Strategy for Industry and Mining

National Adaptation Plan
to Climate Change

5 Strategy for Industry and Mining

5.1 Introduction

The industrial sector can be divided into three broad categories: mining, manufacturing, and public-utility services. In 2013, the sector accounted for 24.4% of GDP and for 8.16 million jobs. In addition to its economic importance, industry contributed to society through incorporation of novel technologies and solutions, products and processes. In this respect, strengthening the adaptive capacity of industry and mining to climate change is an indispensable requisite for Brazil's sustainable economic development.

Founding of the Inter-ministerial Committee on Climate Change (CIM) in 2007, and launching of the National Climate Change Plan, introduced a framework for participation of the industrial sector in issues relating to the theme within the national public-policy agenda, culminating with enactment of Law 12187/2009, which instituted the National Climate Change Policy (PNMC).

The PNMC prepared the field for launching, in 2010, of the Climate Change Mitigation Plan for Industry for Consolidation of the Low-Carbon Economy in Manufacturing, and for Climate Change Mitigation and Sectoral Adaptation for Consolidation of the Low-Carbon Economy in Mining, in acknowledgement of the vital role played by manufacturing and mining activities in environmental, social and economic issues.

Initially, climate-change discussions within the sector were dominated by issues relating to reducing greenhouse-gas emissions in industrial processes of the aluminium, cement, paper and pulp, chemicals, iron and steel, limestone and glass industries; and in extraction, physical processing, pelletizing and internal transport processes relating to mining. Sectoral plans regarded adaptation as a co-benefit, stemming from improved efficiency of energy use and materials consumption.

The Industry Plan has a governance structure centred upon the Technical Committee for the Industry Plan (CTPIn-MDIC) comprised of government and private-sector representatives, with participation of the National Confederation of Industry (CNI). The Plan for Low-Carbon Mining is centred on the Secretariat for Geology, Mining and Mineral Processing of the Ministry of Mines and Energy (SGM/MME). These respective governance structures are the focal points for promotion of the goals and actions under the Plan and the relation to the Coordination Unit of the National Plan for Adaptation.

This Chapter was prepared under coordination of the Secretariat for Development of Production of the Ministry of Development, Industry and Foreign Trade (SDP/MDIC) and the Secretariat of Geology, Mining and Mineral Processing of the Ministry of Mines and Energy (SGM/

MME), with the support from the Ministry of Environment (MMA).

It aims to introduce concepts and basic guidelines to complement the approaches relating to adaptation to climate change in the Industry Plan and the Low-Carbon Mining Plan, highlighting the crosscutting nature of actions required and remaining gaps.

5.2 Vulnerabilities of the industry and mining sector to climate change

Resilience of the industry sector can be considered in terms of its sensitivity reduction and increased capacity of adaptation to potential impacts of climate change. When considering the adaptation capacity of industry, not only the direct impacts of climate variability and extreme phenomena, but also indirect impacts on the infrastructure upon which sectoral operations depend, and the resilience of territories where industry is present, must be taken into account.

The impacts of climate change on the industrial sector may also result in impacts upon local, regional and national economies, which underscore the relevance of public policies for adaptation of the sector. A study that examined such impacts from a broader perspective, which included not only direct losses traditionally associated with interruptions of production, but also indirect impacts upon associated local production chains, estimated losses caused by flooding in the City of São Paulo at R$ 108 million per year for the City itself, and at R$ 226 million for the Brazilian economy as a whole (Dos Santos & Haddad, 2014)[13].

The severity of impacts varies from one industry sector and geographical location to another, whereas adaptive capacity is influenced by size and by the quantity of resources available for investment in adaptation measures. Sectors that are highly dependent upon natural resources (e.g., pharmaceuticals, agroindustry and forest-based industries) are more susceptible to changes in biodiversity and agricultural cycles, whereas industrial parks and mines located in hilly areas prone to intense rainfall are more likely to suffer interruption of activities and supply chains, owing to landslides and flooding in lower-lying terrain.

Impacts can thus be categorised either as biophysical or socio-economic (Table 9). Examples of biophysical impacts are scarcity of raw materials caused by changes in biodiversity, agriculture or water supply that may directly affect availability of basic supplies for manufacturing. Examples of socioeconomic impacts include rising prices of raw materials, material damage to industrial facilities, interdiction of transport routes, and interruptions in electric-power supply and communications.

[13] Available at: <http://www.scielo.br/pdf/asoc/v17n4/a05v17n4.pdf>.

Table 9. Dimension of the evaluations and impacts for the industrial sector

Exposure	Vulnerabilities	Potential Impacts		Opportunities	Adaptation Actions
		Socioeconomic	Biophysical		
Extreme Climatic Phenomena	Industrial parks and mining companies located in regions of steep topography susceptible to landslides or on low ground, subject to floods	Reduced availability and quality of water	Increase in operational, investment and insurance costs	Development of new technologies, systems and equipment for prediction and monitoring of risks	Mapping of risk areas
		Reduced availability of raw material and inputs	Reduction or interruption of production	Development, implementation and strengthening of production models based on local potential	Availability of tools to access the data on the monitoring and early-warning network in management language
	Industrial parks and mining companies far from storage facilities	Reduced thermal comfort, quality and security of the working environment	Production loss	Strengthening of sustainable production systems	Investments in ecosystem services
	Industrial parks and mining companies with water supply dependent upon public distribution networks and poorly diversified energy mixes (highly dependent on distribution networks)	Compromised human resources	Competitiveness losses		Inclusion of “climate risk” in all the industry planning actions
		Damages to industrial infrastructure (mines, buildings, machinery etc.)	Reduced capacity to generate jobs and income		Investments in reuse, desalinisation and alternative water-supply and power sources
	Industries with low investment in adaptation of industrial facilities (buildings, and equipment) and research and development	Damages to logistic infrastructure (roadways, waterways and ports)	Compromised logistics		
		Damages to power and telecommunications infrastructure			

Table 9 (CONTINUED). Dimension of the evaluations and impacts for the industrial sector

Exposure		Vulnerabilities	Potential Impacts		Opportunities	Adaptation Actions
			Socioeconomic	Biophysical		
Extreme Climatic Phenomena	Elevation in the sea level	Industrial parks and mining companies located in the coastal zones	Potential loss in supply and quality of water			
			Rusting of metallic structures and equipment			
			Damages to port facilities			
	Change in weather patterns	Industrial parks and mining companies located in vulnerable regions or dependent on raw materials from agricultural, forests or biodiversity	Reduction or interruption of raw-material supplies			
			Reduced thermal comfort, quality and security of working environments			

5.3 Adaptation of industry and mining to climate change

5.3.1. Relevance of adaptation to the sector

The sensitivity of industrial and mining activities to climate variations stems from their direct dependence on raw materials derived from natural resources and the physical integrity of public or proprietary infrastructures (water-supply, wastewater, electricity, logistics and telecommunications). Uncertainties as to the links between current weather phenomena and climate change notwithstanding, evidence of economic and social damage caused by climate events in recent years (exemplified by the current water-shortage crisis in the Southeast) lends credence to the importance of adoption of appropriate adaptation strategies, targeted at improving the management of risks and opportunities for mitigation of economic losses, reinforcing climate resilience, and strengthening the industrial and mining sectors and their respective production chains.

In view of its technical and technological resources, its strong influence on supply chains, its capacity for innovation and to respond quickly to contingencies through effective actions for minimizing damage to people and the environment, industry has a crucial role to play in promoting resilience among other economic sectors and society as a whole.

Intrinsic characteristics of the industrial sector, such as its great heterogeneity and dependence on public infrastructure, make delineation of adaptation actions more challenging. Such actions must seek combinations of different response strategies, based upon the mapping of regional vulnerabilities and potential impacts, increased tolerance to risk, ecosystem services, and exploitation of other potential opportunities. Categorisation by size, sector of activity and geographic location facilitates identification of vulnerabilities and the adoption of appropriate adaptation measures.

The physical risks of climate change may affect industrial and mining activities in different ways, each demanding different strategies for adaptation, depending upon their capacity to influence the sector and the degree of engagement of production chains (Figure 5). Identification of business opportunities in the field of adaptation is important for strengthening the value chain. Vulnerabilities associated with core operations, value chains, or external factors require different adaptation strategies. Industry has considerable scope for implementing necessary adaptation measures relating to its core operations. It has less influence, however, when addressing broader value chains; and its influence declines dramatically in cases involving adaptation measures for external factors (public and private electricity and water-supply infrastructure) which demand coordination with the public sector and other economic sectors.

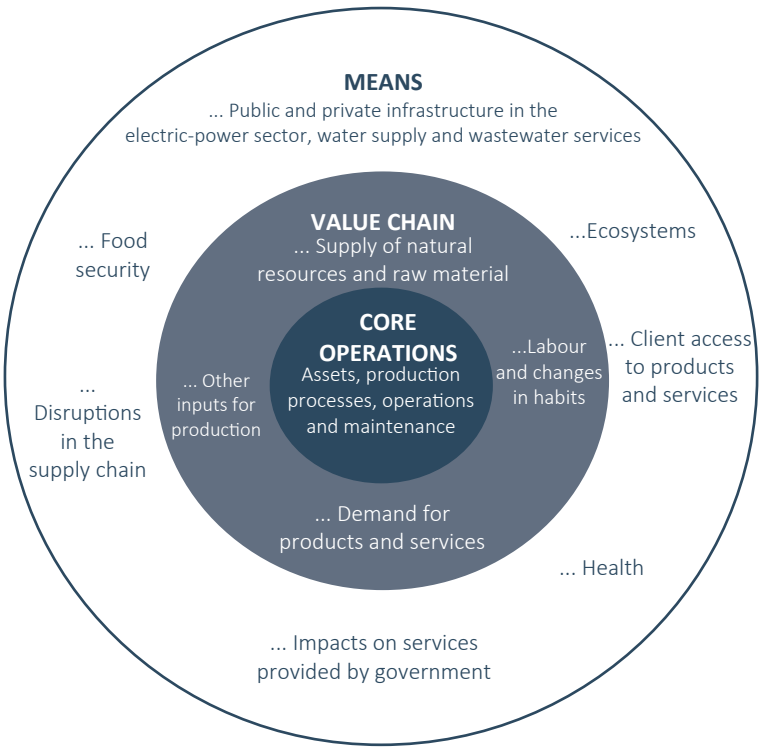

Figure 5. Influence zone of Industry on the Adaptation[2]

Climate change may also increase the exposure of industry to non-physical risks (i.e., reputational or market risks) as a consequence of higher investment, insurance and input costs, and decreased financial measures. Potential impacts on the sector may go far beyond economic and structural losses, and affect the capacity of industry to generate jobs and income.

5.3.2. The Crosscutting Nature of Vulnerabilities and Adaptation Measures

The impacts of climate change on other economic sectors also have repercussions upon industry and require preparation of combined adaptation strategies (Figure 6). Within the context of drafting of this NAP, reduction of exposure and vulnerability in the following sectors is of greatest interest to the business sector:

• **Water Resources:** water is among the key vectors of biophysical and socio-economic impacts. Changes in rainfall patterns or extreme events which affect availability or quality of water used by industry in its processes, demand preparation of short, medium and long-term adaptation strategies on different

[14] SUSSMAN and FREED, 2008. Self-adapting to climate Change: A Business Approach. Pew Centre on Global Climate Change. Adapted from the document "Primary Contributions of the Industry- CNI", available at the electronic address: http://www.mma.gov.br/images/arquivo/80182/Contribuicoes_Peliminares_PNA _ Sector% 20 industrial_CNI.pdf, accessed at 3/11/15.

scales, as they could dramatically affect levels of industrial activity, generating higher costs and reducing the feasibility of certain water-intensive segments.

For facing up to these scenarios, it is imperative that support and encouragement be given to initiatives that target improved water efficiency in industrial processes and reuse of water.

• **Agriculture:** This sector provides basic inputs for an array of industrial segments, including paper and pulp; iron and steel; food and beverages; mining; chemical, etc. Changes in availability of such inputs can affect continuity of operations in these sectors.

• **Biodiversity:** A number of industrial segments, including pharmaceuticals, cosmetics, biofuels, forestry-based, chemicals, etc. are likely to be affected by reduced biological diversity and associated ecosystem services that are important for water and raw-materials production, climate regulation, nutrients cycles, pollination, seed dispersal, etc. Negative impacts on biodiversity and associated ecosystem services may generate economic risks, including fewer opportunities for generating value through creation of innovative products and increased competitiveness.

• **Coastal Zone:** A major portion of Brazil's industrial facilities are located in coastal areas that are susceptible to a rise in sea levels. Lower flow levels in rivers and higher sea levels may result in encroachment of saltwater, affecting the salinity of water used by industries in coastal areas, especially, those located in estuary areas.

• **Infrastructure (energy, transport, telecommunications, cities):** Reinforcement of the resilience of critical infrastructure is crucial for the effectiveness of initiatives targeted at industrial adaptation.

• **Health:** Extreme climate events present risks to the health and safety of workers, especially those involved in outdoor activities such as mining and construction. Higher temperatures are liable to affect recruitment, retention, safety and productivity of industrial workers, and to increase accident hazards.

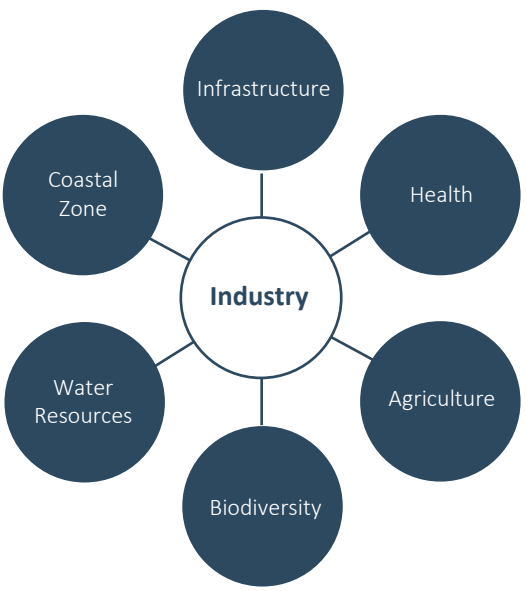

Figure 6. Crosscutting nature of adaptation measures

5.4 Guidelines

More than any other, the public sector has capacity to model the impacts of climate change and to ensure that the challenges of adaptation posed for society as a whole

are adequately addressed.

The sectoral guidelines aim to foster the development of policies that facilitates adoption of adaptation measures by the private sector and to promote the consideration of an adaptation perspective into decision-making of public and private stakeholders, thereby enabling coordination and convergence with policies of other sectors.

During review of the Industry Plan and Low-Carbon Mining Plan, these guidelines will serve as a basis for formulation of a Plan of Action for Adaptation, to complement the respective mitigation initiatives proposed under these Plans.

In the light of preliminary contributions forwarded by the National Confederation of the Industry's Technical Chamber for Adaptation, discussions within the framework of the Working Group for Adaptation of the Inter-ministerial Committee for Climate Change (CIM) and inputs prepared by the Centre for Sustainability Studies of the Getúlio Vargas Foundation (State of the Art Mapping on the Topic of Adaptation in Brazil) the following guidelines were prepared:

1. Deepen knowledge on impacts and specific vulnerabilities on industrial subsectors: This guideline is to be developed jointly with initiatives that stimulate research into the impacts, vulnerabilities, opportunities and appropriate adaptive measures of companies of various sizes in each industrial subsector, with the aim of consolidating databases, defining indicators, downscaled mapping of risk areas and making information accessible for decision-making and formulation of prevention plans.

2. Establish an institutional framework to facilitate implementation of adaptation measures: Adoption of effective adaptation measures requires an institutional environment that promotes inclusion of an adaptation perspective to climate-risk management for companies without compromising competitiveness of the national economy. This guideline aims to stimulate organization of information on adaptation and consolidation of inter-sectoral discussion forums, promotion of joint adaptation strategies, and to facilitate access to sources and mechanisms for implementation of adaptation measures.

3. Develop decision-making support tools for Adaptation in Industry: Adoption of adaptation strategies will be facilitated by development of tools for incorporation of knowledge of impacts and vulnerabilities designed to assist with decision making at strategic and operational levels. Such tools may consist of fiscal incentives and tax credits; templates for adaptation strategies; and development of maps of likely short, medium and long-term impacts based on projected climate scenarios.

4. Raise awareness among micro and small businesses of adaptation topics within the sustainability agenda: Micro and Small Businesses form the largest contingent of industrial companies and are generally the most vulnerable and least prepared to adopt adaptation measures. It is therefore important to work jointly with small-business support institutions through targeted actions, training, funding for adaptation investments, and drafting of guidance manuals and business continuity plans for adaptation to disasters.

5. Introduce climate-risk considerations into sectoral policies and encourage consideration of such risks in corporate decision-making: Facing up to climate change requires progressive inclusion of climate-risk mitigation measures in public policies and introduction of climate scenarios into government planning. An adaptation perspective should also be incorporated into business decision-making when considering location of facilities, supply chains, logistics and communication strategies, to enable identification of impacts, analysis of vulnerabilities and implementation of adaptation measures.

6. Provide stimulus for the capital-goods segment so as to increase the resilience of society: The aim of this guideline is to orient formulation of targeted policies for development of the goods and equipment industry that favour adaptation and increased resilience, including equipament for reuse, water desalination, construction work, thermal comfort, automation of outdoor activities, etc.

7. Alongside the National Confederation of Industry (CNI), promote a strategy for collaboration among Labour Unions and Industrial Employers' Federations for development of joint strategies for climate-risk management in industries located in sensitive regions: The territorial dimension of adaptation imposes a need for extensive coordination among players at the municipal, state and federal levels. All too often, the role of coordinating the sectoral and local aspects is relegated to local-level players, making their role in evaluation and planning of adaptation activities of key importance, especially in sensitive areas.

8. Foster Ecosystem-based Adaptation (EbA) practices as tools for strengthening territorial and industrial resilience: Adaptation measures targeted at reducing vulnerability of territories to potential impacts of climate change also reduce, in a synergic way, industrial vulnerabilities. In this context, use of biodiversity and of environmental services as components of an adaptation strategy for addressing adverse effects of climate change may present an alternative for strengthening climate resilience of the industrial sector. For example, regional investment initiatives for river-basin management and recovery may contribute to preservation of headwaters, thereby ensuring sustainability of water supplies.