



The Advantages of Adaptation: Big Opportunities for Small Business

Climate Change Adaptation Innovation
Opportunities for Indian Micro-Small &
Medium Sized Business (MSMEs)



Published by

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, New Delhi

Project on "Strengthening Climate Innovations of the Indian Private Sector", within the framework of Indo-German Technical Cooperation supported by the German Federal Ministry for Economic Cooperation and Development (BMZ)

**Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH**

Private Sector Development
2nd floor, B-5/1, Safdarjung Enclave,
New Delhi 110 029
T: +911126715964/5968
F: +911126715967
E: manfred.haebig@giz.de
www.giz.de

Responsible

Manfred Haebig, Director Private Sector Development

Editorial

Ernst and Young

Photos by

Katherine Miles, Ernst and Young

Design

Aman Khanna, Infonauts
www.infonauts.in

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Foreword



Manfred Haebig
GIZ Private Sector Development

The world has become increasingly aware of the need to reduce greenhouse gas emissions. Businesses globally have started to take advantage of new business opportunities by dealing innovatively with the challenges related to climate change and changes in the framework conditions introduced as policy responses to them. Dealing innovatively with the direct and indirect impacts of climate change can make businesses “climate proof”, minimizing climate risks, while enabling them to gain competitive edge through innovations. Realising the emerging business opportunities, many businesses in India, including micro, small and medium enterprises, have started to introduce mitigation measures, for example to improve energy efficiency.

However, the private sector at large has not yet recognized how product, process, business model and organizational innovation may reduce risks arising from climate change impacts or enable businesses to make use of new opportunities. Changing framework conditions resulting from climate change or from political responses represent both, an opportunity and a risk, for the competitiveness of businesses and therefore must be managed accordingly.

Under the framework of Indo-German bilateral development cooperation the German Federal Ministry of Economic Cooperation and Development (BMZ) through its implementing agencies Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH and Kreditanstalt für Wiederaufbau (KfW) jointly with and Small Industries Development Bank of India (SIDBI) are strengthening the role of Indian MSME to contribute to climate change mitigation and adaptation. As a development bank, SIDBI is empowering the entire value chain of Indian micro, small and medium enterprises with access to financial and non-financial services. By promoting investment in green or energy efficient technologies, it is furthering the responsive climate change agenda.

We in GIZ are convinced that the private sector is essential in the development of “climate solutions”: Industry is the second-largest consumer

of energy, with micro, small and medium enterprises (MSMEs) accounting for 80% of industrial enterprises. The private sector, including the MSMEs, can therefore play a significant role in reducing greenhouse gas emissions by applying sustainable, resource and energy-efficient production processes. At the same time, businesses can become “green innovators”.

This Discussion paper is one of the results of the joint efforts of GIZ and SIDBI to strengthen the growth and responsible competitiveness of MSME. With illustrative case studies, this paper aims to bring mitigation and adaptation to climate change to the Indian business mainstream by increasing awareness, encouraging constructive dialogue on business action that mitigates the risks and exploits the opportunities of climate change. It is an important contribution to strengthening responsible competitiveness and implementing the National Voluntary Guidelines on Social, Environmental and Economic Responsibilities of Business (NVGs) released in 2011 by the Ministry of Corporate Affairs, specifically the environmental responsibilities stressed in the NVGs. At the same time it encourages business action for implementing the National Action Plan of Climate Change.

The Discussion Paper is part of a series, aiming to raise awareness and facilitate exchange and debate among MSME, their associations and the wider business community on

- business and innovation opportunities related to climate change
- business risks related to climate change

Businesses can get practical support from an E-Learning Programme on www.climate-expert.in, which provides simple tools helping businesses mitigate the risks and formulate a risk management strategy.

We would like to encourage a discussion on how Indian businesses can contribute towards “Greening” the Indian Economy. We are confident that Indian MSMEs have inherent vibrancy and resilience to come up to expectations of globalised world and adopt climate and environment friendly measures.

We hope this Paper contributes to a constructive debate and discourse!



Manfred Haebig, GIZ Private Sector Development





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→ Executive Summary

Climate change has emerged as a force which is changing the way business is done. The new realities of increased global temperatures, unpredictable and extreme weather conditions, shortage of natural resources, and a resultant change in demand and supply patterns are impacting businesses significantly. While these impacts pose risks, they also present new business opportunities for enterprises.

This study aims to explore such risks and new market opportunities from the perspective of Indian Micro, Small and Medium Enterprises (MSMEs) due to their significant contribution in the growth of Indian economy. While India's 26 million MSMEs may not themselves be large carbon emitters, they are the most vulnerable of businesses to the impacts of climate change - especially those relying on agricultural inputs in their value chain. Hence, this study suggests suitable frameworks, case studies and policy measures that can be used by MSMEs and policy makers to foster business growth while meeting environmental objectives. The report highlights innovation as an important tool for MSMEs in adapting to these climatic changes. It involves enterprises improvising upon existing services and solutions, and developing new ones. Innovations can be around products, processes or the complete business model and can result from a variety of voluntary and involuntary drivers. Some of the voluntary drivers include latent market opportunities, increasing customer awareness or financial incentives, like access to easy finance or cost savings. Involuntary drivers such as government regulations, supplier requirements, as well as new standards are incentivizing specific behaviour.



The key sectors that hold significant potential for innovation resulting from climate change include: energy and power, building and infrastructure; financial services, transportation, paper and pulp and steel among others.

The study is backed by case studies of some noteworthy MSMEs which have either implemented changes to their businesses as a risk management strategy or have created new solutions to improve their competitiveness and meet environmental objectives. One such notable case study is that of TARA, a social enterprise which is innovating to adapt to climate change, while also contributing to wider social objectives. Another one is a case study from Muzaffarnagar, in Uttar Pradesh where sugar businesses, paper mills and jaggery farmers are interacting in one eco-system, each contributing to another, in new business opportunities in response to climate change adaptation. This case study also highlights the key challenges before Indian MSMEs to adapt new technologies which primarily include low technological awareness and limited access to finance.

To foster innovation and make use of new opportunities, an effective policy support system and strong support from business associations and other relevant stakeholders is desired. Thus, suitable measures such as innovative financing mechanisms for MSME to finance technology investments are recommended for policy makers and business associations.



1

Introduction



The impact of the changing climate presents new risks to business and requires an adaptation response.¹ But with risk comes opportunity. Companies are already experiencing new market opportunities arising from climate change adaptation.² The new realities of increased global temperatures, unpredictable and extreme weather conditions, as well as a change in the availability of raw materials are changing patterns of demand and supply both across and within sectors. Existing demand is increasing and is also being created for entirely new products and services. It is these changing dynamics that are forcing companies both big and small to innovate and rethink how they conduct business to sustain and grow in the changed environment.³

So far, the debate on climate change seems to have primarily focused on climate change mitigation and hence most of the new business opportunities support the transition towards a low carbon economy. However, lately realizing the impacts of climate change on their business, companies have started modifying their processes and existing product offerings to adapt to the environmental and social changes. As against mitigation, which is primarily about decreasing greenhouse gas emissions, adaptation is about dealing with the inevitable changes in the climate, which are already happening. Essentially, adaptation strategies require a consideration of a company's value chain to understand the areas of vulnerability and devise strategies to build resilience. Given these impacts vary by geography, adaptation responses unlike mitigation need to be local and regional.⁴

Some businesses, the climate innovators are taking their adaptive response to another level. They are securing their competitive advantage through responding to new patterns of consumer demand



for either existing or revolutionary new products or service offerings. An international survey by the Economist Intelligence Unit (EIU), found that 39 per cent of companies questioned are seeing players in their industries secure a competitive advantage from assisting clients adapt to climate change, and nearly half of respondents indicated their firms are conducting research on the topic of climate change adaptation.⁵ It is these businesses that are tapping into 'adaptation market opportunities', which are set to thrive. However, unlike their western counterparts, there is only a limited awareness about the risks and opportunities that climate change presents to the relevant stakeholders in developing economies like India.

In the context of Indian businesses, it is important to highlight that they are relatively more vulnerable or sensitive to the impacts of climate change compared to other regions.^{6,7} Thus, it is essential that Indian businesses start focusing on innovation to reduce their vulnerability and build 'resilience' and capacity to adapt to climate changes.⁸

This study aims to fill the gap in research on the advantages of adaptation from the Indian perspective of Micro Small and Medium Enterprises (MSME). MSMEs form the basis of a growing economy and are the key to promote sustainable economic development. In India, MSMEs contribute to 8 per cent of the nation's GDP, 45 per cent of the manufacturing sector's output, and 40 per cent of the country's exports.⁹ While India's 26 million MSMEs are not large carbon users and emitters, among the several business groups they are likely to be more vulnerable to the impacts of climate change¹⁰. Luckily though, their inherent small size positions them well to nimbly react to changes in their operating context and therewith contribute an important share towards a green economy. With the right skills, resources and knowledge they can be well positioned to take advantage of the adaptation market opportunities. They are also the type of business where budding entrepreneurs incubate revolutionary new business models and products before they become mainstream.

This study explores and assesses the several business opportunities open to MSMEs from adaptation, and sets out a framework for the different types of innovation models and strategies the organisations can adopt to tap those opportunities. To illustrate the range of drivers, responses and types of innovation opportunities that can emerge from climate change adaptation, the study draws on case studies and examples from

a number of sectors including steel, paper and pulp and housing, all of which are typically energy sensitive and significantly affected by climate change. The study also explores areas/sectors where demand for adaptation is likely to increase and assesses the size of the 'adaptation market opportunity' in those specific sectors.

The study is backed by the examples of small businesses in India which are either dealing innovatively with the risks posed on them by climate change as a risk management strategy, or, have successfully tapped new market opportunities to improve competitiveness and meet environmental objectives. While the report covers the opportunities from climate change adaptation including those that also have mitigating effects, the opportunities from climate change mitigation per se are out of scope of this study due to sufficient existing literature available on the same.

Finally, the report suggests specific measures that can be taken by the policy makers, business associations, MSMEs and other stakeholders to create a more favourable regulatory and business environment for adapting to risks and opportunities that climate change presents.

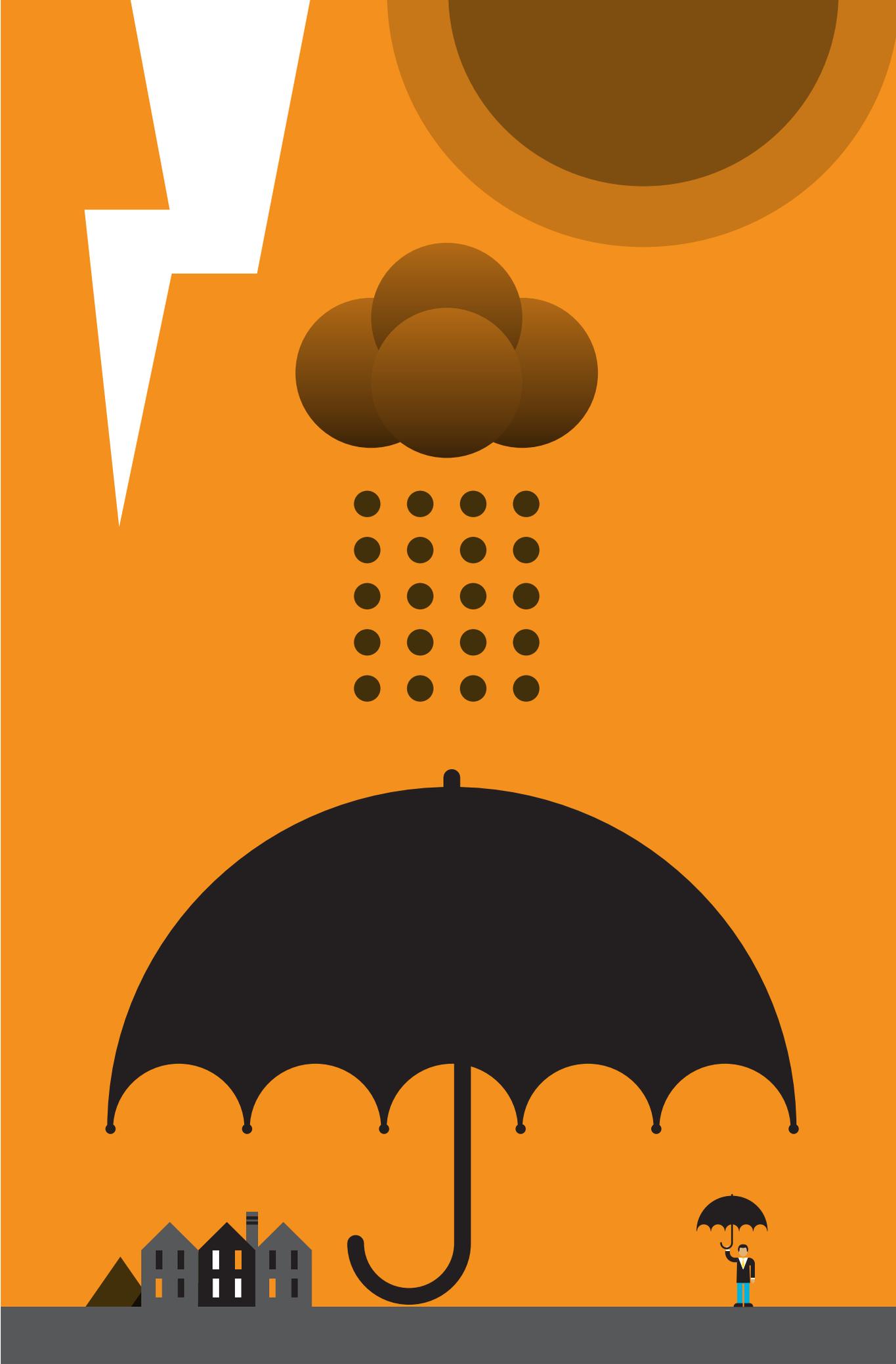


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- 9 http://planningcommission.nic.in/plans/mta/11th_mta/chapterwise/chap5_ind.pdf
- 10 RBI circular 1 July 2011.



1

Introduction





2 Innovating to Adapt to Climate Change



Since the impacts of climate change will be realized with greater frequency and intensity, adaptation requires deviating from business as usual practices and innovating to account for this new reality. In the Indian context, there are various initiatives working towards a more inclusive and innovative India. National Innovation Council (NInC), which sits under the Office of Adviser to the Prime Minister on Public Information Infrastructure and Innovations, is one of these actors highlighting the importance of the agenda. The NInC specifically defines innovation as 'thinking differently, creatively and insightfully to create solutions that have an impact in terms of social and economic value.'¹¹ It is about identifying, trying and testing new ideas to find those that work.¹²

Climate change impacts can be a driver for innovation. As for climate change adaptation, Table 1 gives an overview of what impacts of climate change can be expected and what this means for businesses. Before going into more detail on the concrete sectors and case studies of this paper, this chapter sheds light on the innovation framework, meaning on the types and drivers of innovations as well as the motives of MSMEs to become climate innovators.

2

Table 1		Examples Climate Risks requiring Business Action
Impacts of Climate Change	Knock on Impacts on Business	
Temperature change	Requirement for cooling equipment for employees and to maintain stable temperatures for climate sensitive industrial processes.	
Precipitation change impacting agricultural yields	Change in availability and quality of climate-sensitive natural resources as input materials for production, increased competition and cost for resources.	
Sea Level rise and extreme weather events including flooding	Risk of damage of assets (buildings and equipment), business interruption to water and energy supplies, supply chain & logistics, increased costs to weather proof buildings & storage facilities and higher costs of insurance policies.	
Water stress	Increased competition and cost for water resources.	
Biodiversity loss	Change in availability of natural resources as input materials.	
Human health and increase in incidence of disease	Health of employees and workers in supply chain compromised, and rising costs of healthcare.	
Regulation to encourage mitigation	Increased cost for energy resources and cost for compliance.	
Changing socio-cultural preferences	Changes in consumer behaviour and demand for specific products and services.	

MSMEs and the Scope of Innovation

MSMEs play a special role in fostering innovation and international studies suggest that they are in a better position to innovate and adapt to climate change than larger companies due to their small size and ability to change. In fact innovation intensity, a measure of revenue derived from products or services less than 3 years old, is higher in SMEs (60 per cent) compared to large companies (25 per cent).¹⁴ The reasons attributed to this are that frequent innovations are a challenge for bigger companies because of their set processes. Also the pressure of maintaining production levels and profit margins reduce the tendency of trying new ways of working, and instead the focus is on tried and tested methods. SMEs on the other hand have to look at innovation as a mechanism to differentiate themselves in the market and improve cost efficiency.¹⁵

Innovation is usually perceived to be driven by high-end technology and costly research & development. However, businesses innovate



across the entire value chain. Innovation can take place by redesigning existing **products and services** or introducing new ones, which reduce the environmental impact over their life cycle. It can also involve implementing new or improved **operational systems & processes**, which involve more efficient methods of manufacturing, drawing on technological advances. Some examples of this are:

minimising treat and reuse or recycle waste;

- the use of alternative technologies in the processes to reduce
- emissions of greenhouse gases and other pollutants and to provide renewable energy;
- management systems redesign to measure and monitor environmental impacts, also including new socio-technical systems.

Lastly, innovation can also involve implementing or improving **the entire business model** (both the product and systems/ processes) which encompasses the entire value chain and renegotiates the impact of the product on the society, processes of production, raw material procurement and logistics.¹⁶

→ Types of Innovations

Depending upon the nature of innovation, types of innovations can be classified as:¹⁷

→ Reactive

This form of innovation involves changes to business processes and products to improve performance like improving cost effectiveness of production and reduction of specific risks, which threaten to disrupt business continuity. Essentially existing knowledge is applied to existing problems, where its implementation has been previously hindered. It is usually driven by regulation (new legislation) but there can be non-regulatory drivers (latent market opportunities), which result in voluntary adoption of reactive types of innovation.



Example of Reactive innovation

Supreme Court of India's historic judgement in December 1996 directed all polluting units in the Taj Trapezium Zone to stop the use of coal and coke and to switch over to natural gas. Regulations like those might contribute to the shift of coal fired furnaces to natural gas fired furnaces like those used in the Firozabad MSME glass cluster, which produces 70 per cent of the total glass produced by small-scale units in India

Source: http://www.teriin.org/index.php?option=com_content&task=view&id=53

→ Incremental

This form of innovation involves upgrades to existing technologies and business processes, within an existing technological paradigm. Like reactive innovation, knowledge, which is new to the sector or region, is applied to existing problems. This type of innovation is driven by self-motivation of companies as they voluntarily seek to innovate around their management systems and improve practices. While they go beyond compliance in terms of reducing risks and cutting costs, they do not revolutionize their approach to doing business through these incremental innovations.



Example of incremental innovation

The adoption of improved cleaner production practices by leather and leather products MSME's cluster in Chennai as a result of access to soft loans, investment subsidies and special schemes. Some of these schemes specific to Chennai cluster are DIPP, DC MSME, Market Development Scheme, Market Access Initiative Scheme, IDLS, SIDBI financing schemes for energy saving, energy audit schemes from GEDA, Credit Linked Capital Subsidy Scheme, Bank of Baroda Scheme for financing energy efficient projects.

Sources: <http://www.chennaileatherbds.com/Scheme.asp>&<http://msmefdp.net/ResourceBank/Diagnostic%20Study/Chennai-DS.pdf>

→ Radical

This type of business innovation improves the product and processes. These innovations often involve the application of existing knowledge to new market niches and using advanced technology but an old business model. Radical innovation helps to adapt to climate change impacts by using less resources and energy in processes or products. Radical innovation is also similar to reactive innovation when it comes to applying new technology to existing problems. The differentiation comes from the fact that radical innovation is in response to an unmet need whereas reactive innovation is in response to some pressure and a felt need to innovate. SME play a critical role for radical innovation, as they are faster and more flexible and responsive than larger companies. A company's products or services often have a larger environmental and social impact than its manufacturing processes.



Example of radical innovation

The development of drip irrigation system by Megha Agrotech which adapts to growing uncertainty around water availability by reducing the water requirement. Megha Agrotech is a Bangalore based manufacturer and supplier of drip irrigation equipments. Drip irrigation system is an innovation for the developer of the system as well as for the user of the system. MSME Grape cluster Nasik, Maharashtra has adopted a drip irrigation system for cultivation of grapes and has overcome the shortage of water during summer. Drip irrigation technology has also

been supported by the state government and has been offered at a subsidized rate.

Source: [http://www.msme.foundation.org/DSR_temp/Diagnostic 20Study%20Report%20of%20Grape%20Cluster%20Nasik%20Maharashtra.pdf](http://www.msme.foundation.org/DSR_temp/Diagnostic%20Study%20Report%20of%20Grape%20Cluster%20Nasik%20Maharashtra.pdf)

→ Transformative

These types of innovation result in the creation of new markets and hence transform the existing market by introducing not only a new product or service (e.g. energy positive buildings, mobility solutions, etc.) but also new business models. Transformative innovations draw inspiration from emerging sustainability risks and opportunities that will shape the future. Transformative innovations that are not solely motivated by profit making objective but serve the interests of wider societal groups are referred to as 'social innovations'. It is important to take note of social innovations because they address needs of more than one stakeholder group. One is through the service that they offer to a customer group and second is through the process of delivery wherein they serve the interest of societal groups or stakeholders.¹⁸

Although there are no standard ways of measuring their impact, such innovations appear to play a significant role in social progress, by making certain services or products available to sections of society that did not have access to them before. This inclusion in turn strengthens their basic support systems required for improving quality of life. Today there are signs that relooking at existing business models and social innovation shall become all the more important because some of the barriers for long term challenges like climate change, poverty, health, education, housing can only be addressed by socially sensitive transformative innovation.



Example of transformative innovation

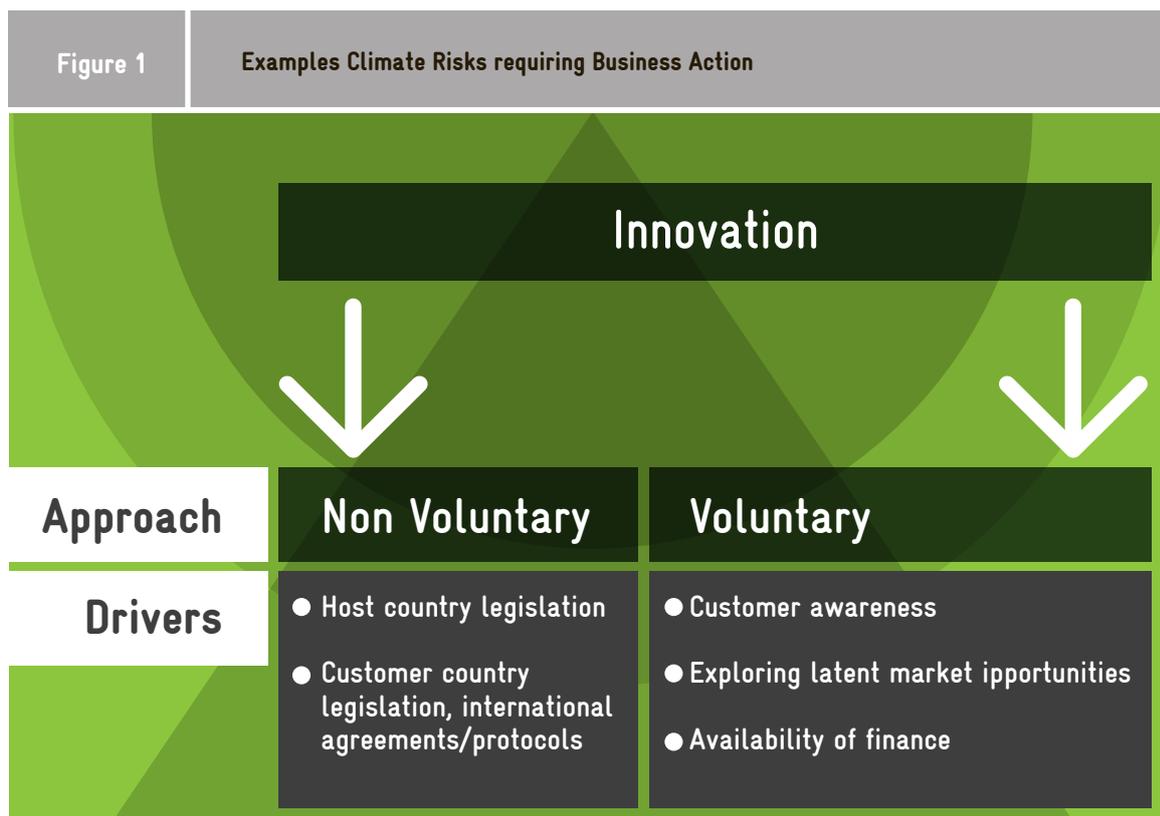
Mitticool Clay Creations in Gurjarat have created low-cost, patented clay refrigerators that need no electricity to preserve drinks and eatables. International buyers have since shown an interest in this innovation.

Source: <http://west.gian.org/pdf/case-study-on-mitticool.pdf>



→ Drivers of Innovation and Market Potential

To understand the opportunities to adapt and innovation, it is necessary to consider what drivers are already causing MSMEs to change their ways of working. The stimulus or drivers for innovation exhibited by businesses can be broadly classified as voluntary and non-voluntary.



2

Innovating to Adapt to Climate Change

→ Voluntary drivers (non regulatory)

Voluntary drivers for adaptation may include:

1 Customer awareness

Behaviour and consumption patterns are changing as a result of climate change awareness and new realities. This change in requirements and needs create demand for offering new products and services.¹⁹ There has been increased demand for cleaner production in the business to business (B2B) and business to customer (B2C) segments. This has been due to increasing levels of awareness about climate change, uncertainty about energy supply and risk of potential regulation governing GHG emissions and energy usage²⁰. MSMEs supplying to big businesses have found they

are being encouraged to increase their energy efficiency and adapt to climate change by their business partners, with the added benefit of not only meeting their customer's requirements but also cost savings. The Government of India is also encouraging consumer awareness about the energy efficiency of electrical appliances by mandating specific companies to declare the efficiency of products. This is aimed at influencing purchase decisions of the general public, which would force companies to adapt to changing preferences.



Example of Innovation where of customer awareness is a driver

Auto giant Maruti Suzuki is working with its Indian based suppliers on issues like cleaner production and energy efficiency.

Source: <http://www.marutisuzuki.com/pdf/Environmental-performance-10-11.pdf>

2 Emerging/Latent market opportunities

These are opportunities driven by previously unknown needs, which can result from the changing patterns of supply and demand resulting from climate change adaptation. Since this requires deviation from the business as usual approach, innovation plays a significant role in development of these potential services and products.



Examples of Innovation where latent market opportunity is the driver

Raj Sales Corporation specializes in trading of industrial insulating solutions, primarily EPE (expanded poly ethylene), XPE (extruded poly ethylene). The company based in the narrow lanes of Chowri Bazaar in old Delhi has found an opportunity to apply EPE to a new market and use it as housing insulation material. Ten years ago monthly sales for EPE sheets was around 60-70 sheets and this has risen to around 1500-2000 rolls per month today. This is an example for a voluntary driver for exploring latent market opportunities presented by the climate change. The object of innovation in the above adaptation is product which has been introduced into a different segment to serve the latent need of the market.

Source: EY stakeholder consultation



3 Availability of finance

This helps companies adopt new technologies and innovate, and lowers the entry barrier and quicker adoption of innovations. For Indian based MSMEs, the Small Industries Development Bank (SIDBI) has introduced a lending scheme for promoting energy efficiency and cleaner production options for MSMEs. It offers a 1 per cent lower than normal interest rate if the company meets certain energy efficiency related eligibility requirements.

In addition, the National Innovation Council is in the process of establishing a \$1 billion fund to spur innovation among the private sector in India and address the MSME financing challenge. A new type of asset class has emerged which is of relevance to innovative MSMEs. 'Impact Investments' provide capital in the form of private equity or debt to a business with the intent to create positive impact beyond financial returns.²¹ These types of impact investors are increasingly providing start up or early stage financing for MSMEs that focus on transformative innovation and create social enterprises to that aim to drive social change, including around issues such as climate change adaptation. Impact Investors and incubators active in India include The Acumen Fund, Aavishkar, LGTVP, Start Up India and India Unlimited.^{22 23 24 25 26}



Examples of innovation where availability of finance is the driver

At Steelcon Metal Cast, an MSME within Rajkot Cluster Foundry, a divided blast cupola was able to be installed to replace a traditional coal fired cupola as a result of SIDBI financing. This has resulted in net savings of 8850 INR per Mt of liquid metal and saw revenues soaring.

Source: SIDBI

➔ Involuntary/ Regulatory drivers

Regulation forces companies to change the way they operate and acts as an involuntarily driver of innovation. Often compliance is an essential operating condition and non-compliance leads to regulatory sanctions. Research suggests that where this is the case innovation will be wide spread. A compliance driver will also lead to quicker internal buy in of management and hence quicker adoption.²⁷

One of the key regulatory drivers that is enforcing change among energy intensive sectors is the Perform, Achieve and Trade scheme under the National Mission on Enhanced Energy Efficiency of National Action Plan on Climate Change (NAPCC). This sets energy consumption targets for specific sectors and mandates phased energy reduction. Units not able to achieve their reduction will either have to purchase energy saving certificates (ES Certs) to achieve targets or pay a penalty. While this requirement is not specifically directed at MSMEs, as important parts of the chain of bigger companies they are increasingly impacted by such developments as is outlined in the case study.

The Planning Commission of India established the National Manufacturing Plan to encourage sustainable manufacturing. It lays down mandatory conditions for compulsory treatment of all wastewater as per Central Pollution Control Board (CPCB) norms. Facilities like individual or central effluent treatment plants (CETP) are required to be implemented due to these norms.

India's State Electricity Regulatory Commission (SERCs) mandated distribution companies to purchase a certain percentage of their total power requirement from renewable sources. Power generation is the biggest source of greenhouse gas emissions. Globally it contributes to around 26 per cent of GHG emissions. This has encouraged various industrial units to use biomass in captive power plants to generate renewable power and resulted in creation of market. The generator has the option of selling the electricity separately and trading the associated environmental aspects as tradable commodity, in the form of renewable energy certificates (RECs).



Examples of Innovation resulting from Involuntary Drivers

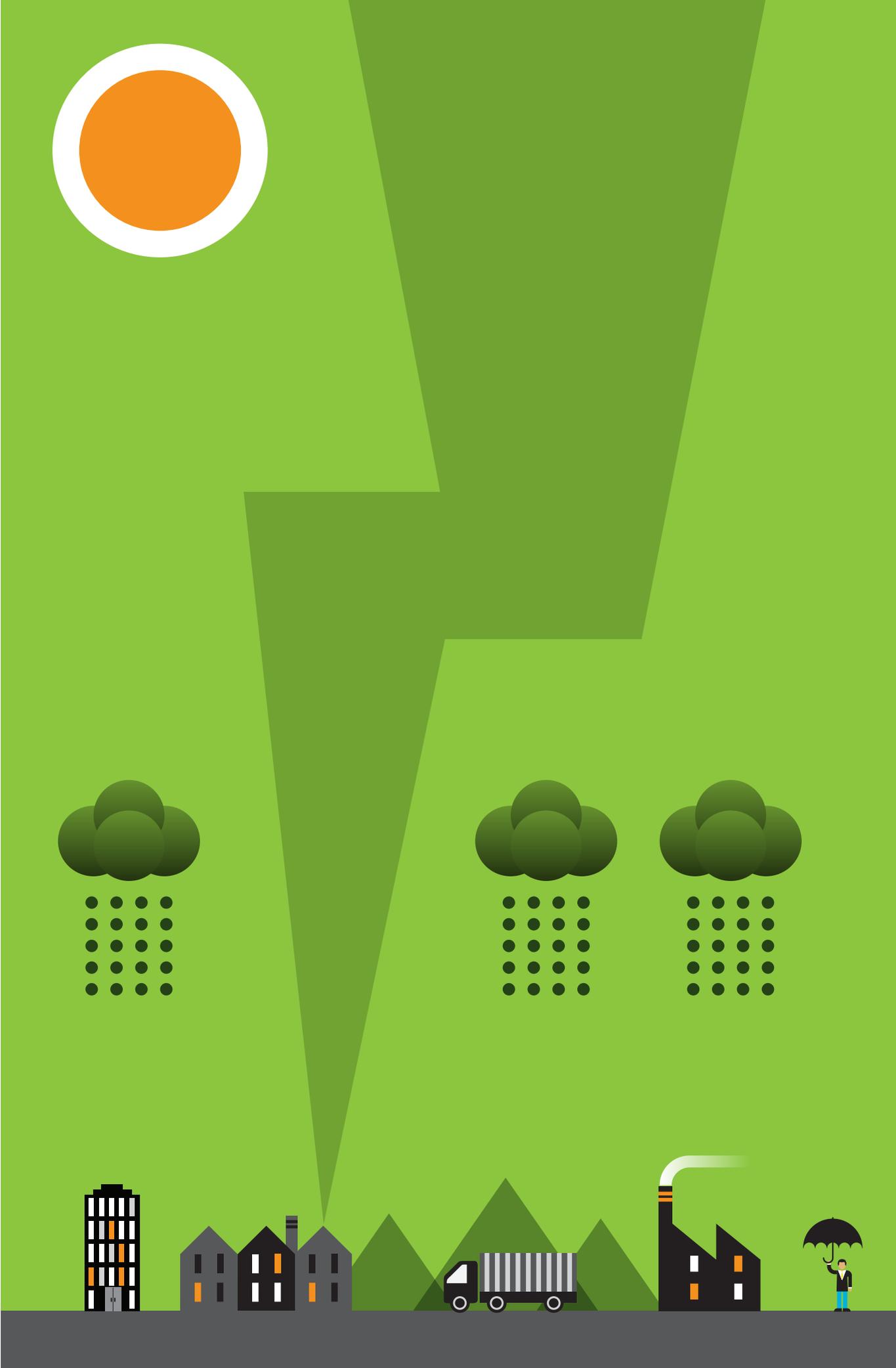
In Howrah foundry cluster, when the West Bengal Pollution Control Board ordered implementation of strict air emission norms, regulatory pressure led to the adoption of a divided blast cupola with pollution control device in the furnace with improved energy and emission performances.

Source: <http://www.teriin.org/upfiles//pub/papers/ft4.pdf>



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- 18 Mulgan, Tucker, Ali and Sanders, Supra note 25, at 10
- 19 WBCSD. Supra, note 19, at 9
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3 MSME Climate Change Adaptation Market Opportunities



Climate change presents scope to explore big new market opportunities for small businesses. Assessing the vulnerabilities faced by different sectors is the first step to understanding the potential opportunities within or beyond the sector to address new challenges. In order to understand the value proposition of the climate debate in each kind of scenario, it is useful to consider a variety of sectors to assess their vulnerabilities, opportunities and market potential. Therefore, this chapter illustrates a range of opportunities and types of innovation that have arisen for MSMEs in India, by considering in turn three sectors: The paper and pulp, steel, and housing/building sector. For context some key statistics are provided about the sector, before the climatic impacts on MSMEs in the sector are set out. Consequently, the adaptation market opportunities related to the sector are described with reference to the previously noted innovation framework.

New Opportunities

As society and policy frameworks shift to deal with the new risks and realities of climate change, businesses of all sizes are realizing that they do not operate in isolation of the wider environment, economy and society. From a climate change perspective, at the most basic level companies have realized the need to manage the impacts of climate change to ensure business continuity. They are beginning to assess these direct and indirect impacts on their core operations, or value chain, which may vary based on sector and geography. In turn, they are developing suitable strategies to ensure their viability.

For the innovators, it goes over and above risk management and involves companies identifying new opportunities which involve the development of new products and services. At the foundation, these opportunities relate to building resilience of the company's physical assets, or its business operations as a part of risk management strategy. (See Figure 2). Many businesses are seizing opportunities that create long-term shareholder value. Furthermore, significant market opportunities exist in a number of key sectors that will play a pivotal role in adaptation.

The sectors that have been identified as holding significant business opportunities resulting from climate change adaptation and have been taken for our study are: Energy & Efficiency, Building & Infrastructure, Paper & Pulp, Financial Services among others. These sectors present significant opportunities for MSMEs that either operate directly in these industries or supply to them.^{28 29}

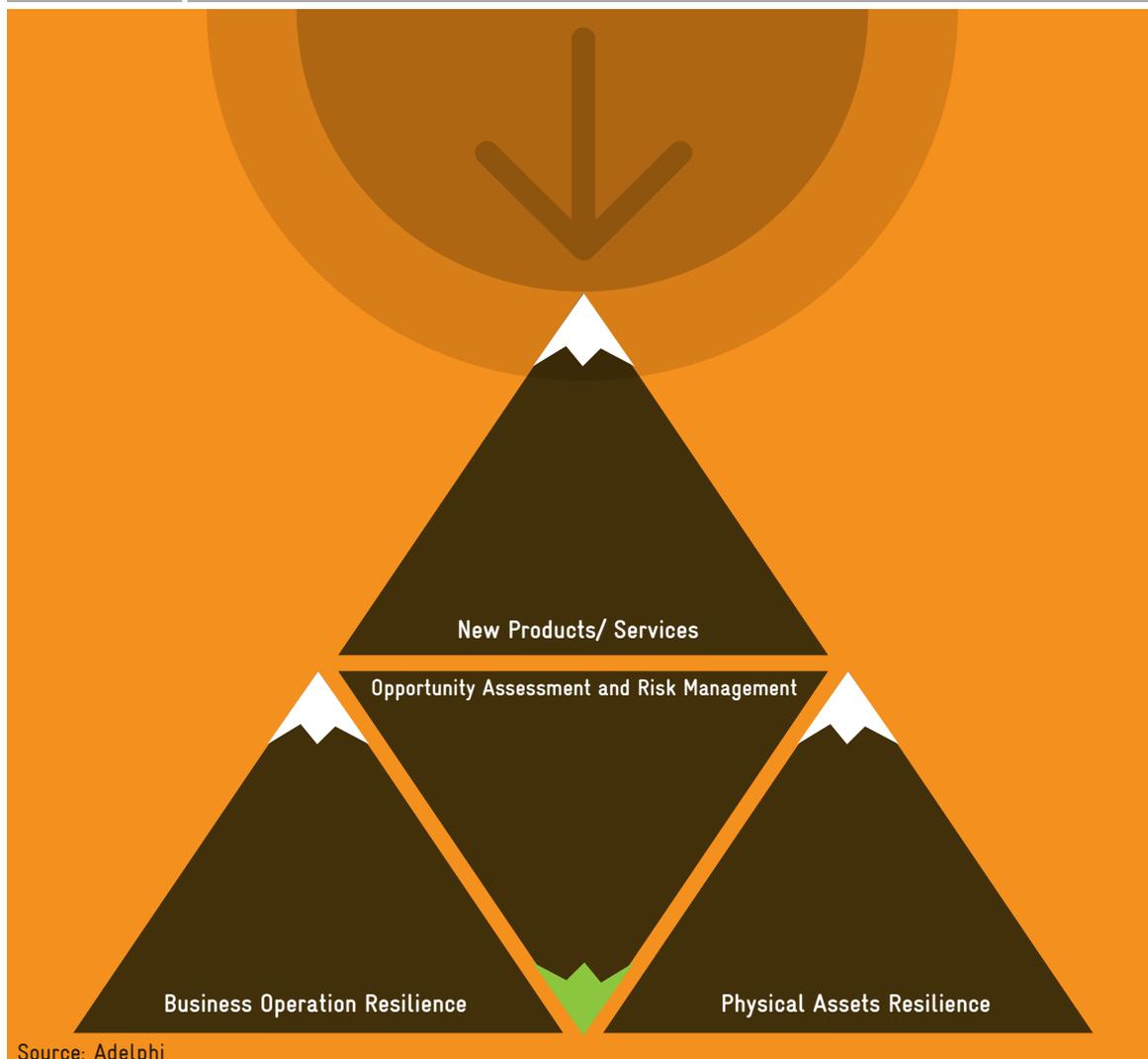
Energy & Power

With an increased focus on reducing the use of fossil fuels in powering the global economy, business interest in the renewable energy market and energy efficient technology to support the transition to a low carbon economy has grown.³⁰ Research by HSBC puts 2020 projections for the energy efficiency market in India between from 61 billion USD to 102 billion USD^{31 32}. This creates potential for new start-ups and innovative SMEs in the areas of manufacturing of renewable energy technologies like solar photovoltaic, wind, geothermal power, tidal/wave, regional biomass, energy storage and novel transport options.³³ Use of biomass in industry also presents an opportunity for farmers and other micro entrepreneurs.



Figure 2

Adaptation approach- Taking business continuity and business opportunity together



Source: Adelphi

They can consider the use of agro residue or energy plantations as source of energy as it detailed in the first case study in chapter 4.



Example of MSME's manufacturing renewable energy technologies

- Ankur Scientific Energy Technologies Pvt. Ltd. is a small company that has been developing activities and equipments in the area of non-conventional energy sources. The company has been manufacturing biomass gasifiers which will help in replacement of non-renewable and expensive fuel.
- Ammini Solar Pvt. Ltd. manufactures solar photovoltaic modules and other solar equipments which harness solar energy and reduce

the usage of conventional energy. Ammini Energy Systems Pvt. Ltd. has been rewarded with the MSME National Award-2010 in the category of Quality Products.

Sources: <http://www.ankurscientific.com/company.htm>

<http://www.ammini.com/newsdetail.aspx?category=Company%20News&newsid=16>

→ Building & Infrastructure

According to a survey by the Economist Intelligence Unit, 17 per cent of businesses have incurred damages to building/equipment due to climate change and 27 per cent of businesses plan to protect their assets by investment in better buildings.³⁴ Market opportunities have already emerged from the adaptation requirement of the buildings and infrastructure sector. These include retrofitting existing buildings and developing new climate proof (as well as mitigating) solutions to deal with extreme weather patterns and increasing temperatures. Opportunities include new and alternate construction materials, ventilation, insulation, and heating of buildings, and water saving and waste minimisation solutions.³⁵ MSMEs have already found opportunities in providing new technology solutions like cooling, ventilation and heating, water saving and waste minimisation, climate proofing products like improved roofing and insulations, new and alternate construction materials.³⁶



Example of MSME's active in Building, Infrastructure & Building Materials

An MSME 'Kusum Brick Field' in Ghaziabad (UP) has adapted its products from solid bricks to the production of eco-friendly 'perforated bricks' with energy efficient manufacturing process relying on semi-mechanized brick molding machinery. In response to regulation the business has also switched from using a moving chimney brick kiln to using a fixed chimney kiln equipped with gravity settling chamber (pollution control system), which has resulted in a fuel saving of 10 per cent.

Source: <http://www.resourceefficientbricks.org/Kusum.php>



→ Financial Services

Noticeably changing weather conditions have begun to affect trends in consumer demand for products and services. For example, the insurance industry has seen an opportunity to enhance existing or offer new products. Innovative incentives and rewards have been included in existing products encouraging those who re-build damaged properties to use green and LEED-certified (Leadership in Energy and Environmental Design) building practices.³⁷ Internationally, new insurance products are also popping up such as for geo-sequestration (carbon capture and sequestration), both to insure the operation and insurance for liability to third parties from the activity.³⁸ Other new products also offer enhanced protection against operational disruption from weather events to protect against distribution in supply chains and impacts of disruption in water and energy supply.

In India, since most of the rural population is dependent on agriculture or manual labour for their livelihood security, climate change impacts like uncertain weather and increase in incidences of certain diseases pose a serious threat to their well-being and capacity to earn an income. This has created the development of products that can secure against losses of crop, assets, and health. Opportunities have already been created for MSMEs operating in the micro insurance industry for such protection. The success story of SKS Microfinance, launching initial public offering showcases the potential of such opportunities.³⁹

What the concrete impact and business opportunities for MSMEs through climate change adaptation within specific sectors are, is presented in the following using the examples of the Indian MSME paper and pulp industry, the steel sector, and the housing and building industry.



Example of an MSME providing agricultural insurance

Agriculture Insurance Company of India is an insurance company and provides National Agricultural Insurance Scheme for crops, seed crop insurance, Varsha Bhima, weather based crop insurance scheme.

Source: http://www.aicofindia.com/AICEng/Pages/Default.aspx&http://www.ncap.res.in/upload_files/others/oth_15.pdf

Example 1: MSME Paper and Pulp Industry

→ Key Facts on the Indian MSME Paper and Pulp Industry

- 666 companies are engaged in the manufacturing of pulp, paper, and paperboards in India at a total operating capacity of 9.3 million tonnes. Out of the 568 running mills, the majority are classified as MSMEs with 458 mills run at a capacity of less than 60 tonnes per day (tpd), 48 are of capacities ranging from 60 tpd to 100 tpd, and 62 are of capacities above 100 tpd.
- The Indian paper and pulp sector accounts for about 1.6 per cent of the world's production of paper and paperboard.
- The total production grew from 5.80 million tonnes in 2007-08 to 7.2 million tonnes in 2009-10. In the growing economy paper consumption is poised to increase from 8.86 million tonnes in 2009-10 to 13.95 million tonnes in 2015-2016.
- About 38 per cent of the total paper production is based on recycled paper, 32 per cent on wood, and the remaining 30 per cent on agri-residue.
- The sector is one of the top 5 sectors in terms of both energy intensity and percentage share in the gross output for MSMEs.
- The consumption of steam and electricity per tonne of paper production in India is about 11-15 tonnes and 1,500-1,700 kWh. There is variation in water consumption for Indian paper mills, while the most efficient plants may have water consumption of 5-10 KL/ton of paper, the least efficient use up to 150KL/ton of paper.
- The sector is forecasted to consume approximately 730 PJ per annum of energy in the year 2020 and 1702 PJ per annum in 2030. It is expected to contribute 76 million tCO₂ per annum and 164 million tCO₂ per annum of GHG emissions in the years 2020 and 2030.

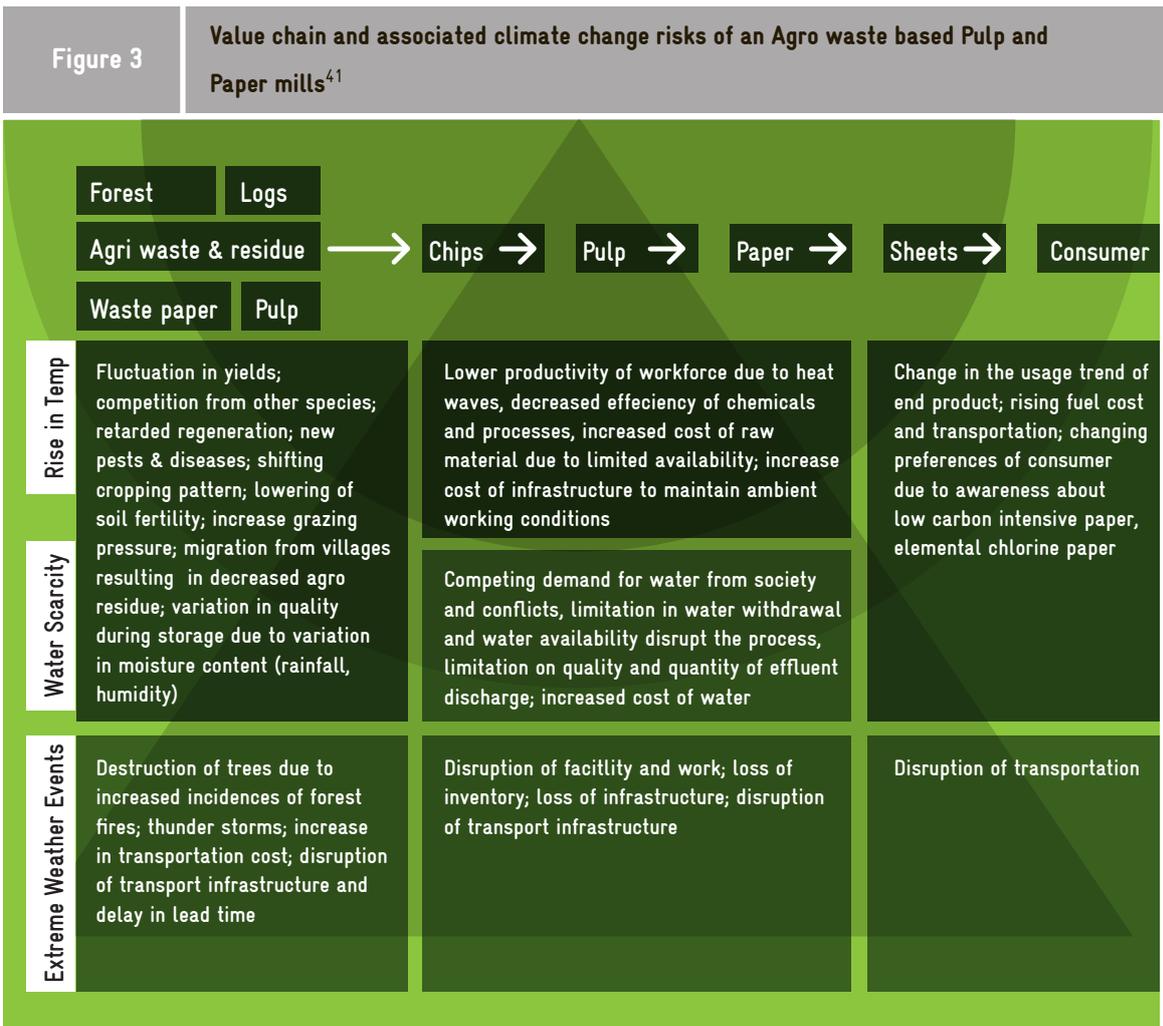
Sources: Planning commission of India, 11th Five year Plan 2007-2012 pg 209, IPMA, 2011. Indian paper industry: Overview. Indian Paper Manufacturers Association: New Delhi, CII-ITC CESD. 2010. ICT's Contribution to India's National Action Plan on Climate Change. CII-ITC Centre of Excellence for Sustainable Development: New Delhi.

→ The Impacts of climate change on MSMEs in the Pulp and Paper Sector

The paper and pulp sector is impacted by climate change throughout the value chain (see figure 3). These key impacts result in challenges for the sector including variation in the availability, cost and quality of



raw material and fuel, as well as operational challenges relate to the affordability and supply of electricity and water. Temperature variation also impacts the chemical properties and hence the efficacy and shelf life of chemicals and chemical processes. For example, resin is an essential natural chemical products used in paper production. Climatic conditions are already affecting the availability of resin, which has a knock on affect on the cost of production, given the fact that the price difference between the resin and substitute chemical is almost 50 per cent.⁴⁰



➔ New business opportunities created by climate change adaptation.

Despite recent trends like a shift towards paperless offices and e-papers which reduce the traditional usage of paper industry, the demand for better quality paper and paper products continues to increase with the economic growth of India. In fact, per capita consumption of paper is considered as one of the indicators of socio-economic development of any country. In India per capita consumption of paper is 7.2 kg. This is

far lower than in other emerging economies, for example 45 kg in China, 15–20 kg in other East Asian countries, and much higher in the US and Europe. Consequently there is still a large section of the population, which will be first generation users and it will take some time before India's paper requirements plateau.⁴² The increase in demand would put further focus on the need for new technologies and innovations for alternative input materials for the sector.

- **Recycled paper bags:** Governments are increasingly banning the use of plastic bags and de-incentivizing the use of plastic packaging. States like Rajasthan, Maharashtra, Punjab, Himachal Pradesh, Goa, West Bengal and National Capital Territory of Delhi have already implemented a plastic bag ban.⁴³ Large retail chains like Reliance Fresh, operating in these states and beyond have taken up the initiative of using paper bags instead of plastic bags. This regulatory driver is increasingly extending new market for MSMEs as demand for bags made from waste paper/materials is increasing.
- **Packaging for new products:** Changing consumer demands for existing products such as bottled water is increasing the market for packaging for these products. For example, in India, the total annual bottled water consumption has risen rapidly – tripling between 1999 and 2004 – from about 1.5 billion litres to five billion litres.⁴⁴ This is driven by factors like decreased availability of potable water. The market potential of bottled water or packaged water is estimated to be over Rs 1,500 crore.⁴⁵ The increase in demand of number of bottles is proportionately increasing the demand of packaging cartons for paper manufacturers.
- **New products made from recycled paper:** Recycled paper pallets for lifting goods are replacing traditional pallets, historically made of wood, plastic and metal. The usage of wood and other forest products has been under tremendous pressure and has increased demand for alternate raw materials. Plastic is also being banned in many states, and the pallet industry faces a risk of scarcity of raw input materials. Paper pallets, are a specialized substitute product that has been invented because of the need for new innovative environmentally friendly products. A transformational example of this case is IKEA.⁴⁶ IKEA uses 10 million pallets to supply its furniture stores and will stop using wood by January 2012 in favour of a lighter, thinner, recyclable paper-based alternative, which will reduce transportation costs by 10 per cent.
- **Technology trading:** Due to inherent nature of MSMEs, technological awareness and the ability to afford technology is limited. This results

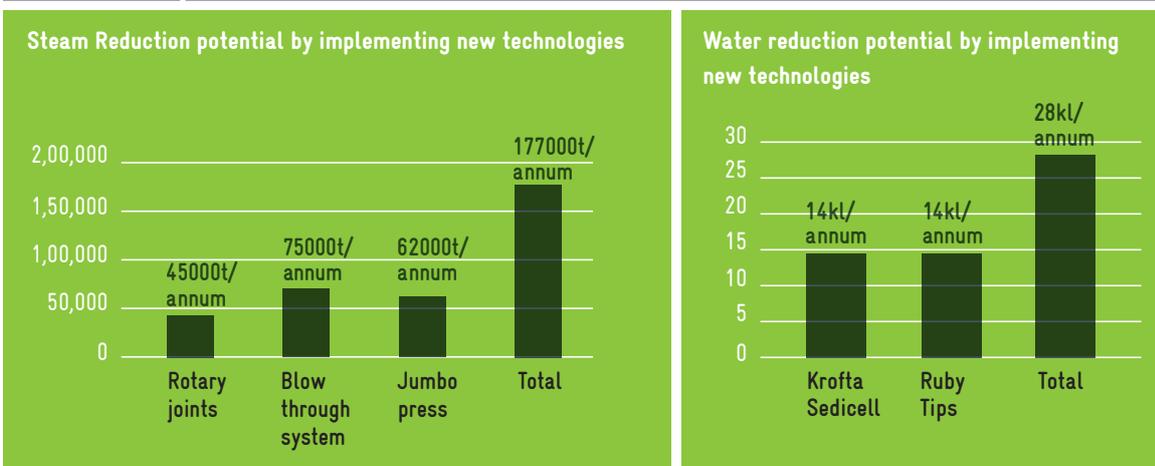


in MSMEs working with older inefficient technologies that increase operational costs and their environmental footprint. Climate change adaptation has increased uncertainty around cost and availability of energy, water, and raw material for example paper mills in Muzaffarnagar have seen an increase in water costs from 10p/kiloliter of water to 28p/kiloliter. Also the increased stringency of the Central Pollution Control Board (CPCB) norms has resulted in units needing to build effluent treatment plants. These developments put renewed focus on the need for new and efficient technologies for MSMEs. A stakeholder consultation in Muzaffarnagar revealed several technological changes, which will result in substantial savings in cost for energy and water. An internal assessment carried out of potential savings that can be achieved in the cluster shows tremendous potential translating into cost savings. A notable opportunity for technology trading in the sector is present and so offers the potential for paper MSMEs to diversify into technology transfer, an opportunity which may not be limited to the paper players.

3

Graph 1

Energy and water savings potential for Muzaffarnagar cluster



Example 2: The MSME Steel Sector

→ Key Facts on the Indian Steel Industry

- India was the 5th largest steel producer in 2010 and recorded a growth of 11.3 per cent compared to 2009. The Iron and steel industry is estimated to contribute to about 2 per cent of India's GDP.
- India is one of the fastest-growing steel industries worldwide with demand fuelled by continuous growth in the automobile, infrastructure and real estate sectors. Total crude capacity is expected to be around 112 million tonnes by 2015, registering a CAGR growth of 9 per cent. The Indian Government aims to raise steel production capacity to 300 million tonnes by the end of 2020. Consequently, the country is expected to become the second-largest producer by 2015–16.
- The secondary steel production is primarily in the MSME sector and constitutes approximately 57 per cent of total steel production.
- The specific energy use ranges from 56 to 66 litres of furnace oil (or 226 to 269 kg of coal) and 165 to 192 kilowatt/hour (kWh) of electricity to produce one tonne of steel.
- The iron and steel industries emitted 117.32 million tons of CO₂-eq. and accounted for 28.4 percent of the total emissions from the industries sector.
- In spite of significant efforts to reduce energy consumption, CO₂ emissions from the steel sector has gone up, and as production continues to grow, absolute CO₂ emissions will continue to increase despite energy efficiency efforts.

Sources: Planning commission of India, 11th Five year Plan 2007-2012 pg 215; MoS (Ministry of Steel), 2011. Annual report 2010-11, Ministry of Steel, Government of India, New Delhi; Energy Manager Training, 2011. Secondary steel making: Overview; Mjunction, 2008. Rising importance of secondary steel sector.

→ The impact of climate change on MSMEs in the steel sector

Climate change impacts will affect the entire value chain of the steel sector (see figure 4). Uncertainty of water and increasing energy cost are increasing the cost of operations. However the greatest risk comes from changes in the policy regime, which are already affecting the energy/emission performance of the sector.



Figure 4

Value chain and associated climate change risks of the MSME Steel Sector



➔ **New business opportunities/ markets created by climate change**

- **Technology transfer:** The new opportunities in the steel and steel re-rolling sector are an example of incremental innovation and driven primarily by pressure from customers and the regulator to increase the energy efficiency of their processes. With increasingly stricter policy regimes and the increasing cost of energy, the new operating conditions require efficient processes and operation as an adaptation mechanism for business.

Some of the potential technological improvements that have been implemented by MSMEs in the sector to improve the efficiency of operations and adaptation to climate change include:

- Blast furnace- blast oxygen furnace (BF-BOF) plants which reduce emissions through an all encompassing adoption of continuous casting, and integrated casting & rolling operations. A shift towards DC arc technology for the electric furnace steel production is estimated to improve the process efficiency by over 5 per cent. Technologies like LD convertor, cold rolling and slab casting have been adopted by several plants in the Indian steel sector. Increased adoption of these technologies in existing plants would provide a further scope for intensity reduction.
- The Coke Dry Quenching (CDQ) technique is an emerging technology in the steel industry that promises energy savings of over 1 GJ/tcs. It quenches carbonized coke using an inert gas; the heated gas is then used to generate electricity, therefore affording energy benefits over the conventional wet quenching. With about 90 per cent Indian plants yet to adopt CDQ, a potential for energy savings is being underutilized. The adoption of Top Pressure Turbine (TPT), a power generation system for converting the physical energy of the high-pressure blast furnace top gas, promises an energy saving of up to 0.6 GJ/tcs. In addition, several waste heat recovery technologies are available to use waste heat and convert it into useful energy. The adoption of an automated monitoring system for ensuring process optimisation in the plants reduces the energy and emissions intensity of steel production. However, this intervention requires the availability of modern control systems and trained personnel to operate them.
- Intervention in the form of raw material enhancement will help in lowering the overall energy consumption in the sector. With the quality of both feedstock (iron ore) and the fuel (coal) available in India being below the world average norms, it is necessary that plants using domestic supplies adopt beneficiation processes for iron ore and coal. Other efficiency improvement measures that could be more widely adopted by the industry include the use of tar in blast furnaces; carbon monoxide firing in vertical shaft kilns; and adoption of multi-slit burners. In addition, general energy saving practices such as installation of variable frequency drives; use of high-efficiency motors, pumps, and blowers; improved insulation of furnaces; and replacing electric heaters with fuel-fired heaters could incrementally reduce energy usage in the plants.⁴⁷
- Coking coal availability is a major issue for steel industry in India. Moreover, the steel industry globally is under pressure to reduce the GHG emissions of the sector. Newer smelt reduction technologies developed by Siemens and Posco like COREX & FINEX obviates the need for coking and



sintering plants by using non-coking coal with lump ore and pellets as inputs. COREX and FINEX are radical innovations, which have the potential to change the way steel is manufactured in India. JSW steel has already set up a plant, which uses the COREX technology. The major benefits of the COREX and FINEX technologies include substantially reduced specific investment costs and operation costs compared to the traditional blast furnace route; elimination of coking plants; high operational flexibility; environmental benefits due to savings in resources and energy as well as lower emissions; use of wide variety of iron ores and coals; and production of hot metal with similar quality to blast furnace.⁴⁸

All the examples are incremental innovations where the object of innovation is the process of production, driven by combined pressure of uncertainty around future regulations for energy prices and emission restrictions and access to finance.

India SME Technology Services Limited (ISTSL) is providing a platform for MSMEs to tap opportunities at the global level for acquisition of modern technologies to adapt to climate change technology transfer and promotion of energy efficient, environment friendly technologies in the MSME sector. This is to reduce Green House Gas emissions in the MSME sector. ISTSL has entered into partnerships to implement Energy Efficient technologies in Stainless Steel Re-rolling Cluster of Jodhpur, in association with KfW, Germany.⁴⁹

Example 3: The Housing/ Building Sector

→ **Key Facts on the Housing / Building Sector**

- Construction in both the commercial and residential sectors contributes approximately 6.5 per cent of India's GDP.
- India is the second most populated country in the world with over 1.2 billion people living in diverse climatic zones.
- More than 40 per cent of the population falls below the international poverty line of USD 1.25 per day, they are extremely vulnerable to such climatic impacts as many living in inadequate shelter that will not stand up to the changing climate.
- The 65th round survey on Housing Condition (Schedule 1.2) found that 28 per cent of rural households and 6 per cent of urban households still live in semi-pucca structures and nearly 2 per cent of the urban households

and 17 per cent of the rural households live in katcha structures. As the country's economy grows lifting these sections of the population out of inadequate housing to permanent climate resilient structures will be a necessity.

- According to the 2001 census, 61.82 million people, or 23.1 per cent of the urban population resides in slums where the quality of housing stock is poor.
- At the advent of the 21st Century (2001), the housing stock in India stood at 50.95 million for 55.8 million urban households indicating the shortage of supply relative to demand.
- Buildings are responsible for more than 40 per cent of global energy use and over one third of global greenhouse gas (GHG) emissions.
- In India, the residential sector consumes the second highest quantity of primary energy (21 per cent) after industry. In terms energy usage within the residential sector lighting and fans are responsible for the majority of energy use.
- Reducing GHG emissions in the built environment is widely recognized as the least expensive way to mitigate impacts. The sector has the potential to play a significant role in the response to climate change. Not only will it be impacted by climate change, as it is estimated that the built environment is responsible for 30 percent of raw material use and 25percent of water use globally, but it also has an important role in adaptation, by providing populations with climate resilient housing.
- According to National Mission on Sustainable Habitat the overall potential of energy saving through retrofitting is 20 per cent of existing consumption for residential sector and 30 percent for the commercial sector.

Sources: ICT's contribution to India's NAPCC; National Mission on Sustainable Habitat, CII, DESC; Housing Condition and Amenities in India, 2008-09, NSS 65th round, Ministry of Statistics and Programme Implementation, GoI, Nov 2010; UNEP (United Nations Environment Programme), 2009. Building and Climate Change: Summary for policymakers. United Nations Environment Programme, Sustainable Buildings and Climate Initiative: Paris.



→ The impact of climate change on housing/ building sector

The key challenges for the housing and building sector will be to ensure the availability of building materials, as well as climate proof buildings so that they can withstand the increasingly frequent extreme weather events and high temperatures. The key impacts on the housing/ building value chain are set out in figure 5.

Figure 5		Value chain and associated climate change risks of the MSME building and housing sector							
	Extraction of raw materials	→	Designing and production of raw materials	→	Designing of Buildings	→	Construction	→	Use and maintenance
Rise in Temperature	Reduced worker productivity; increased risk of community conflict for natural resources; future exploration may be restricted by expanded protections for biodiversity threatened by climate change and for forested areas that serve as carbon sinks; lower productivity of work force.		Restriction on emissions and high cost of energy for cooling requirements; reduced worker productivity		Increased demand for buildings with reduced cooling requirement		Reduced productivity of work force due to heat waves		Increased energy requirement and cost for cooling; increased cooling requirement; increased; heat island effect and changes of local weather and precipitation
Water scarcity	Reduced water flow in rivers threatening the restrictions on sand mining resulting in reduced availability; increased risk of community conflict for water use		Disruption of production due to reduced water availability; conflict with community for water use				Disruption of construction due to decreased water availability		Increased cost of sourcing water from external sources, disruption in supply
Extreme weather events	Disturbance to mine infrastructure and operations due to more frequent and intense natural disaster		Disruption of production due to reduced water availability; conflict with community for water use		Increased requirement of buildings resistant to extreme weather		Disruption of construction activity		Increased demand of material resistant to extreme weather conditions

→ New business opportunities/ markets created by climate change

A number of design innovations and opportunities for SME's have emerged due to climate change adaptation across the whole of the building/ housing sector value chain. Due to increased temperatures, demand has already risen for adaption to buildings to protect them for the heat, for example through products such as external shading devices and different types of roofing.

- **External shading devices:** The use of shading devices is an important aspect of energy-efficient building design to block unwanted sunlight and heat. These shades can be in form of overhangs, canopies, and awnings. Manufacturing of these shades provides an opportunity for the SMEs in the fabrication sector. The demand for these shades directly co-relates to the staggering demand for houses of 26.53 million units. This is radical innovation with the product being the object of innovation, driven by consumer demand.
- **Cool Roof:** Cool Roof refers to the outer layer or exterior surface of the roof which acts as the key reflective surface and prevents the transfer of sun heat into the building. These roofs have higher spectral reflectance than a typical roof surface. Various types of cool roofs are available, namely roof coating, broken china mosaic terracing, modified bitumen, reinforced cement concrete, slate or tile, metals and built up roofing.

Depending on the type, buildings with cool roofs can use up to 40 per cent less energy for cooling than the traditional alternative, and stay 25-35 degrees cooler in the summer sun. This reduces energy use, energy demand, energy cost, increasing the life of the roof, and contributing to the reduction of urban heat islands.⁵⁰ The potential of cool roof solutions is directly proportional to housing requirement mentioned above. Additionally, this solution can also be expanded to cater to the retrofit market. This is a radical innovation with the product being the object of innovation, driven by consumer demand.

Customers are increasingly demanding energy efficient building materials to retrofitting buildings as well as requiring energy efficient building materials in new builds. Therefore, there are innovation opportunities around building design and planning, which reduce the energy and light requirements of buildings.

- **Insulating material and their installation:** Insulation plays a major role in determining the energy efficiency of the building. At least 15 to 20 per cent of the heat ingress into a building can be through its walls and roof, proving the importance of insulating material in the energy performance of a building.⁵¹ Optimum level of building insulation not only improves the energy efficiency of the building, but also adds to the overall comfort. Proper installation of insulators has a potential to reduce energy consumption by 5-8 per cent.⁵²



SME's play an important role in the manufacturing, trading, and installation of insulation materials. There is a huge potential and demand for insulating material in old buildings as well as in new building construction. It has been suggested that demand for insulation is a factor of estimated housing demand of 26.53 million and 150 sq. m for new buildings, which is a figure of about 3.9 billion sq. m.⁵³

The global demand for insulation is forecast to increase 5.0 per cent per year through 2014 to nearly 23 billion m² of R-1 value. More than 40 per cent of all new insulation demand generated worldwide during the 2009-2014 period will be attributable to the Asia/Pacific region. Several Asia/Pacific countries are forecast to record rapid growth, including India, China and Indonesia. This is radical innovation, addressing latent consumer demands.

- **Glass:** Glass is an important component of buildings. Use of insulated window glass, which consists of 2 panes of glass with a gap, reduces the ingress of heat and at the same time allows light to penetrate. A high performance glass can result in energy savings of up to 35-40 per cent compared to conventional glass.⁵⁴

India's housing requirement is estimated at 26.53 million.⁵⁵ Given that windows accounts for 10 per cent of the entire floor area of buildings, and it has a role in improving the energy efficiency of buildings, there is a huge potential and demand for high performance glass for new builds. Added to that the market for retrofitting, and market demand further increases. This is reactive innovation where an existing product is innovated, driven by consumer demand.



- 28 WBCSD (World Business Council for Sustainable Development), 2005. *Pathways to energy and climate change 2050*. WBCSD: Geneva
- 29 UKTI, supra, note 1, at 5
- 30 International energy outlook 2011, US Dept of energy; <http://www.renewableenergyfocus.com/view/9729/global-renewable-electricity-to-grow-32-per-year/>
- 31 Robins, N., Singh, C., Clover, R., Knight, Z. and Magness, J. 2010. *Sizing the climate economy*. HSBC: London.
- 32 HSBC, supra, note 21, at 9.
- 33 Final Report for BERR Enterprise Directorate: *SMEs in a Low Carbon Economy*, URN 09/574
- 34 UKTI, supra, note 1, at 5
- 35 UKTI, supra, note 1, at 5
- 36 Adapting to an uncertain climate: A world of commercial opportunities, EIU; *Opportunities for UK Business from Climate Change Adaptation*



- 37 <http://www.firemansfundpersonal.com/pages/green-buildings>; <http://www.ceres.org/press/press-releases/dozens-of-new-insurance-products-emerging-to-tackle-climate-change-and-rising-weather-losses>
- 38 <http://usa.marsh.com/LinkClick.aspx?fileticket=rBtfHyO98xc%3D&tabid=1985&mid=10432>
- 39 Microfinance News, 2010. SKS Microfinance IPO subscribed 8.64 times on the third day at NSE. Microfinance focus, [online] 30 July. Available at: <http://www.microfinancefocus.com/news/2010/07/30/sks-microfinance-ipo-subscribed-10-5-times-on-the-third-day-at-nse/>
- 40 Stakeholder consultation in Muzaffarnagar, 3-4 November 2011.
- 41 IFC Climate Risk Case Study, BSPM, IPCC, 4th Assessment Report, Chapter 7
- 42 Planning commission of India, 11th Five year Plan 2007-2012
- 43 Infoqueenbee, 2010. Use of "Plastic Bags" banned in some states in India. Infoqueenbee, [online] 06 April. Available at <http://www.infoqueenbee.com/2010/04/uso-of-plastic-bags-banned-in-some.html>
- 44 (this does not include the other smaller regional brands, which according to the Bureau of Indian Standards are more than 1,800 in number) <http://www.fnbnews.com/article/print.asp?articleid=22233>
- 45 <http://www.fnbnews.com/article/print.asp?articleid=22233>
- 46 IKEA 2010, http://www.ikea-components.com/web/Paper_Pallet.aspx
- 47 Low carbon strategies report, GoI, 2011. *Supra* note 42, at 14
- 48 Competence in iron making, Siemens VAI, 2007
- 49 Ists1, 2011, <http://www.sidbi.com/ists1.asp>; The project is now being taken up for implementing Clean Development Mechanism (CDM) project by implementing Energy Efficiency measures, which are expected to generate CDM revenues, besides reducing the cost of fuel being consumed by the units.
- 50 Bureau of Energy Efficiency, *Environmental Design solution, Cool roofs manual*, 2010
- 51 CII (Confederation of Indian Industries), 2008. *CII Bulletin on Building Insulation*. CII-Sohrabji Godrej Green Business Centre (SGGBC): Hyderabad.
- 52 CII-SGGBC, *supra*, note 84, at 27.
- 53 EY Stakeholder discussion on 15 November 2011, Mr Ashok Lal, New Delhi
- 54 CII Bulletin on *High Performance Glass*
- 55 <http://mhupa.gov.in/ministry/housing/HOUSINGSHORTAGE-REPT.pdf>



3

MSME Climate Change Adaptation Market Opportunities





4 Case Studies



Indian entrepreneurs are successfully finding an advantage in adapting climate change. Knowingly or unknowingly, they are already climate proofing their business and changing the way they operate to ensure their competitive advantage in this changing operating environment. Drawing on a series of stakeholder consultations, some of the different types of 'climate innovation', the drivers, and complexities are illustrated in the following case studies.

4

Case Studies

Case Study I: Sweet Opportunities - Transformative & Radical Climate Change Innovation in Muzaffarnagar

The context

On first glances Muzaffarnagar, in Uttar Pradesh, is not a place where you would expect to find cutting edge 'climate innovations'. The town is a major sugar and paper production centre and it is also Asia's largest jaggery market, a sugar substitute made from sugar cane. But as this case study illustrates some businesses have found sweet new opportunities as they adapt to a new operating environment created by a changing climate. Sugar businesses, paper mills and jaggery farmers are interacting in one eco-system, each contributing to another, to the benefit of all and the environment. However this eco-system also demonstrates the complexity of the climate challenge, as despite their innovations they face new barriers.

The starting point was a consideration of the climatic impacts on the MSME paper and pulp sector in Muzaffarnagar. There are approximately 45 paper manufacturing units in the place of which 41 are currently running with an installed capacity of 0.7 million tons/annum, manufacture products ranging from kraft paper, duplex boards to specialty papers to serve the domestic market. Muzaffarnagar paper mills used to rely on locally available bagasse, sugar cane fibre, from the sugar mills for paper pulp and fuel, as well as domestic waste paper. When the sugar mills stopped selling their excess bagasse for the purpose of their own renewable power generation, the paper mills were forced to seek new sources of agro residue for pulp manufacturing and fuel.

Reactive Innovation by the Sugar Mills

Financial incentives, created in the context of wider international and national policies focused on climate change mitigation have acted as voluntary drivers to stimulate the sugar mills to change from conventional to renewable energy sources. Specifically the establishment of a scheme for where sugar mills receive a capital subsidy of Rs. 20 lakh/ MW of power produced from biomass. This has resulted in them diverting the excess bagasse earlier sold to paper mills for the purpose of their own power generation. This development has changed the industry dynamics and evolved the sugar industry. This new opportunity for sugar mills has presented a business continuity challenge for the paper mills.



“Our industry is plagued with uncertainty. Currently, we are faced with increasing regulation on the price of sugarcane and sugar which is eroding our profit margins. In addition, the changing rainfall patterns and temperature variation has forced us to shift the production cycle and work at a higher capacity. For our very survival we have been forced to improve our operating effectiveness and diversify our business around our two main byproducts, bagasse and molasses, and produce power and ethanol. They have now emerged as stable revenue sources for the otherwise fluctuating sugar business. If we were just making sugar we would be making a loss of Rs 500 million. Luckily several incentives from the Government like a 10 year tax holiday, and permission to sell electricity to private buyers and carbon credits has facilitated power generation from bagasse and created new business opportunities for us. While we have managed these uncertainties, the impact on the farmers must be harder. Since our industry is interconnected to so many others, any hardship or changes in our industry will have knock on effect on our supply chain.”

Anonymous, Sugar Mill Manager, Muzaffarnagar

Reactive Innovation by the Paper Mills

The deficit of bagasse as a raw material from sugar mills has forced the paper units in Muzaffarnagar to source an alternative raw material for their paper making processing. A conveniently and locally available substitute material is bagasse from Jaggery, a coarse unrefined sugar cane juice in solidified form. This bagasse is finer in size than that generated in sugar mills and results in better quality paper.

“For more than two decades I have been papermaking using waste paper but also relying on bagasse, crushed sugarcane, as agro waste for raw material for paper pulp and as a clean fuel, as an alternative to coal. Over the years we have improved the efficiency and capacity of operations to 400 Kw of power and 3.5 ton of steam, per ton of paper produced. Our efficiency improvements were driven by increasing competition and cost effectiveness. Until recently, our primary source of bagasse has been from nearby sugar mills. But its availability has reduced due to the increased sugar mills efficiency and the fact they now convert their bagasse into electricity channeling it to the state electricity grid. This has forced us to

look for alternate bagasse sources. Luckily the local jaggery making units came to our rescue. These units have been traditionally active in making jaggery and burning the bagasse in kiln or throwing it away. Now we source substantial amount of our bagasse from them. In fact all the paper mills in the region have moved to jaggery units for the procurement of bagasse. But in July 2010, Central Pollution Control Board (CPCB), issued a directive, which restricted chemical pulping of any agrowaste, including bagasse, in absence of a soda recovery plant. So now we can now only use bagasse as a biofuel and not for paper pulp. This is a shame as it is a renewable source for paper pulp, makes high quality paper, and the alternative material waste paper is more expensive and in limited supply. While we are keen to implement such a plant the costs are high for an individual small mill owner. We were promised financial support but our proposal for financial assistance to establish a Common Chemical Recovery Plant (CCRP) is still pending with the MoEF. In the meantime, we are incurring heavy losses due to this since we have to shift our raw material base to 100 per cent waste paper. This is affecting our bottom line. We feel helpless, and would like a scheme or soft loans to help businesses like us implement these environmentally friendly technology and systems to we can continue to use agrowaste as paper pulp.”



Pankaj Aggarwal, Owner of Bindlas Duplex Ltd, & Chairman of UP Paper and Pulp Manufacturers Association, Muzaffarnagar



→ Transformative Innovation by Jaggery Micro Entrepreneurs

Prior to the usage of jaggery bagasse (also referred to as 'kolhu' bagasse) by paper mills, there were roughly around 300 units producing jaggery, and the bagasse generated as by product was burnt as waste in the agricultural fields. Now though, a new market with the potential of absorbing 5000 tons bagasse/day was created for micro enterprises specializing in jaggery production.

This new market of bagasse driven by consumer demands from the paper mills resulted in livelihoods diversification for local farmers and the jaggery units increasing from 300 to over a 1000 in last couple of years. In addition, a secondary market has also been created to transport bagasse from jaggery units to paper mills. To fulfill this need a new cohort of micro entrepreneurs providing transportation services was created. According to the paper mills involved in procurement of jaggery bagasse, the number of people engaged in the range of economic activities from making jaggery to transporting it is approximately 30,000. However, this will have also had a positive impact on their dependent family members. Entrepreneurs consulted for this study attributed an increase in prosperity into region to this development.

4

Mohammed Yusuf, Jaggery Unit Owner, and father of nine children, Muzaffarnagar



“This jaggery unit is only one of the activities that I do to make my ends meet. The margins are going down due to fluctuating jaggery prices and the cost of high sugarcane. Also the variation in temperatures and rainfall are resulting in newer diseases, which affect the quality of sugarcane and hence jaggery. Apart from selling jaggery at a price of 20,000 per ton, for a number of years now I have been able to earn an additional income through selling bagasse to paper units - 1400 rupees for every ton of bagasse. However, over the last two years, I don't know why, but there has been a steady decline in the demand from paper mills and I have been forced to look for alternate arrangements to supplement my income. I have involved 3 of my sons in the business to save labour costs. When the past I used to be able to pay the fees of madarsa for my younger child, this is now a challenge. I face uncertainty. I don't know what the fate of crop will be next year and whether demand for bagasse in paper mill will once again increase.”

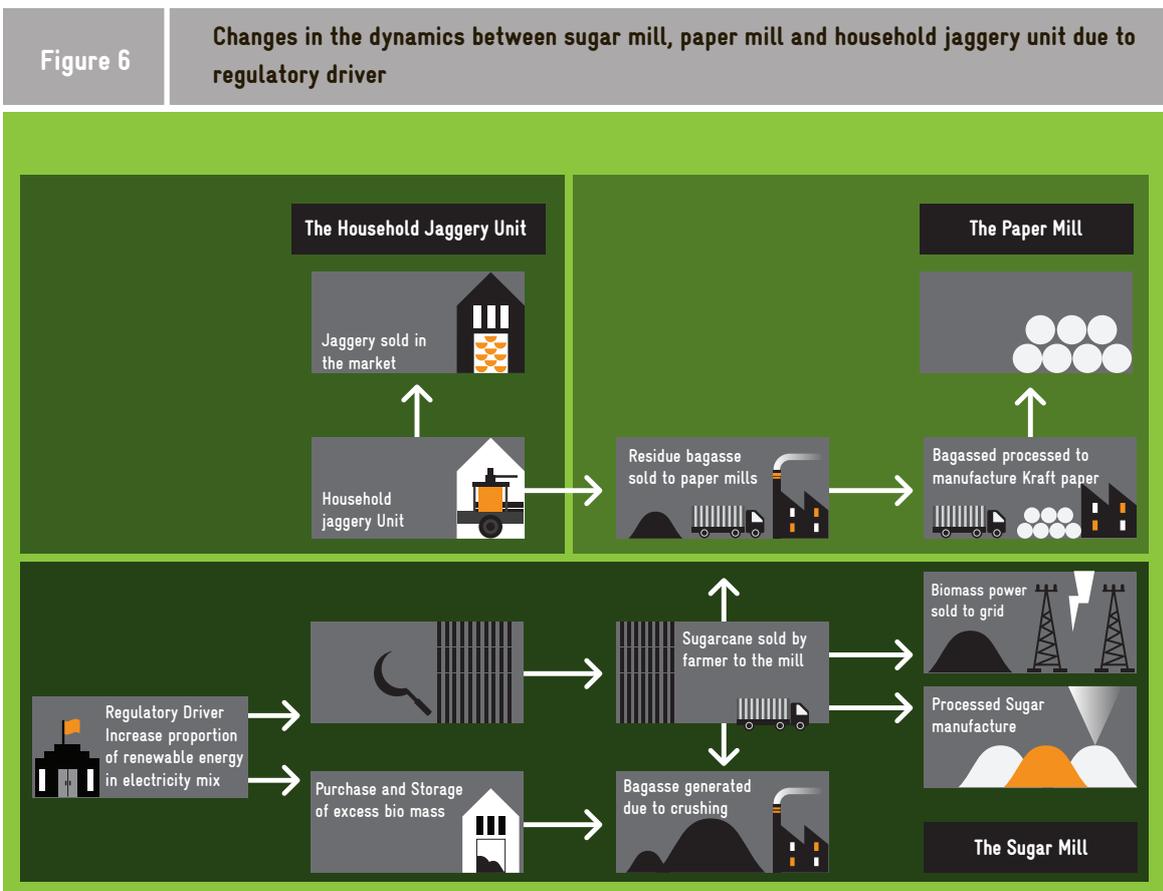
→ Regulatory drivers for transformative innovation

This case of Muzzafanagar indicates that climate change has already resulted in increased business vulnerability and is affecting livelihoods. Those livelihoods that are linked to agriculture have already been directly and indirectly impacted by changing weather patterns, which are causing new diseases for crops and are thereby reducing the quality and quantity of agricultural produce. The case of the jaggery farmer highlights that addressing India's development challenges cannot be decoupled from addressing climate change.

Although there is enormous potential to build business resilience and to promote the capacity of MSMEs effects to climate change, thus to reduce vulnerability, a lot of barriers still remain. The case shows that for micro enterprises it is difficult to adapt to climate changes, as there is a lack of awareness and limited availability of financing options to seek new business opportunities. Furthermore, it also highlights that there is a need to not only adapt to climate impacts but also to associated policy changes. In addition to that, it exemplifies that adaptations to climate change can have unintended environmental consequences, indicating the complexity of the challenge. This has resulted in the need for the paper mills to adapt to new environmental requirements. Compliance is costly, and small businesses lack the financial resources and access to make the transition despite the motivation. They require additional schemes



and support such as those pioneered by the Small Industries Development Bank (SIDBI).



4

Case Studies

➔ Case Study II: Waste not, Want not - Incubating innovation for social transformation

➔ The Context

Bundelkhand is a poor and vulnerable region in Northern India that is already experiencing the effects of climate change including extreme weather conditions, like droughts flooding, water scarcity and reduced agricultural yields.⁵⁶ With more than one third of the households in the region below the Poverty Line (total population of 21 million) it is not surprising that seasonal migration to nearby urban centres is increasing. This is due to a lack of secure livelihoods and failing harvests which means families have to rely on a variety of uncertain income generating activities to make ends meet. It is a place where the social impacts associated with climate change adaptation are clearly visible. Therefore, one wonders how in such a poor area, with one of the lowest per capita incomes in India, there can be business opportunities for any

businesses, least of all a business exhibiting several different types of cutting edge innovations.

Defying expectations of a successful micro handmade paper business called TARA Haath Kagaz Udyog has been set up in the area. Technology and Action for Rural Advancement (TARA) is in this context a new type of business, as a social enterprise and incubator with financial, social and environmental goals. It was set up by Development Alternative Group (DA) –one of the World’s Top 25 think tanks.⁵⁷ The business TARA Haath Kagaz Udyog was established to provide the local community with an alternative source of livelihood with the aim of disconnecting the dependency of local livelihoods from natural resources to create a reliable employment base throughout the year.

➔ **Transformative Product Innovation providing critical livelihood support**

TARA had identified the market opportunity for increased handmade paper demand within lifestyle market segment. The recent legislations surrounding the ban on plastic bags also increased the demand for recycled paper bags. Public sector undertakings (PSU’s) have steadily increased the procurement of handmade paper material from TARA. Earlier PSUs used to order for approximately 5000 bags which increased to 60,000 bags in 2010 and it rose to 100,000 bags in 2011. TARA is also currently in talks with several corporations within and outside India in order to supply them with handmade paper bags made from various waste products.

In order to provide critical raw material security to the business for its paper production, Tara uses waste such as cotton, hosiery or any other fibrous waste, as the input material for the handmade paper. One of the material wastes that are increasingly available in India is packaging cartons, known commonly as Tetra-Paks. These packaging materials are made of a composite consisting of layers of high quality paperboard, aluminium and polyethylene sheets. However, while the paperboard is high quality and can be used for handmade paper, first the old Tetra-paks require separating. In the past Tetra-pak waste has been unable to be recycled by small businesses such as TARA as it requires expensive equipment to separate out the components.



TARA has developed a low cost machine to be used by small companies to extract the paperboard from the Tetra-Paks by segregating out the aluminium and polyethylene sheets, so to unlock this opportunity to use this waste product as an input material for its paper making process. This application of old technology to a new problem presents not only an innovation for itself for the benefit of TARA's own paper making business, but also has the opportunity to be a spin off product for other sectors.

In addition to Tetra-Paks as waste material, TARA is also experimenting with various other kinds of inputs for manufacturing specialty paper. Trials are on for using a local weed called Bhaincha, banana peel, denim waste and elephant dung. This illustrates that TARA has propagated transformative innovation, driven by accessing latent market opportunities.

➔ **Radical process innovations to deal with climatic impacts**

TARA has been relying on simple production techniques and minimal mechanisation to make its paper products, such as manual paper making machines operated by women workers. Until recently, the drying of the paper has been in the open air, which requires space, sunshine and reliable weather. The increasingly unpredictable weather and monsoons aggravated by climate change has forced TARA to find alternative drying solutions. To address this issue, the business has developed and is currently deploying new drying machines, which can be powered by solar energy or biomass. These dryers have been developed to ensure that the variation in the climate will no longer impact the production schedule which is increasingly important due to the expanding business both within India and internationally. This radical process innovation around dryers is set to increase the output of the unit.

The use of solar and biogas energy for the dryer also helps in reducing the overall energy consumption in the process. Keeping energy consumption low is not only in TARA's own interests for managing its costs, but apparently it is also an increasingly important factor that customers consider when procuring handmade paper from TARA. Hence, the focus on reducing energy consumption is driven in part by customer demands and allows the business to appeal to a niche lifestyle market.

Given that TARA is a social enterprise, these innovations have not just had an impact on the businesses bottom line but also a tremendous positive social impact on members of the local community.

Due to prevailing gender inequalities in Indian society and vulnerabilities to climate extremes, women have been the key target group for TARA to employ in order to support them to supplement the household-income. The positive impact of this has been that whereas the male members are engaged in seasonal and uncertain activities, women engaged in handmade papermaking earn a consistent wage throughout the year filling the critical income gap. This additional income has helped the families in improving their quality of life, ensuring continued education of their children, and resulted in improving the social status of women.

Reference	TARA paper – Paper on which we Write a New Social Contract	
	Conventional Paper Mills	TARA Handmade Paper Unit
Energy consumption (kW/ tonne of paper)	11,134	6,934
Water consumption (cubic metres per tonne of paper)	154	77
Quantity of wood pulp used (tonnes)	1.9	0



56 <http://nraa.gov.in/Drought%20Mitigation%20Strategy%20for%20Bundelkhand.pdf>

57 <http://www.fpri.org/research/thinktanks/GlobalGoToThinkTanks2010.pdf>



4

Case Studies







5 Challenge and Recommendations



Challenges

'New ideas that work' are consciously or unconsciously being adopted or dreamt up by small and medium sized Indian businesses to adapt to climate change. These businesses are innovating and implementing adaptive strategies, addressing operating challenges like the availability of raw materials and rising water and energy costs impacts on their value chain, both up and down stream. While the connection to climate change is not acknowledged as the driver for the change, this study has shown that business owners are joining the dots and retrospectively linking back their innovations as adaption to their vulnerability and need to build climate resilience. This is as they are already feeling the heat in terms of climate risk, but also seeing the hot new opportunities emerging.

The new patterns of demand and supply has created a new breed of both intentional and unintentional 'climate innovators'. Whether it's the socially driven entrepreneurs, such as the team at TARA with their transformative and inspirational innovation ideas incubated then disseminated for others to adopt. Or the profit motivated business men from Muzaffarnagar that are nevertheless creating positive social change through their reactive innovations using alternative input materials for the paper production process. The bulk of it is also the incremental climate innovators who are adapting through energy efficient technology adoption, such as the steel rerolling companies nudged into action by international financing incentives and the desire to remain competitive. Unintentionally, these businesses have enhancing their own resilience to climate change and building their capacity to bounce back in the event of adversity.

So climate change is presenting big opportunities for small businesses in India and is not just risky to business. The commercial opportunities may be greatest for those involved in specific sectors, such as housing given the need for climate proofing of buildings. But there will be opportunities for all to upgrading their existing physical asset to remain competitive. It is these opportunities that are set to strengthen the MSMEs contribution to the important process of balanced regional economic growth and employment generation. But there are barriers to realize this potential. Small businesses still face big challenges to be able to take full advantage of the opportunities and new market segment they see developing.

Technological obsolescence and access to finance have long been associated with MSMEs. Further constraints such as high cost of credit, low access to new technology, poor adaptability to changing trends, lack of access to international markets, lack of skilled manpower, adequate infrastructure facilities, including power, water, roads, etc. and regulatory issues related to taxation (state-central), labour laws, environmental issues etc. are also linked with its growth process. Looking at these challenges through the lens of climate change impact, they translate into roadblocks in adopting effective climate change adaptation and mitigation strategies.

Lack of access to low cost finance, including private sector funding, limits the ability of MSMEs to invest in innovations for climate change adaptation and green technologies for mitigating their climate change impacts. Limited access to new markets and lack of knowledge of latest marketing technologies often dampens the need to innovate and develop new products and services tailored to favour climate change adaptation/ mitigation.

However, MSMEs face numerous challenges which include difficulty in access to seed funding from the government and investors, issues in recovery of dues from member units, understatement of effluent volume by member units, lack of technological expertise. Availability of skilled labour may be affected if climate impacts lead to altered migration patterns. The main concern faced by MSMEs in accepting and adopting new environment friendly technologies is lack of awareness and knowledge and shortage of funds, which makes adopting such technologies financially non-feasible. MSMEs are frequently constrained by the lack of awareness of various promotional schemes instituted by the Government. Where awareness exists, accessibility is constrained by bureaucratic red tape.



There is a need for common infrastructure projects for MSMEs. Through coming together and sharing the costs of infrastructure, which would be prohibitive for individual MSMEs, these small businesses could benefit from economies of scale and collaborate on aspects of common infrastructure, for example on the development and financing of Common Effluent Treatment Plants (CETP).

Some of the other barriers include lack of awareness of the impacts of climate change and the importance of adaptation to ensure business continuity and/ or competitiveness; and the lack or limited nature of green consumer demand.



Recommendations

Due to the inherent nature and size of business, MSMEs have the flexibility and potential of responding relatively quickly to the challenges posed by a changing operating environment. This gives unique advantage to MSMEs over bigger businesses, which due to established processes take more time to innovate or adapt. But the ability of MSMEs to realize this potential is often slowed by a lack of complete awareness of the policy and institutional framework within which they have to operate. The study identified several aspects related to awareness, technology availability and finance that would help MSMEs respond to increase their competitiveness. What is required for climate change adaptation related innovation to penetrate further into the MSME market is an effective policy support system for MSMEs.



For Policy Makers

- The ability of MSMEs to respond to technological challenges is hindered by limited access to concessional finance. Several climate adaptive strategies involve retrofitting the existing machinery and procuring newer more efficient ones to improve the resource efficiency. These initiatives may require higher initial investment, which is difficult for a small business. This lack of concessional finance often hinders the adoption or results in late adoption of technologies and removes the early mover advantage. Availability of funds from financial institutions and other agencies at preferable rates especially for climate adaption will improve the accessibility of technology and consolidate the position of MSMEs in India. To address the wider financial requirement of climate specific adaptation, development of an “MSME climate adaptation fund” may be explored. The fund may focus on thematic areas of energy, water and other areas of adaptation that may arise.

- There is limited awareness about the existing government policies and incentives and hence a need for closer interaction between the government agencies and the local business associations to increase the awareness. Policy makers can explore an association with Industrial Innovation Clusters, cluster level bodies aimed at fostering innovations, as envisaged by National Innovation Council.
- MSMEs are usually owner managed and therefore a heavy involvement in the day to day running of the business compromises efforts in research and development. Consequently, the level of awareness about the technological advancements, benefits and applications in other geographies often becomes a challenge. Furthermore, since MSMEs are generally located in interior locations the availability of technology, skill transfer and capacity building becomes difficult resulting in slower technology transfer. This gap can be filled by instituting periodic technology reviews of various MSME sectors led by Ministry of Micro, Small and Medium enterprises to consider existing and available technology solutions and recommend suitable ones for the Indian context. A special vehicle may be developed on the principle of partnership, and may comprise of MoMSME as the nodal agency, and various participants from financial institutions, technology and research organisations specializing in different MSME sectors. Potential linkages may be explored with Technology Information, Forecasting and Assessment Council (TIFAC, Dept. of Science and Technology) and Industrial innovation clusters as envisaged under the National Innovation Mission for such assessments and sensitisation measures.

➔ For MSMEs & Business Associations

MSMEs operate in a dynamic environment. Businesses are already innovating and rethinking how they conduct business to sustain and grow their market share or build new business. They are motivated to secure their competitive advantage by responding to new patterns of consumer demand. It is only by addressing these challenges that they can grow from the small businesses of today to the big businesses of tomorrow.

- With change in the global climate affecting various segments of society, MSMEs and business associations need to be aware of the potential impacts of the change in global temperatures and its associated factors. Since MSMEs work with a limited economic buffer, any shock in the operational environment may lead to troubled times. To address this it is recommended that business associations conduct a cluster or product wise value chain analysis to identify the vulnerabilities and potential adaptation needs.



A proactive measure would not only help address the climate challenge but also identify new businesses opportunities.

- There is scope for knowledge sharing and learning from cross-sectoral experiences. Business associations may take the lead in accessing knowledge and sharing the experiences of MSMEs in other geographies and sectors to enhance the understanding of the issue and mechanisms to address it.
Commission of research studies on the social impacts of business activities:
- This would identify the real impacts of the MSMEs in the wider socio-economic environment.
- There is an increasing focus on MSMEs for monitoring the non-financial impact of its activities. The Ministry of Corporate Affairs has recently released the National Voluntary Guidelines on Environmental, Social and Economic Responsibilities of Business, which have a special section on MSMEs. It may be prudent for MSMEs and business associations to proactively adopt the guidelines and identify areas of improvement for long-term benefits and preparedness for future regulations.

Acknowledgements

We would like to convey our sincere thanks to all the stakeholders and experts who shared their views and ideas to enrich the study. We would like to especially extend our gratitude to (in alphabetical order):

Mr. Aman Sharma, Green Power Associates
Mr. Amit Garg, Silverton Papers Ltd
Mr. Ashok B Lall, Ashok B Lall Architects
Ms. Chitra , Chitra Vishwanath Architects
Mr. Deepak, Siddheshwari Industries
Mr. Gireesh Madaan, UNDP GEF- Steel
Mr. Jitendra Jain, NGP Industries
Ms. Kanika Kalia, TARA (Technology and Action for Rural Advancement)
Mr. Madhuban Pandey, TARA (Technology and Action for Rural Advancement)
Mr. Manish Kapoor, Meenu Paper Mills Pvt Ltd
Mr. Manoj Kumar Sharma, Central Public Works Department, Gol
Mr. Mukesh Gupta, Raj Sales Corporation
Mr. Naveen Aggarwal, Tirupati Balaji Fibres Ltd
Mr. Pankaj Aggarwal, Bindlas Duplux Ltd
Mr. Prasoon Agarwal, Silverton Paper Ltd.
Mr. S K Jaini, M K Petro Products India Pvt Ltd
Mr. Sanjeev Jain, Garg Duplux & Paper Mills (P) Ltd
Mr. Shailja Kishore, Development Alternatives
Mr. Shishir Sangai, Siddheshwari Industries
Mr. Sonal Kulshreshtha, TARA (Technology and Action for Rural Advancement)
Mr. Sushil Agarwal, Tehri Pulp & Paper Ltd
Mr. Vijai Chaturvedi, TARA (Technology and Action for Rural Advancement)
Mr. Vineet Nigam, TARA (Technology and Action for Rural Advancement)
Mr. Vivek Jha, TARA (Technology and Action for Rural Advancement)



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Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH

Manfred Haebig
Private Sector Development
2nd floor, B-5/1, Safdarjung Enclave,
New Delhi 110 029
T: +911126715964/5968
F: +911126715967
E: manfred.haebig@giz.de
www.giz.de