s \) refers to sugar price and CCS refers to quality of cane. Under the formula, growers share income only from the resulting raw sugar stream of the mill. Other outputs such as molasses and bagasse are treated as the property of the mill. The growers’ share of revenue has varied between 62 to 67 percent over the past decade.
In practice, due to free market pricing, the actual cane price typically differs from the formula. Given the landholding structure and low number of farmers, a free market pricing system is viable in Australia, but may not be viable in India.

Source: ISO Cane and beet payment systems

Case study – Variable formula based pricing in Brazil linked to sugar and ethanol pricing

Brazil’s cane payment system is based on both the quality of cane and the prices of sugar, anhydrous ethanol and hydrous ethanol since 1998-99. The cane quality is assessed in terms of recoverable sugar, measured as kilograms of total reducing sugar (TRS) per MT of cane. This is calculated by measuring both juice Brix and juice Pol; then the weight of wet bagasse is also measured (inversely related to the amount of fiber in cane).

The price of TRS per kilogram is obtained from a formula, which takes into account the price of white sugar in the international and domestic markets, the price of VHP sugar in the international market, the price of hydrous and anhydrous ethanol in the domestic and international markets. These prices are provided by the Centro de Estudos Avancados em Economia Aplicada (CEPEA). One interesting element in the pricing of TRS to growers is that the formula takes into account how costly it is to make each of the products from the same amount of cane. On an average the grower’s revenue share amounts to 56 to 61 percent.

Brazil is the only country where farmers have a share in ethanol profits as well, due to its unique dynamic management of product mix, where the mills utilize cane to produce both sugar and ethanol directly. The Brazilian system is an illustration of variable pricing formula.

Since the growers in Brazil are paid on the basis of cane quality and there is no relative payment scheme, independent growers concentrate their deliveries in those months, when cane sucrose and juice purity are at their highest. The independent growers have tended to concentrate deliveries in the months of highest sucrose content and juice purity, and millers process their own cane on either side of the sucrose peak. In India, given the large number of farmers, the implementation of a relative quality based payment system would be difficult, but the variety specific incentives can be used to encourage adoption of high sucrose varieties.

Source: ISO Cane and beet payment systems
Case study – Provincial government mandated pricing in China

China used to follow fixed government mandated price for beet and cane. While cane and beet prices are no longer fixed by government, there is no formalised sharing of the revenues from the sugar production in China’s beet or cane sectors. Instead, the provincial governments in the sugar growing areas have established general frameworks for cane and beet prices within which millers have a degree of freedom in setting the prices. Thus, depending on the level of sugar prices, the governments may set guidance prices, minimum prices or not define a price at all. The approaches differ by region, and the nature of government intervention has evolved as the country has gradually moved towards a more market-oriented economy.

On an inter-seasonal basis, beet and cane prices are loosely correlated with the domestic price of sugar. This means that when beet and cane prices are set during pre-season negotiations, the processors, growers and the government representatives take into account the various market conditions. Significantly, the provincial governments have allowed the prices of beet and cane to fall as well as rise, reflecting changes in market conditions.

A recent development has been the establishment of a linking mechanism between cane and sugar prices during the season. Under this system, if the price of sugar increases above a certain threshold price, the price of cane will increase according to a sliding scale. However, the system falls short of full revenue sharing arrangement, since a decline in the price of sugar below a certain minimum level will not trigger a reduction in the cane price. This new system is, however, tacit acceptance of the merits of revenue sharing. China’s pricing model is an illustration of a system that varies by region and loosely links cane and sugar prices, with support mechanisms for farmers built in to minimize the risks.

Source: LMC

8.8 Monthly release mechanism

The instruments of regulation for monthly release mechanism are monthly releases given by the government to each mill that determine the quantity of sugar that has to be sold by the mill within the release period. At present, the releases are given on a monthly basis to mills across India. In the recent past, several mills have been using legal intervention to sell sugar over and above the release quantities in the free market. The release mechanism enables the government to influence prices in the domestic market by regulating supply, and is aimed at ensuring consistent availability of sugar through the year, at an equilibrium price.
The regulatory modification options that have been considered for monthly release mechanism are:

- **Monthly release mechanism exists** - This option corresponds to the current state where releases are issued by the government on a monthly basis. Mills can sell only the specified quantity of sugar during the period.

- **Monthly release mechanism does not exist** - Mills would have the freedom to sell any quantity of sugar in the free market. The mills decision to sell sugar would be determined by their view of current and future prices and the cost of holding inventory.

Since monthly release mechanism influences the domestic prices and restricts the ability of mills to manage the price risk, the evaluation criteria that have been considered are:

- Sugar price risk management
- Level playing field
- Social objectives - Consumer protection, farmer and mill sustainability

**Monthly release mechanism exists**

The release mechanism would enable the government to influence spot prices using supply regulation and would ensure consistent availability throughout the year. Mills would be unable to optimize their inventory and would also be restricted in their ability to manage price risk effectively, since they would not be able to control the sale quantity of sugar. Also, the mechanism distorts the level playing field, since new entrants are allocated a share of the market demand based on their relative production capacity. The release mechanism also protects inefficient mills by assuring them of a ready market for their production. In the recent past, some mills have been able to sell more sugar than specified by the release orders through legal intervention, further disadvantaging the mills that do follow the release orders.
**Monthly release mechanism does not exist**

Mills would be able to manage their inventories based on the view of current and future prices and the cost of holding inventory. Given the presence of a futures exchange for sugar, transparent future price indicators are already available for the industry, though their future effectiveness will depend on greater participation by the industry stakeholders. Mills would also be capable of managing their price risk, since they would control supply and inventory decisions. The availability and price for consumers would now be determined by the demand and supply of sugar. There would be a more level playing field that would lead to incentives for efficiency, removal of undue advantages for new entrants and better price discovery in the spot market, due to removal of supply distortions.

Removal of release mechanism would also lead to a risk of high prices for consumers and risk of low prices for mills and farmers, since the government intervention would be limited. The risk of manipulation of future prices on the commodity exchanges would also need to be addressed.

<table>
<thead>
<tr>
<th>Monthly release exists</th>
<th>Monthly release does not exist</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Sugar price risk management</td>
<td>Level playing competition</td>
</tr>
</tbody>
</table>

*Figure 128: Scenario evaluation for monthly release mechanism*

*Source: KPMG Analysis*

The removal of monthly release mechanism would enable better price risk management and help create a level playing field while addressing the social objectives of consumer protection and mill and farmer sustainability. The risks that would need to be mitigated are:

- **Risk of high prices for consumers** - This risk can be mitigated through government intervention using a strategic stock. The strategic stock would be a market based mechanism rather than a regulatory mechanism for influencing the price and availability. The risk could be further mitigated by an appropriate international trade tariff policy, which would enable the management of deficits and surplus in production, through imports and exports.
Risk of low prices for mills and farmers - As discussed above, the strategic stock and tariff policy could be used for reducing supply in the domestic market to maintain prices at a sustainable level.

Manipulation of future prices through the commodity exchanges - As discussed in the section on 'Business Roadmap', the commodity exchanges are currently using several checks and controls to ensure a fair market. With the increasing participation on the exchanges, the risk of price manipulation would reduce further. The government could also actively monitor the exchanges through the existing mechanism like the Forward Markets Commission (FMC) or through independent bodies.

The strategic stock would enable the government or an independent body to intervene as a market participant to maintain prices in a sustainable band. It can, therefore, be an effective replacement for the monthly release mechanism.

The annual cost of managing a strategic stock is estimated to be approximately INR 170 crores per lakh MT of sugar. The strategic stock would be augmented when sugar prices are low and would be depleted when sugar prices are high. The difference is procurement price and selling price will be able to cover the expense of managing the stock. An average increase in sugar prices by approximately INR 2.2 per kg over the average procurement price would be adequate to recover the estimated cost of managing the strategic stock. The strategic stock could, therefore, be a self sustaining mechanism.

For managing the strategic stock, a sustainable price needs to be defined. It is advisable that this band be notified along with the announcement of the cane price, in order to ensure that the cane price can be recovered from the sugar price, and arrears can be minimized. If the sugar price falls below the band, the strategic stock intervention would get initiated through sugar purchase, thus increasing the prices. If the sugar price rises above the band, the strategic stock intervention would lead to sugar release in the market, thus decreasing the prices.

The strategic stock would need to ensure that mills make adequate returns after accounting for cane price, taxes and cost of conversion. This would enable sustained growth for the sector and also lead to minimization of arrears. The strategic stock will also enable lower volatility in prices, thus strengthening the financial position of the sector.

Given the change in the consumer profile, as indicated by the consumer survey, and the need for re-evaluation of sugar to be a part of the Essential Commodities Act, definition of a sustainable price band will not adversely impact the consumer interests.
<table>
<thead>
<tr>
<th>Table - Cost of managing strategic stock</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average strategic stock held for a year</strong></td>
</tr>
<tr>
<td><strong>Cost of working capital (assumed)</strong></td>
</tr>
<tr>
<td><strong>Average holding time (assumed)</strong></td>
</tr>
<tr>
<td><strong>Average procurement price (assumed)</strong></td>
</tr>
<tr>
<td><strong>Cost of purchase</strong></td>
</tr>
<tr>
<td><strong>Interest cost of strategic stock</strong></td>
</tr>
<tr>
<td><strong>Storage cost (assumed)</strong></td>
</tr>
<tr>
<td><strong>Storage cost of strategic stock</strong></td>
</tr>
<tr>
<td><strong>Total cost of strategic stock</strong></td>
</tr>
<tr>
<td><strong>Average increase needed in price realization needed for break even over 12 months</strong></td>
</tr>
</tbody>
</table>

*Figure 129: Cost of managing strategic stock*

*Source: Industry sources, KPMG Analysis*

The strategic stock can be implemented in multiple ways. The key determinant would be the title ownership of the stock.

The operational management of the strategic stock in line with the defined price band could be done by an independent body, considering the large number of stakeholder groups that would be impacted. While the sustainable price band could be defined by the government and the industry, the independent body would be responsible for day to day operations. The independent body could be funded jointly or individually by the industry and the government. The funding could also be done through a Special Purpose Vehicle (SPV). Existing mechanisms, like the SDF, could be partially utilized for setting up the strategic stock and for sharing the losses, if any, due to its operations. The independent body could hold the title of the stock and its operational management would need to be done in a neutral and independent manner. Sector objectives would need to be fulfilled without preference being given to any individual stakeholder group.

Depending on the prices in the domestic and international markets, the independent body could procure or release sugar stocks in line with the defined policy. It could also be a central mechanism for exporting or importing sugar, in case of domestic surplus or deficit.
The strategic stock could also be implemented as a hybrid model. Instead of the government procuring stocks from the mills and storing in government storage facilities, the stock can be stored at the mills and released in line with the government directions using the existing distribution networks. The government would need to reimburse the storage cost to the mills. This would include interest, warehousing and insurance costs. If the government owns the stock, it would need to bear the cost of procurement. If the mills own the stock, then they would also own the profits or losses made by selling the strategic stock at specified times. If the mills own the stock, then they would be allowed to export sugar in case of viable international prices, since exports would not depress the domestic price.

International trade is of strategic importance for India, since it can enable management of surplus and deficits through exports and imports. The strategic stock could also be used for achieving this objective. In case of domestic surplus, the strategic stock could be used for procuring surplus sugar and exporting it, with the losses, if any being shared by the industry and the government. Similarly, in case of domestic deficit, the stock could procure sugar from international markets to increase domestic availability.

The strategic stock can effectively replace the monthly release mechanism and provide significant benefits for all stakeholders.

- The need for government intervention and control would be reduced and the industry would have the opportunity to become self-reliant.
- The interests of the farmers would be protected since the cane price will be recovered from the sugar price, thus minimizing arrears.
- Industry attractiveness would increase since margins would be protected due to the sustainable price band.
- The induced cyclicality would reduce leading to greater stability in earnings for both millers and farmers.

Previous studies like the Tuteja Committee recommended the removal of monthly release mechanism. The Mahajan Committee recommended that monthly releases be continued and the releases should be decided in consultation with the industry. It also recommended the use of buffer stock, export restrictions and monthly release mechanism to control the domestic prices in a sustainable band.

Also, as per LMC, an international agency focusing on the sugar industry, the key regulatory imperatives for India would be

- Establish a sustainable price band for sugar
- Use the futures market for establishing sugar price benchmarks
A comparative analysis of recommendations is given in Figure 130.

<table>
<thead>
<tr>
<th>Regulation</th>
<th>Mahajan Committee</th>
<th>Tuteja Committee</th>
<th>KPMG ISEC Study</th>
<th>Rationale for changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monthly releases</td>
<td>Monthly releases to be continued</td>
<td>Monthly release to be removed</td>
<td>Monthly release to be removed</td>
<td>Availability of future price discovery mechanisms like commodity exchanges</td>
</tr>
<tr>
<td></td>
<td>Allocation of releases to be done in consultation with the industry</td>
<td></td>
<td>Strategic stock to be used for market interventions to maintain the sugar price in a sustainable band</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Use of buffer stocks, export restrictions and monthly releases to control domestic prices</td>
<td></td>
<td></td>
<td>Use of court orders</td>
</tr>
</tbody>
</table>

*Figure 130: Comparison with previous studies for monthly release mechanism*

*Source: KPMG Analysis*

**Case study – Government owned buffer stock in China**

At present, China uses a system of state intervention in the form of guidance prices, as well as a system of state reserves at the national and provincial levels. These systems help to stabilize domestic sugar prices.

The release of the central government stocks was successfully used to control the sugar prices in the domestic market in 2004 and 2005. The government usually sells through auctions to address the domestic demand in case of spurt in domestic prices. To bolster the state reserves, the country typically imports Cuban sugar through preferential agreements.

The buffer stock system in China is self-sustaining and the cost of managing the system is recovered through the profits generated by the sale of sugar in times of high prices. The buffer stock model adopted by China is completely owned and managed by the government. In case of India, this model can be suitably modified to enable even greater efficiencies. The mills could partner with the government for either storage or ownership of the buffer stock.

*Source: ISO Outlook for China’s sugar economy*

**Case study – Other commodities like rice and wheat in India**

In India, there are a number of agro commodities which are part of the Essential Commodities Act. In addition, many of these commodities like rice and wheat are produced only during certain months, but are consumed throughout the year. Also, these agro commodities are produced only in certain states.
A salient feature of India’s cereals situation is that the production is highly concentrated in few states. The Food Ministry procures the food grains from the surplus states into a central pool and redistributes the same to all the states. The central pool of food grains has been created primarily to maintain a minimum buffer stock for meeting unforeseen exigencies. It also provides for food grains, which are required for Public Distribution System and other food grain based welfare programs of the government.

To procure the food grains, the ministry uses a Minimum Support Price (MSP). The Food Corporation of India (FCI) maintains the central pool and supplies food grains to the various states. Also, FCI intervenes when the producer prices fall below MSP, or in case of the regional shortages. Apart from FCI, which is the main agency for procurement and distribution, state government agencies also play a vital role in the distribution of these food grains.

For any of these commodities, there is no monthly release mechanism equivalent that is in use. The buffer stocks are used for market intervention to protect the consumer interests. The strategic stock suggested for sugar is similar to this model, though with necessary modifications that are specifically relevant for sugar.

Source: Department of food and public distribution, Government of India

Case study – Recent deregulation experience in India for monthly release mechanism

At various points of time in the past, the monthly release mechanism has been removed. In each of these cases, the mechanism was reintroduced within a short period.

In August 1978, the monthly release mechanism was removed. Due to huge stocks, mills started selling sugar under cut throat competition and prices crashed. As a result, the industry suffered heavy losses. To remedy the situation, the industry resumed a period of voluntary release mechanism in March 1979. By June 1979, the government resumed the monthly release mechanism.

Again, the government decided in February 2002 to dispense with the release mechanism by March 2003, after futures/forward trading in sugar was established. Fearing drastic fall in sugar prices following the removal of monthly release, a number of factories approached the courts in 2002 for release orders for sale of free sale sugar. Courts held that the government had no authority to enforce restrictions on the sale of free sale sugar and allowed the sale of sugar leading to fall in sugar prices. The sugar industry simultaneously urged the Government to continue with the release mechanism. Thus, the release mechanism was extended up to September, 2005, with another review scheduled for taking a decision.
The absence of a strong forward/futures exchange implied the absence of a future price discovery mechanism in the past. Consequently, the removal of the release mechanism led to a sudden increase in supply in the market, leading to low prices. The situation today is different and given the availability of a more robust futures market for sugar, the removal of monthly release mechanism can be considered. The implementation plan for regulatory modifications would need to ensure that the risk of low prices and its adverse impact on stakeholders is mitigated, to the extent possible.

Source: Tuteja Committee, Mahajan Committee

8.9 International trade

The instruments of regulation for international trade include tariff based restrictions like import duties and export subsidies as well as non-tariff restrictions like export bans. Tariff restrictions are not being considered here since they are WTO compliant and will continue to evolve based on the future direction of WTO discussions. The regulatory modification scenarios for non-tariff restrictions have been considered. Also, imports for sugar are already under OGL and are governed only by the import duties and the countervailing duty. Hence the import duties have not been considered for regulatory modification. In the past, India has been successfully able to address domestic shortages through raw sugar imports, which were refined by mills for sale in the domestic market. In the future, these can be considered if there are domestic supply shortages, due to production variations.

International trade restrictions enable the government to influence prices and availability in the domestic market through supply control.

Source: KPMG Analysis
The regulatory modification options that have been considered for the international trade are:

- **Non-tariff trade restrictions exist** - This option corresponds to the current state, where the quantitative restrictions on exports may be imposed in the form of export bans for specified periods.

- **Non-tariff trade restrictions do not exist** - The trade restrictions would be limited to WTO compliant tariffs and stakeholders would be free to export or import sugar based on domestic and world prices and the applicable tariffs.

The macroeconomic parameters that have been considered are:

- Domestic sugar prices driven by domestic demand and supply
- World sugar prices driven by global demand and supply

The trade restrictions influence India’s ability to participate and leverage global trade and also influence domestic prices. Hence, the evaluation criteria that have been considered are:

- Sugar price risk management
- Linkage with international trade
- Social objectives  Consumer protection, farmer and mill sustainability

**Non-tariff trade restrictions exist**

The government would be able to influence the domestic prices through supply control. Industry players would be unable to enter into long term export commitments, since export restrictions enforced by the government do not classify as force majeure under the international law. Therefore, if industry players are unable to deliver against export commitments due to export bans, they are liable for the losses incurred by the buyer. Mills would also be unable to leverage the international market for managing surplus sugar production that cannot be managed in the domestic market. India’s credibility as a trade participant would also be hurt leading to higher risk premiums, which are attached to sugar exports from India.

**Non-tariff trade restrictions do not exist**

India’s credibility as a global trading partner would be enhanced, enabling the industry to enter into long term commitments. Industry players would be able to leverage opportunities for exports for managing domestic surplus. However, the removal of non-tariff restrictions could lead to a price risk in domestic markets in case of attractive export opportunities that may reduce the domestic supplies leading to high prices. Given a stable tariff policy, the domestic prices would tend to move in tandem with the world prices and would be limited in the band of export parity price and import parity price.
Based on the benefits and drawbacks discussed above, the removal of non-tariff restrictions will enable sugar price risk management and enhance linkages with the international trade. This will be done along with addressing the social objectives of consumer protection and mill and farmer sustainability. The risks that would need to be mitigated are:

- High world prices and attractive export realizations may lead to high prices in the domestic market. Historically, domestic prices have been higher than the world prices for sugar. As discussed in the section ‘Business roadmap’, major sugar producers export at competitive world prices while maintaining high domestic prices. The risk of exports leading to small domestic supply is therefore low. The risk can be mitigated through the use of strategic stock for augmenting the domestic supply and by the import tariff policy.

- Low cost imports may lead to low domestic prices impacting the mill and farmer sustainability. The risk can be mitigated through modifications to import tariffs. India’s current import tariff of 60 percent is much lower than the WTO bound rate of 150 percent and therefore the risk of low cost imports is low. Given the social objectives of farmer and mill sustainability, India would need to maintain a high bound rate even in the future to ensure that subsidized sugar from other geographies does not hamper the sustainability of the Indian industry.
The Tuteja committee recommended that raw sugar imports be used for addressing domestic shortages and WTO compliant export incentives be used for boosting India’s exports. The Mahajan Committee recommended that India should strive for regular exports of atleast one million MT with a focus on neighboring countries. Further with key risks mitigated, as discussed in the section on ‘Business Roadmap’, accessibility to international markets would also tend to stabilize the critical domestic market. The regulator will have a key role to play in enabling timely exports and imports for maintaining stability in the domestic markets. This could be through changes in the tariff structure or through facilitating government intervention for supporting exports.

Also, as per LMC, an international agency focusing on the sugar industry, the key regulatory imperatives for India would be

- Tariff policy to be based on the price band system
- Quota system for exports to be explored.

A comparative analysis of recommendations is given in Figure 133.

<table>
<thead>
<tr>
<th>Regulation</th>
<th>Mahajan Committee</th>
<th>Tuteja Committee</th>
<th>KPMG ISEC Study</th>
<th>Rationale for changes</th>
</tr>
</thead>
</table>
| Trade restrictions  | • Imports to continue under OGL with a WTO compliant import duty and a countervailing duty  
|                     | • Regular exports of atleast one million tons                                      | • Domestic shortages to be addressed using raw sugar imports                     | • Domestic shortages to be addressed using sugar imports, preferably raw sugar imports | • Strategic benefits of international trade for India  
|                     | • Focus on neighboring countries that offer freight advantage                       | • Use of WTO compliant incentives for boosting exports                           | • Use of WTO compliant tariff restrictions for imports and exports                   | • Demonstrated ability to meet domestic shortages through raw sugar imports         |
|                     | • Use of imports to bridge the availability gaps                                   |                                                                                  | • Use of strategic stock to maintain the sugar price in a sustainable band in the domestic market |                                                                                  |
|                     | • Partial exemption from levy for exporting mills                                   |                                                                                  |                                                                                  |                                                                                  |

Figure 133: Comparison with previous studies for international trade

Source: KPMG Analysis
Case study – Quota system for exports in Thailand

In order to ensure segregation of domestic and export sugar, sales are controlled through a system of quotas. These are allocated on a mill-by-mill basis. This mechanism prevents the exportable surplus from entering the domestic market and depressing prices to export parity levels. The quotas are administered by the Office of the Cane and Sugar Board, a tripartite body comprising grower, miller and government representatives. India can also draw learnings from the Thailand experience of having an independent body managing the regulatory environment for the sugar industry.

Each mill may sell only a specified amount of sugar on the domestic market (quota A); the remainder of its output (quotas B and C) is exported.

- **Quota A** - Quota A is the Cane and Sugar Board’s policy instrument for ensuring that the domestic market is adequately supplied with sugar at stable prices. The domestic marketing of sugar is controlled via a system of weekly sales quotas, and the government fixes the domestic sugar prices. This ensures price transparency in the domestic market.

- **Quota B** - The purpose of quota B is to establish a representative price for all sugar exports, and is used to calculate industry revenue for the purpose of revenue sharing between millers and growers. As such, it is the basis for price transparency for export sugar.

- **Quota C** - This quota represents the balance of sugar output. This sugar must be exported, although millers are under no obligation to export this sugar in the same crop year. However, for the purpose of revenue sharing, it is assumed that quota C sugar is sold at the quota B price, during the marketing year in which it was produced.

The quota system enables Thailand to regulate the domestic price and ensure mill viability as well as farmer viability through the guaranteed prices. In case of price changes in the international market, the government intervenes to address the shortfall between the guaranteed price and the actual realizations.

Source: LMC
Case study – Free market international trade in Australia

Australia is a major sugar exporting country. Australia exports more than 70 percent of its total sugar production and hence it is heavily dependent on world trade. In addition to this, Australia does not have any trade restrictions. It does not have any import/export tariffs, or quota system for sugar production.

The mills in Australia can export any quantity of sugar at international prices. The cane price is linked to realizations from the export markets as well as the domestic market. They are also free to import sugar at international prices. Thus, the domestic sugar prices are always at import parity. Further, the domestic sugar prices as well as domestic sugar production are directly linked to the international sugar prices and trade, due to the free regulation regime in Australia.

Given the presence of large farmers and the low domestic consumption, the need for influencing domestic price in Australia is low. Consequently, absence of tariff policies does not have a major impact on the stakeholders, unlike in India.

Source: Industry sources, KPMG research

Case study – Use of variable duty structure in the Andean Pact

Prior to 1995, most countries in the Andean Pact (Bolivia, Colombia, Ecuador, Peru and Venezuela), employed simple ad valorem tariffs on sugar imports. The principal objective of introducing the Andean Pact was to stabilise domestic prices in light of significant fluctuations in world prices. Apart from the Andean Pact countries, the principle of variable duties is also employed by Argentina, Chile, Morocco, Tanzania, South Africa, Côte d’Ivoire and Senegal.

The implementation of a price band system has helped Colombia to stabilise its domestic price. In particular, the system has successfully insulated the domestic producers from the world market in times of very depressed prices, while offering little or no support when world sugar prices have been high.

In order to prevent prices from falling to export parity levels, Colombia operates a market clearing mechanism to ensure that the country’s exportable surplus does not enter the domestic market. For a country that is a net exporter, such a mechanism is essential for a price band system to work effectively.

The price band system is WTO compatible as long as the total value of a fixed tariff plus a variable tariff/duty stays within the bound rate agreed by a country.
Since 1995, sugar imports into the Andean Pact Community have been controlled via a system of both tariffs and variable duties. The basic import tariff stands at 20 percent, which is the basic rate applied to agricultural products. The band within which the system is designed to contain domestic prices is derived from a long run average of the world market prices. In this way, the system remains linked to the world market, but ensures that the short/medium term price volatility is not transmitted to the local market. The variable duty is equal to 120 percent of the difference between the floor, or ceiling price and the reference price. When the reference price rises above the ceiling price, the variable duty is used to offset the basic tariff, though the basic tariff cannot become negative.

Given India’s low reliance on imports, this may not be a relevant system for India due to high implementation complexity. In case of India, import tariffs can be fixed within the WTO bound rates and depending on the domestic surplus or deficit situation, the same can be varied.

8.10 Levy sugar

The instrument for levy sugar are the levy release orders issued by the government under which 10 percent of the mills production is procured by the government for distribution through the Public Distribution System (PDS). The levy sugar is procured at the levy price that is set by the government based on the cost of production and assuming a reasonable margin for the mills. The levy price has typically been lower than the free market price in the past.

Levy sugar enables the government to supply sugar through the PDS to Below Poverty Line (BPL) households and ensure the availability of sugar at affordable prices. In the analysis, it has been assumed that the current 10 percent levy quota is adequate to meet the consumption needs of the target segment. It is also assumed that the sugar would continue to be part of the PDS in the future as well.

The current subsidy for levy sugar is made up of various components and is shared between the mills and the government.

The difference between the levy price and the free market price is borne by the mills. The levy price is supposed to be fixed based on the actual cost of production. Though some states in India follow the SAP cane pricing model and cane price in these states is typically higher than the SMP, the levy price is fixed assuming cane price to be equal to SMP. Also, the levy price was last fixed in 2003, though the cost of sugar production has increased since then.
The difference between the levy price and the levy issue price (the price at which levy sugar is sold to consumers) is borne by the government. While levy issue price is marginally higher than the levy price, it does not completely cover the cost of administration, storage and distribution through PDS. This part of the subsidy has not been covered as part of this discussion.

Source: KPMG Analysis

The regulatory modification options that have been considered for levy sugar are:

- **Levy sugar continues to exist at 10 percent** - The government would continue to procure 10 percent of the mill’s production as levy sugar at the levy price.
- **Levy sugar does not exist** - The government procures levy sugar from the free market for distribution through PDS.

Since levy sugar is targeted at consumer protection and lower levy price impacts the mills and farmers, the evaluation criteria that have been considered are:

- Economic profit for the sector
- Social objectives - Consumer protection, farmer and mill sustainability

**Levy sugar continues to exist at 10 percent**
Mills would continue to share the subsidy for levy sugar with the government if the levy price is lower than the free market price.

**Levy sugar does not exist**
The government would need to procure sugar for distribution through the PDS from the free market. Mills would not share the subsidy, and hence the government subsidy cost would be higher.
The share of subsidy borne by the mills and farmers is estimated at between INR 240 crores and INR 1,000 crores per annum, depending on the prevailing free market price. If cane prices are linked to sugar prices with the farmers assumed to have a share of 70 percent, then the subsidy borne by farmers would approximately be between INR 160 crores and INR 700 crores per annum.

<table>
<thead>
<tr>
<th>Removal of levy sugar (Illustrative)</th>
<th>Current free market prices</th>
<th>2005-06 free market prices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual procurement of levy sugar</td>
<td>All India</td>
<td>1.96</td>
</tr>
<tr>
<td>Average free market price (ex mill)</td>
<td>WUP</td>
<td>14.00</td>
</tr>
<tr>
<td>Levy price</td>
<td>WUP</td>
<td>12.77</td>
</tr>
<tr>
<td>Total subsidy</td>
<td></td>
<td>240</td>
</tr>
<tr>
<td>Mill’s share of subsidy</td>
<td></td>
<td>72</td>
</tr>
<tr>
<td>(30 percent of total)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Farmer’s share of subsidy</td>
<td></td>
<td>168</td>
</tr>
<tr>
<td>(70 percent of total)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Figure 135: Subsidy cost for levy sugar**

*Source: Industry sources, KPMG Analysis*

<table>
<thead>
<tr>
<th>Economic profit</th>
<th>Social objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>![High]</td>
<td>![Medium]</td>
</tr>
<tr>
<td>![Low]</td>
<td></td>
</tr>
</tbody>
</table>

10% levy exists

- ![High]
- ![Medium]

Levy does not exist

- ![High]

**Figure 136: Scenario evaluation for levy sugar**

*Source: KPMG Analysis*

Based on the above discussion of benefits and drawbacks, removal of levy sugar would increase the economic profits of the sector, while addressing the social objectives of consumer protection and mill and farmer sustainability by shifting the subsidy cost from mills and farmers to the government.

While the Mahajan committee recommended a phased reduction of levy sugar to nil, the Tuteja committee recommended continuation of levy sugar at 10 percent. A comparative analysis of recommendations is given in Figure 137.
Figure 137: Comparison with previous studies for levy sugar
Source: KPMG Analysis

8.11 Summary

Complete absence of all regulations would not be the optimal scenario for the sugar industry and there is a need for developing an appropriate regulatory environment. This environment would need to enable the industry to leverage the transformation opportunities. Farmer interests would need to be protected and sector attractiveness would need to be enhanced. Protection for consumer interests would need to be aligned with the consumption pattern. There is a need to re-evaluate the inclusion of sugar in the Essential Commodity Act. The weightage of sugar in the WPI also needs to be re-assessed.

The regulatory modifications suggested are evolutionary in nature. Given the large number of stakeholders involved and the strategic importance of the sugar industry, these modifications would gradually enable the industry to align itself with the emerging opportunities. The summary of recommendations that have been made for regulatory modifications to enable the sector to successfully implement the business roadmap is:

<table>
<thead>
<tr>
<th>Regulation</th>
<th>Mahajan Committee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Levy sugar</td>
<td>• Levy sugar to be discontinued in a phased manner over two years</td>
</tr>
<tr>
<td></td>
<td>• If sugar is maintained as part of PDS, it should be procured through open tenders or at a fixed price from the mills, linked to the free market price</td>
</tr>
<tr>
<td></td>
<td>• Levy price to be based on actual cane price paid by the mills</td>
</tr>
<tr>
<td></td>
<td>• Levy price to be announced before the start of the season</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tuteja Committee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Levy sugar</td>
</tr>
<tr>
<td>• Levy sugar to be maintained at 10 percent</td>
</tr>
<tr>
<td>• If levy sugar is not lifted within three months of the levy release, it would revert to free sale sugar</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>KPMG ISEC Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Levy sugar to be discontinued and sugar for PDS to be procured through the free market</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rationale for changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subsidy to shift from farmers and mills to the government</td>
</tr>
</tbody>
</table>
Reservation of cane area
- Government mandated command area with reviews on exception basis
- Distance between mills to be determined based on regional variations with a national minimum benchmark of 25 km

Cane pricing
- Formula based pricing linked to prices of sugar and primary by-products (molasses and surplus bagasse) and to average recovery
- Prices to be determined using a fixed formula based on region specific variations
- Incentives to be given for varieties with high sucrose content and for early and late maturing varieties
- Minimum support prices to be announced to protect farmers from subsistence risk

Monthly release mechanism
- Monthly release mechanism to be removed
- Creation of a strategic stock which will be managed by an independent organization and will aim at maintaining the sugar price in a sustainable band

International trade
- Removal of non tariff trade restrictions

Levy sugar
- Levy sugar to be discontinued
- Sugar for PDS requirements to be sourced from the free market
Implementation Plan
The suggested regulatory modifications would need to be implemented in a manner that ensures a smooth transition, for all stakeholders. The implementation plan outlines the phased approach that needs to be adopted for successful implementation of the regulatory roadmap.

As the regulatory modifications are implemented, they may have short term impacts, which would adversely impact the stakeholders during the transition period. The stakeholders have varying abilities to manage these impacts and therefore certain pre requisites would need to be fulfilled before the regulatory modifications are implemented. The modifications themselves would need to be implemented in a phased manner to ensure that there is minimum disruption to the sector during the transition.

9.1 Additional risk

While the risks related to each individual regulatory modification have been assessed and mitigations discussed in the previous section, each regulation has been analysed independently of the others so far. If the interdependencies between the regulations are considered, then additional risks arise, that needs to be addressed.

![Diagram of Implementation Plan]

*Figure 138: Regulatory analysis approach*

*Source: KPMG Analysis*
Impact of mill recovery on cane price

If the cane price is linked to mill recovery, it may vary between nearby mills. At the same time, since the government will continue to allocate command area, farmers would be allowed to register only with the allocated mill. Farmers in the command area of a mill with low efficiency or inadequate investments in farm productivity, leading to low recovery may get a lower cane price than farmers in the command area of other nearby mills.

The issue of low recovery would be addressed by mills that are looking at long term growth, since consistently lower cane price offered due to low recovery may lead to farmers shifting to alternate crops or shifting to alternate buyers through reduction in supply of cane to the mill. Also, if the mill recovery is consistently lower than other mills, the regulator may need to reallocate cane area during the review to other efficient mills.

Impact of removal of monthly release

The removal of monthly release mechanism has led to sharp short term decline in prices in the past. If the monthly release is deregulated while the cane price and sugar price link has not been established, then low prices would adversely impact the ability of mills to pay the farmers leading to creation of arrears and the mill and farmer sustainability may be at risk.

To mitigate this risk, appropriate monthly release modification process would need to be followed. Adequate mitigating mechanisms including creation of a strategic stock and definition of a sustainable price band, which will link sugar and cane prices, will be key pre-requisites for removal of monthly release mechanism.

9.2 Macro economic environment

The effectiveness of implementation would depend on the macroeconomic environment prevailing at the time of implementation of the regulatory modifications. The favourable macroeconomic environment is discussed below.

Supply side

The modifications to cane pricing would need to be done before the start of sowing so that the farmers can form a view on expected prices and can dedicate acreage to cane accordingly. The modifications in reservation of cane area would not be impacted by the macroeconomic environment; since reviews would happen only over the long term and on an exception basis as per the pre-defined criteria.
Market side

The modifications to market side regulations may impact the sugar prices. Consequently, farmers, millers and consumers would all be impacted by the modifications.

From the farmer’s and miller’s point of view, the modifications should be done when there is a deficit of sugar in the domestic market and when the international prices are high. In this scenario, the domestic sugar prices would also be high. In case there is a drop in prices, due to flow of excess supply post changes to the regulation, farmers and mills would be more capable of sustaining the impact.

From the consumer’s point of view, the modifications should be done when there is surplus of sugar in the domestic market and when international prices are low. In this scenario, the domestic sugar prices would also be low and even if there is an increase in prices, due to reduction in supply post changes to the regulation, consumers would be more capable of sustaining the impact.

Given the consumption pattern for sugar, the market side regulatory modifications would need to be done at a time when farmer and miller risks can be minimized. This would imply sustainable high domestic sugar prices and preferably high international prices.

As has been observed in the past, monthly release removal has led to sharp increase in supply and drop in sugar prices. Consequently, the monthly release removal should be done towards the end of the sugar season, when stocks are at their lowest level relative to the rest of the year. Due to low stocks, the impact of drop in prices is expected to be limited and the markets would stabilize faster.

9.3 Pre requisites

The following pre requisites would need to be addressed before the regulatory modifications can be implemented:

- Consensus amongst central and key state governments Since changes in the sugar regulation, especially cane pricing, would affect both the central and state governments and could have an impact on large sections of the rural population; a consensus would need to be achieved before the modifications are implemented. These could be similar to the consensus that central and state governments recently arrived at during implementation of Value Added tax.
- Creation of an independent regulator The government would need to set up an independent regulator for the sugar industry. The role of the regulator would include:
- Assist the government in development of policy for command area reviews
- Periodically collate data and calculate benchmarks
- Reviews on exception basis of command area based on the benchmarks
- Assist the government in definition of pricing formula
- Determine the support price for cane that could be based on recommendations of expert agencies like CACP
- Estimation of sugar price for announcing expected price
- Estimation of advance cane price
- Determine final price for cane
- Review and modifications to the cane price formula in case of emergence of ethanol as the primary product instead of sugar or changes in cost structure that may impact the sharing ratios
- Estimation of regional variations that would need to be factored in to the distance separation between mills and the cane pricing formula
- Assist the government in definition of sustainable band for sugar prices
- Assist the government in development of strategic stock policy
- Assist the government in definition of tariff policy
  - Management of tariff restrictions for international trade
  - The government would also need to create a dispute resolution body with legal standing, which could play the role of arbitrator for the industry
  - The government would need to define the sustainable price band for sugar price with the assistance of the independent regulator
  - The government would need to create the strategic stock and define the strategic stock management policy. An independent body may need to be created for managing the strategic stock.
  - The government would need to define the tariff policy with the assistance of the independent regulator

Case study – Independent regulators in other industries in India

Several industries in India have transitioned from direct government intervention to regulatory interventions by independent regulators. These include the telecom, power and insurance industries. In each of these industries, the objective of instituting an independent regulator was to enable transparent, objective and informed policy formulation and implementation with the consensus of all stakeholders. In most cases, the regulatory authority is composed of an independent regulator and an arbitrator with legal standing for dispute resolution.
In case of telecom, the regulatory authorities include the Telecom Commission, Telecom Regulatory Authority of India (TRAI) and the Telecom Dispute Settlement & Appellate Tribunal (TDSAT).

The Telecom Commission was set up by the government with necessary executive, administrative and financial powers to deal with various aspects of telecommunications. The Telecom Commission is vested with the functions of policy formulation, licensing, wireless spectrum management, administrative monitoring of public sector units, research & development and standardisation and validation of equipment.

In April 2000, the government also established TDSAT, a separate authority from the TRAI, to handle disputes in the telecom sector.

TRAI was established as an independent statutory authority under the TRAI Act in 1997. The functions and responsibilities of TRAI include:

- Ensure technical compatibility and effective interconnection between different operators and service providers
- Revenue sharing arrangement between different service providers
- Protection of consumer interests
- Protection of national security interests
- Enforcement of quality service standards
- Ensuring compliance of licence conditions
- Fixation of tariffs for telecom service and ensuring price regulation
- Ensuring effective compliance of Universal Service Obligations (USOs)
- Resolution of disputes between service providers
- Rendering advice to the government in matters relating to the development of telecommunication technology and in general, the telecommunication industry
- Levy fees at such rates and in respect of such services as may be determined by regulations
- Seek information on all aspects of service providers’ activities
- Seek information, advice and inputs from any source it deems necessary
- Investigate on its own accord any matter which in its opinion constitutes public interest
- Inspect facilities, books and records of operators and service providers
In case of power, the regulatory environment is made up of central and state level regulators, since power is a concurrent subject. At the central level, the Central Electricity Regulatory Commission (CERC) regulates all matters pertaining to more than one state. The State Electricity Regulatory Commission (SERC) is responsible for regulating the sector within a particular state. In addition to this, there is an Appellate Tribunal, which is the higher court of appeal against the regulators, for dispute arbitration. The Central Electricity Authority (CEA) continues to be responsible for long term power planning and approvals for large projects.

In the insurance sector, the regulatory bodies include:

- **IRDA**, which is responsible for regulating, promoting and ensuring orderly growth of insurance and reinsurance businesses on the basis of relevant laws and regulations.
- **Tariff Advisory Committee**, which controls and regulates the rates, advantages, terms and conditions offered by insurers in the general insurance business.
- **Insurance Ombudsmen**, which is responsible for quick disposal of grievances of insured customers and to mitigate their problems involved in redress of those grievances (Restricted to contracts lesser than INR 2 million).
- **Insurance Association of India** includes the Life Insurance council that conducts examinations for individuals, who want to qualify themselves as insurance agents, and may also fix the limits for actual expenses for life insurance companies. The association also includes General Insurance Council, that may fix the limits for actual expenses for general insurance companies.
- As the sugar sector moves on the path to transformation, it can derive learnings from these sectors on the role of the independent regulator and its relevance for the sugar industry.

### 9.4 Timelines for regulatory modification

At present, India is facing a domestic sugar surplus and sugar prices are at an unsustainable low level. At the same time, international prices are also relatively low, and a global surplus is expected. It is assumed that the macroeconomic environment will continue to be similar at least for the next few months. The modifications will need to be initiated once the industry recovers from the current situation.
The implementation of the regulatory modifications would need to be done in a phased manner. As discussed above, market side regulatory modifications, especially those related to the monthly release mechanism, can have a significant impact on sugar prices and therefore needs to be done only after the strategic stock has been created and a sustainable price band defined.

To mitigate the impact on mills, the monthly release mechanism related modifications would need to be done during the latter half of the sugar season so that relatively low stocks are available and the impact of sugar price is relatively lower. Mills would also have a lower price risk as compared to the past experience of monthly release removal, if

- The strategic stock has been created and can be used for intervening to stabilize the sugar price
- The commodity exchange is used by the mills to protect themselves against price risk
- Greater access to international markets is available and therefore in the short term, the reduction in sugar prices is constrained by export parity prices

The supply side modifications should be implemented before the start of the sowing season. The suggested timelines for the regulatory modifications are detailed below:

**Figure 139: Implementation plan for regulatory roadmap**

*Source: KPMG Analysis*
As shown in Figure 139, the government can initiate the pre requisites for regulatory modifications at the earliest. Subsequently, once the sugar industry recovers, the other modifications can be initiated. The government would need to initiate the consensus development amongst centre and state governments and the key stakeholder groups. Once the consensus has been developed, an independent regulator and arbitrator would need to be set up, who can then assist in developing the policy for managing the strategic stock, policy for tariff policy and definition of sustainable price band. Earlier this year, the government has already created a buffer stock for sugar. This buffer stock can now be used as a continuing method of price intervention rather than a one time instrument in the form of a strategic stock.

Once the environment is conducive for regulatory modifications, the supply side modifications can be initiated. The government and the regulator would need to develop and communicate the detailed policies for supply side changes. Both the command area policy and the cane pricing policy would need to be covered.

Currently there are no non tariff restrictions on export since the export ban was lifted earlier this year and the same can be continued for the future. In addition levy sugar can be removed at this time. Since the strategic stock creation and sustainable price band definition would be done by this time, the monthly release mechanism can also be removed.

The supply side modifications would be done before the beginning of the sowing season and the support price for cane as well as the expected advance price can be announced so that farmers can dedicate acreage for cane accordingly. At the same time, benchmark definition for command area and cane pricing and definition of review cycle for command area can be completed.

By the beginning of the sugar season the regulator would need to announce the advance price for cane and the percentage payable within a stipulated time of delivery. This would also mark the beginning of the linkage between sugar and cane prices since the advance price would be based on the expected sugar price. However the first payment of preceding year would continue to influence the farmers’ sowing decisions. As a result, a complete impact of the linkage between cane and sugar prices would be observed with a year’s lag, i.e. in the subsequent sugar season.
The regulator would announce the final price for cane at the end of the sugar season.

The process would then enter the steady state phase where the policies defined by the government with the regulator and the stakeholders would be implemented on an ongoing basis by the regulator. These would include:

- Strategic stock management
- Tariff policy management
- Command area reviews
- Cane pricing
- Arbitration proceedings done by the arbitrator

Till the steady state is achieved the government could consider a mitigation approach whereby, the existing regulations are not completely removed, but kept in abeyance. Based on the experience of the stakeholders and their ability to manage the changes in the business environment, the government could temporarily invoke some of the existing regulations. This would enable the regulator to have an alternate option available in case the suggested mitigation mechanisms fail to stabilize the sector. Once the steady state is achieved, all the modifications can be made permanent in nature.

9.5 Current situation

Currently the sugar industry is passing through a phase of surplus production and there is an expected surplus of 7.8 million MT of sugar. This has been largely due to the remunerative sugar cane prices that are prevalent for the last two years as well as the inability of the sugar industry to export sugar when the world prices were viable last year. As a result, the sugar stocks in India are at an all time high which has depressed the domestic sugar prices making it difficult for the mills to pay the farmers. A host of factors, including a coincidental surplus in the international market, has intensified the seriousness of the situation.

While this report has discussed several long term proposals for the growth and development of the industry, there is a need for immediate measures to help keep the industry viable.

The government, in conjunction with the industry, can consider implementing the following steps immediately to help the industry and the farmers in the current situation.
Exports can be used to reduce the domestic stock to manageable levels. India is not competitive in white or raw sugar exports as seen earlier. Also, the markets for white plantation sugar have decreased, while the markets for refined 45 ICUMSA and raw sugar have increased. India has the capability to produce raw sugar, while its competitiveness is low. The government needs to extend full support to the industry for enabling exports through appropriate subsidies and policy measures. Hence the government can consider extending the WTO compliant support to reduce stocks so that sugar prices recover in the domestic market.

The government can create strategic stock which will help in reducing the stocks in the market. Reduced stocks will lead to price recovery and enable payment of cane prices to farmers. The industry will thus maintain its viability for subsequent years.

Reduced sugar availability does not imply reduced cane availability. The industry and the government can explore ways of processing sugarcane into products other than sugar. One major product which can be produced in this manner is ethanol. The government can also explore the feasibility of using surplus cane to produce ethanol directly from cane or through the B molasses route thus allowing sugar prices to recover to sustainable levels.

The government with the help of the industry can initiate the linkage between the cane and sugar prices at the earliest so that the current situation does not recur in the future. The central and state governments will have to work together to modify the sugarcane pricing mechanism to ensure the long term viability of the industry and the farmers.

Another feature of the industry currently is the subsidies / incentives allowed by certain state governments to the sugar mills located within these states. Such distortions interfere with free competitive forces. The impact of such distortions gets amplified in crisis situations. There is a need for the centre to evolve uniform policies for the industry across the country.

As elaborated above, a combination of policy measures revolving around encouragement of raw sugar exports, diversion of cane for B molasses, direct production of ethanol from cane, linkage of sugar and cane prices and removal of regional distortions are necessary to address such excess supply situations.
The Indian government’s policies would need to support the sugar industry, considering its massive impact on the agro economy and associated social objectives encompassing large masses.

9.6 Implementation risk assessment

Both central government as well as the state government regulate and legislate cane pricing, sometimes causing avoidable aberrations through conflicting laws. A consensus between central and state governments on cane pricing is therefore an essential prerequisite for successful implementation of the roadmap.

In the year 2000, a five member division bench of the Supreme Court (3:2) upheld the validity of the power of the state govt to fix the price of sugarcane, notwithstanding the regulatory framework of the central government in this regard. In contrast to this judgement, an earlier five bench unanimous judgement of the Supreme Court in 1956 had held that the state governments do not have the power to fix cane prices.

Sugarcane is covered under the Essential Commodities Act due to its perishable nature and the need for regulation on cane supply and pricing. Given the large number of farmers with small landholdings involved in farming cane, sugarcane needs to be regulated. Cane is also increasingly being viewed as a strategic crop due to the emergence of ethanol and cogeneration. Since cane is produced primarily in nine states but cane based products are consumed across the country, it needs to be regulated in a unified manner. Moreover, for a sustainable price band to be effective across the country, it is necessary that can pricing be done consistently across states. The independent regulator could play this role in the future.

In case the cane pricing modifications are not implemented, the policy imperatives that may get impacted are:

- **Level playing field** - Different models of cane pricing across states would lead to distortions in incentives for cane cultivation and sugar production across regions. New investments needed for addressing the transformation opportunities may therefore, be concentrated in specific regions leading to inequitable growth across the country.

---

87 Ch. Tikaramji & others vs. state of Uttar Pradesh & others, 1956
- **Efficient use of resources** - Cane pricing directly impacts the incentives mills and farmers have for investing in farm and mill productivity for better yields, quality and efficiency. Non-implementation of the suggested modifications will adversely impact the future improvements in yields, recovery and mill efficiency. The incentives for mills to invest in farm productivity would be reduced and the incentives for farmers to adopt better varieties and farm practices will also be lower.

- **Reduce cyclicality and ensure better management of downturns** - The cane pricing model impacts the levels of arrears that are created, and thus is a determinant of the level of induced cyclicality. Non-implementation of the regulatory modifications may lead to sustained high levels of induced cyclicality with an adverse impact on all stakeholders.

- **Social objectives** - The sharing of profits between mills and farmers impacts the sustainability of both farmers and mills. If the modifications are not implemented, this sustainability may continue to be at risk and will also have an impact on contribution of the industry to rural development.

The resultant impact on the transformation opportunities would be on several dimensions including reduced attractiveness for investments, lower ability of the sector to address food and energy security objectives and lower competitiveness in international markets.

- **Cyclicality management** - If high levels of arrears continue to be a feature of the sector, they will cause high induced cyclicality and distort the price signal for farmers. The ability of the sector to manage this cyclicality will continue to be restricted. The benefits of lower cyclicality for farmers and mills i.e. sustained revenue streams, no need for government support and greater financial strength, may not be realized in case the regulatory modifications are not implemented.

- **International trade** - Given that India's farm costs are high as compared to competing geographies, the cane pricing model will be critical in enhancing India's competitiveness. India's competitiveness for exports would continue to be low, if India's cost of production continues to be high due to the cane pricing model.
- **Productivity improvement** - Projected improvements of 10 percent in yields and 50 basis points in recovery by 2017 would need investments in research and development for seed varieties, farm practices and infrastructure. Lower attractiveness of the sector would lead to lower investments. Also, if the cane pricing does not incentivize adoption of new varieties and farm practices by farmers, these improvements would not be feasible. Consequently, additional sugar production would be based on greater acreage under cane.

- **By-products** - Large investments are needed for realizing the complete potential of by-products by 2017. Lower attractiveness of the sector would lead to lower investments. Unless the sustainability of mills can be improved through a viable cane pricing model, these investments may not be possible.

- **Domestic demand** - In order to meet domestic demand, the sector would need new investments in farm productivity and in milling capacities. Lack of a sustainable cane pricing model, with high levels of induced cyclicality would reduce the attractiveness of the sector for new investments. In order to meet the future expected demand of 28.5 million MT by 2017, Government support may therefore be needed to bridge the availability gap and the sector will not be able to achieve self sufficiency.

9.7 Mitigation approach

In order to mitigate the risk of non implementation of cane pricing modifications, the central government could consider making suitable modifications to the Essential Commodities Act. This would enable it to not only define the minimum price, but also a fair price for farmers, as determined by the Mahajan formula with suitable modifications suggested by this study, which would apply across the country.

If a consensus is not reached between the central and state governments and suitable modifications to the Essential Commodities Act are not feasible, then the adverse impact can be partially addressed through additional mitigation steps discussed below.

- **Introduction of variety based incentives** - While different cane pricing models may continue, all of these can introduce variety based incentives for farmers. These would encourage adoption of better seed varieties, leading to greater farm productivity.
- **Greater collaboration between industry and government for research and development** - If the ability of mills to invest in research and development is reduced, the government would need to address the same by increasing its share of investments. Industry players would need to engage closely with the research institutes for developing the research agenda.

- **Specific incentives for by-products** - Greater revenues from by-products can partially enable the sector to deal with cyclicality. The government would need to provide financial incentives for investments in byproduct capacities, while developing a policy environment that stimulates the demand for ethanol.

- **Timely government intervention for arrears** - In case arrears are caused due to lack of alignment between cane and sugar price, the government would need to intervene in a timely manner to ensure that arrears do not rise to unsustainable levels leading to drastic variation in production.

- **Intervention through strategic stock** - If the strategic stock is implemented, the government/regulator could use the stock to ensure that sugar prices stay at a level that sustains the cane price. This would lead to low arrears and help mitigate the adverse impact of cane pricing.
Way Forward

The business and regulatory roadmaps outlined in this report have the potential to transform the sector and move towards its stated vision. It needs to be recognized though, that globally, the sugar sector is fast evolving and the impact of some of these emerging trends may require re-evaluating the future direction of the sector.

Going forward, the changes in the global and domestic sugar industry may necessitate that the sector vision and roadmap be realigned with changing business dynamics. Some trends that may have a significant impact in the future are:

- Future growth in Brazil - Brazil’s growth would have a significant impact on global sugar supply and trade.
- Future WTO regulations - Future direction of WTO will impact tariff regimes worldwide and influence the trade dynamics globally.
- Ethanol - Future demand of ethanol will impact global and domestic sugar markets and further strengthen the linkage between the sugar and energy sectors. Success of emerging technologies including cellulosic ethanol and alternate sources like sweet sorghum can impact the linkage between ethanol and sugar markets. A key factor influencing growth of bio-fuels in general will be the emerging food vs. fuel debate globally.
- Impact of biotechnology - Advanced research programmes are currently in progress around the world for developing cane varieties using biotechnology. The potential for productivity improvement is immense and its realization will depend on viable commercial development of these technologies and their adoption. For tropical countries, sugarcane has emerged as a strategic crop due to its ability to address both food and energy security concerns. Biotechnology could help address the negative concerns of cane cultivation through breakthrough technologies and agronomical practices and thus enable greater growth of cane.
- Cane quality measurement system – Success of development of cane quality measurement systems, which could be used for large number of mills and farmers in a cost effective manner will influence cane pricing regulations in India and globally.
- Alternate sweeteners – Adoption of alternate sweeteners in India both for household and industrial consumption could increase the substitution risk for sugar.
- Contract farming – The future success of contract farming in India can redefine the farmer miller relationship for cane cultivation.
### Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AP</td>
<td>Andhra Pradesh</td>
</tr>
<tr>
<td>ARPU</td>
<td>Average Revenue</td>
</tr>
<tr>
<td>AUD</td>
<td>Australian Dollar</td>
</tr>
<tr>
<td>CACP</td>
<td>Commission for Agricultural Costs and Prices</td>
</tr>
<tr>
<td>CAGR</td>
<td>Cumulative Average Growth Rate</td>
</tr>
<tr>
<td>CCS</td>
<td>Commercial Cane Sugar</td>
</tr>
<tr>
<td>CDM</td>
<td>Clean Development Mechanism</td>
</tr>
<tr>
<td>CIE</td>
<td>Centre for International Economics</td>
</tr>
<tr>
<td>Cogen</td>
<td>Cogeneration</td>
</tr>
<tr>
<td>DAP</td>
<td>Di-ammonium phosphate fertiliser</td>
</tr>
<tr>
<td>E10</td>
<td>Ethanol 10 percent blending programme</td>
</tr>
<tr>
<td>E5</td>
<td>Ethanol 5 percent blending programme</td>
</tr>
<tr>
<td>EBITA</td>
<td>Earnings before deduction of interest, tax and amortization expenses</td>
</tr>
<tr>
<td>EU</td>
<td>European Union</td>
</tr>
<tr>
<td>FAPRI</td>
<td>Food and Agriculture Policy Research Institute, Iowa, U.S.A</td>
</tr>
<tr>
<td>FCI</td>
<td>Food Corporation of India</td>
</tr>
<tr>
<td>FDI</td>
<td>Foreign Direct Investment</td>
</tr>
<tr>
<td>FOB</td>
<td>Free on Board</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>GOI</td>
<td>Government of India</td>
</tr>
<tr>
<td>GW</td>
<td>GigaWatt</td>
</tr>
<tr>
<td>HA</td>
<td>Hectare</td>
</tr>
<tr>
<td>IC</td>
<td>Investment Capital</td>
</tr>
<tr>
<td>ICUMSA</td>
<td>International Commission for Uniform Methods of Sugar Analysis</td>
</tr>
<tr>
<td>ILD</td>
<td>International Long Distance</td>
</tr>
<tr>
<td>IRDA</td>
<td>Insurance Regulatory and Development Authority</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Full Form</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------</td>
</tr>
<tr>
<td>ISMA</td>
<td>Indian Sugar Mills Association</td>
</tr>
<tr>
<td>ISO</td>
<td>International Sugar Organization</td>
</tr>
<tr>
<td>KG</td>
<td>Kilogram</td>
</tr>
<tr>
<td>KLPD</td>
<td>Kilo Litres Per Day</td>
</tr>
<tr>
<td>LDP</td>
<td>London Daily Price</td>
</tr>
<tr>
<td>MNES</td>
<td>Ministry of Non-conventional Energy Sources</td>
</tr>
<tr>
<td>MSP</td>
<td>Minimum Support Price</td>
</tr>
<tr>
<td>MT</td>
<td>MetricTon</td>
</tr>
<tr>
<td>MW</td>
<td>MegaWatt</td>
</tr>
<tr>
<td>NCDEX</td>
<td>National Commodity &amp; Derivatives Exchange Limited</td>
</tr>
<tr>
<td>NFCSF</td>
<td>National Federation of Cooperative Sugar Factories</td>
</tr>
<tr>
<td>NLD</td>
<td>National Long Distance telecom</td>
</tr>
<tr>
<td>NSSO</td>
<td>National Sample Survey Organisation</td>
</tr>
<tr>
<td>NYBOT</td>
<td>New York Board of Trade</td>
</tr>
<tr>
<td>OGL</td>
<td>Open General Licence</td>
</tr>
<tr>
<td>PDS</td>
<td>Public Distribution System</td>
</tr>
<tr>
<td>PSU</td>
<td>Public Sector Unit</td>
</tr>
<tr>
<td>R&amp;D</td>
<td>Research &amp; Development</td>
</tr>
<tr>
<td>ROCE</td>
<td>Return on capital employed</td>
</tr>
<tr>
<td>ROIC</td>
<td>Return on invested capital</td>
</tr>
<tr>
<td>RPS</td>
<td>Retention Pricing Scheme in fertilizer</td>
</tr>
<tr>
<td>INR</td>
<td>Indian Rupees</td>
</tr>
<tr>
<td>SAARC</td>
<td>South Asian Association of Regional Cooperation</td>
</tr>
<tr>
<td>SAP</td>
<td>State Advised Price</td>
</tr>
<tr>
<td>SBI</td>
<td>Sugarcane Breeding Institute, Coimbatore</td>
</tr>
<tr>
<td>SDF</td>
<td>Sugar Development Fund</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------</td>
</tr>
<tr>
<td>SMP</td>
<td>Statutory Minimum Price</td>
</tr>
<tr>
<td>TCD</td>
<td>Tons of cane crushed per day</td>
</tr>
<tr>
<td>TCSC</td>
<td>Thai Cane and Sugar Corporation</td>
</tr>
<tr>
<td>TRAI</td>
<td>Telecom Regulatory Authority of India</td>
</tr>
<tr>
<td>TRS</td>
<td>Total Reducing Sugar</td>
</tr>
<tr>
<td>TTM</td>
<td>Trailing twelve months</td>
</tr>
<tr>
<td>UAE</td>
<td>United Arab Emirates</td>
</tr>
<tr>
<td>UP</td>
<td>Uttar Pradesh</td>
</tr>
<tr>
<td>USA</td>
<td>United States of America</td>
</tr>
<tr>
<td>USD</td>
<td>United States Dollar</td>
</tr>
<tr>
<td>USO</td>
<td>Universal Service Obligation</td>
</tr>
<tr>
<td>VaR</td>
<td>Value at Risk</td>
</tr>
<tr>
<td>WACC</td>
<td>Weighted Average Cost of Capital</td>
</tr>
<tr>
<td>WPI</td>
<td>Wholesale Price Index</td>
</tr>
<tr>
<td>WTO</td>
<td>World Trade Organization</td>
</tr>
</tbody>
</table>
References

A C Nielsen survey on sugar consumption in India, March 2007
Bloomberg (www.bloomberg.com)
Business world, Marketing white book 2006
CLSA Indian agribusiness sector outlook, May 2006
Cris Infac Sugar annual review, November 2006
Economic survey 2006-07, Government of India
F. O. Licht world ethanol markets outlook to 2012
F. O. Licht world sugar yearbook, 2007
FAPRI commodities database (www.fapri.org)
ICRA sugar sector analysis, July 2006
ISMA Indian sugar year book, 2005-06
ISO MECAS(06)04 Cane and Beet Payment Systems, April 2006
ISO MECAS(06)05 Outlook for China’s Sugar Economy and import prospects, April 2006
ISO Sugar yearbook 2005
LMC Case studies and views on Indian sugar industry, 2007
Madras school of economics study on the relevance of the Wholesale Price Index as a measure of inflation in India 2007
Report of the High Powered Committee for the sugar industry - Mahajan committee report on sugar industry, 1998
Ministry of Agriculture, Government of India
Ministry of Consumer Affairs & Public Distribution, Government of India
NCDEX (www.ncdex.com)
Planning commission (http://planningcommission.nic.in)

Prowess


Reserve Bank of India (www.rbi.org.in)

SBI CAPS report on sugar sector, August 2006

Sugar Breeding Institute, Coimbatore (http://sugarcane-breeding.tn.nic.in)

The Centre for International Economics (www.thecie.com.au)

The political economy of Indian sugar – State intervention and structural change, Sanjaya Baru

Tuteja Committee report on revitalisation of the Indian sugar industry, 2004

US Department of energy, Energy information administration (http://www.eia.doe.gov)
KPMG in India

Mumbai
KPMG House, Kamala Mills Compound
448, Senapati Bapat Marg,
Lower Parel, Mumbai 400 013
Telephone: +91 22 39896000
Fax: +91 22 39836000

Delhi
4B, DLF Corporate Park
DLF City, Phase III
Gurgaon 122 002
Telephone: +91 124 3074000
Fax: +91 124 2549101

Bangalore
Maruthi Info-Tech Centre
11-12/1, Inner Ring Road
Koramangala, Bangalore – 560 071
Phone: +91 80 39806000
Fax: +91 80 39806999

Chennai
Wescare Towers
16 Gennelagh Road, Teynampet
Chennai 600 018
Telephone: +91 44 39844900
Fax: +91 44 39844905

Hyderabad
II Floor, Merchant Towers
Road No. 4, Banjara Hills
Hyderabad 500 034
Telephone: +91 40 39847000
Fax: +91 40 23350070

Kolkata
Park Plaza, Block F, Floor 6
71 Park Street
Kolkata 700 016
Telephone: +91 33 39823210
Fax: +91 33 39823222

Pune
703, Godrej Castlemaine
Bund Garden
Pune - 411 001
Telephone: +91 20 30585764
Fax: +91 20 30585775

Key Contacts

Arvind Mahajan
Executive Director
Business Advisory Services
Tel.: +91 22 3983 5526
Fax: +91 22 3983 6000
e-mail: arvindmahajan@kpmg.com

The information contained here is of a general nature and is not intended to address the circumstances of any particular individual or entity. Although we endeavor to provide accurate and timely information, there can be no guarantee that such information is accurate as of the date it is received or that it will continue to be accurate in the future. No one should act on such information without appropriate professional advice after a thorough examination of the particular situation.