

THE IMPACTS OF INDUSTRIAL DEVELOPMENT IN BRAZIL

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Summary

Brazil, the strongest economy in Latin America, has a diversified and increasingly decentralized manufacturing sector. The country is rich in minerals, hydrological resources, biomass and biodiversity, solar energy and fertile soil. In addition it is the fifth most numerous country and has a culturally diverse population with European, African and indigenous background. However, the benefits and wealth of development are unevenly distributed with a significant proportion of the population living in poverty and deprivation. Indeed, according to the United Nations Human Development Report, Brazil is currently ranked at the top in terms of the existing social and economic inequalities. As in other parts of the world industry has treated the environment in Brazil as provider of resources and as recipient for residues from production and consumption. This attitude has caused widespread environmental destruction and contamination of air, water and soil. Industry can prevent further environmental degradation, by being a positive agent providing the economic basis for sustainable development. The focus should be on production that meets and enhances quality of life and that reduces inequality and poverty without generating negative environmental impacts. The new paradigm of *sustainable production*, widely discussed as *industrial ecology*, offers solutions to the existing problems. A shift from the linear perception of manufacturing production towards a closed systems approach is required. The challenge remains as how to promote a change of attitudes and values among the industrial sector,

the public, stakeholders and consumers as well as other policy and decision makers. There are examples in Brazil, where industry has already undertaken the radical change towards greater eco-efficiency and cleaner production.

1. Introduction

The following analysis of social and environmental consequences from industrial development in Brazil concentrates on the situation prevailing during the twentieth century: the period of decolonization and recent globalization. The discussion is based on a geographical systems perspective. Specific regional economic and social outcomes and environmental impacts of this process are identified and analyzed and pathways of alternative development towards clean production are presented. Although the environment is an important component for industrial production, providing the necessary resources without which there would not be any development or economy at all, it is not taken sufficiently into consideration. A range of different questions will be addressed in this article, such as: What were and what are the driving forces for industrial development and what are its impacts? How are different regions affected by industrial development? What are the social and environmental outcomes of industrialization? What are recent and future challenges in view of a more sustainable society in Brazil?

The theoretical framework for the discussion is based on concepts from Development Geography and Environmental Science. Development Geography has emerged during the 1950s and 1960s, basically to interpret and understand 'underdevelopment' of former colonies and specific regions, as well as to find ways to overcome this legacy. From the experiences in Europe and North America, industrialization was understood as an important motor for progress and thus, early on, industrial development became the key area in strategic development planning. The present analysis considers regional economic and social conditions resulting from the adoption of this development model.

During the past decades new concepts and propositions searching for more appropriate development have been generated within Geography and Environmental Science. Especially since the UN Conference on the Human Environment, held in Stockholm in 1972, greater attention has been given to the consequences of human activities and economic development on the environment. Among the outcomes of the conference was the elaboration of a *Declaration on the Human Environment* and an Action Plan containing several recommendations. These early results were some of the milestones for the *Rio Declaration* and the *Agenda 21*, the outcomes of the UN Conference on the Environment and Development, known as the *Earth Summit*, held in Rio de Janeiro in 1992. Unfortunately the Conventions on Climate Change and on Biological Diversity discussed during the Summit and proposed as an important breakthrough to ascertain greater sustainability, were not adopted due to disagreement, particularly on the part of USA. Industrial production is also co-responsible for climate change because of the release of emissions that enhance the greenhouse effect and deplete the ozone layer.

The demand from people worldwide to tackle poverty and environmental degradation is growing and it has become evident that our development model has failed to deliver the answer to these concerns. Industrial and agricultural production, mining, forestry and

fishing as they are widely practiced today cause negative impacts on the environment and reduce the resource availability. There is no other option than a radical change in production modes and consumption patterns in order to safeguard the quality of life of present and future generations. The industrial sector directly interferes with the environment by extracting and transforming natural resources and by generating negative tradeoffs (pollution, waste). Industry is under pressure from the government and from public stakeholders to assess their activities in terms of environmental impacts and social conditions.

Sustainable development has been defined by the *Brundtland Commission* as "the development that satisfies the needs of the present without compromising the ability of future generations to meet their own needs". A similar approach is taken with "...sustainable development being development that comprises the economic and social development that protect and enhance the natural environment and social equity". The concept of sustainability is certainly contestable and ambiguous because the term itself already bears a contradiction. According to the different perspectives between the North and the South, and between governmental and non-governmental organizations, the focus is either on environmental management and protection or it is rather exclusively on economic development. The term sustainable development embraces social, economic and environmental perspectives and at the same time concerns future generations. The definition rather fulfils a role of guidance, albeit without providing prescriptions on how to address particular sustainability issues in practice.

Several different development strategies have influenced the distribution and diversification of industrial production in Brazil since the beginning of the twentieth century. Growth-driven modernization theories are contrasted with bottom-up development models. Historically embedded factors, current patterns and future trends in industrial development are outlined in this section. The industrial sector plays a key role in the country's economy but also in the overall development. For nearly a century, industrial production has contributed to the generation of wealth, positioning Brazil ninth among the world's largest economies. According to *UNIDO*, the Gross Domestic Product (GDP) in 1997 was circa 804 Billion US\$. Nevertheless, this development has been very uneven in terms of income distribution and access to resources and quality of life. According to the *UNDP Human Development Report* Brazil is among the countries with the largest social-economic disparities: where immense profits are made next to extreme misery.

Social and environmental impacts are often consequences of urbanization and industrial growth, as well as of the industrialization of agricultural production and the emergence of new resource intense consumption patterns. These tradeoffs are not equally distributed among the population and within the country. There are strong regional differences in Brazil, in terms of the degree of air, soil and water contamination, the distribution of wealth, poverty and exposure to health risks. The manufacturing sector and business in general are important actors in this scenario. Equity and environmental justice question the access and distribution of resources. These questions are increasingly becoming the real challenges for local and global decision making.

There are strategies and policies to promote clean production and sustainable industries. These include the enforcement of environmental policies, of voluntary certifications and

accreditation. Technological innovations also contribute to the reduction of pollution and waste production. *Lifecycle Analysis*, *Ecological Footprint Analysis* and the *Extended Metabolism Model* are useful tools to quantify and qualify impacts of production and consumption. They help to identify possible negative impacts from production processes and from final products and they assist in determining measures to mitigate these impacts. These tools can help to increase the environmental and social responsibility of business. Environmental awareness ultimately translates into responsible production and consumption patterns and less resource intense lifestyles. The knowledge acquired by now will provide the opportunity for others to follow and to make a difference.

2. The rise and transformation of industrial production in Brazil

Before discussing the processes and the outcomes of industrial development in Brazil it is important to remember that a culturally diverse indigenous population had occupied the land for thousands of years before the arrival of the colonizers. This population survived on the given natural resource base without causing major damage or threat to the environment. With the colonial invasion the majority of the indigenous population was killed, enslaved or expelled from their homelands. The colonial expansion further introduced the still ongoing process of environmental degradation and contamination.

With the extraction of mineral and natural resources during the colonial and postcolonial period the social, cultural and economic regional disparities were consolidated. Regardless of regional fluctuations between periods of economic boom and periods of decay, the South and South-east of Brazil concentrated most of the wealth produced throughout the country during the past centuries. Since colonial times this part of the country operated as the main economic and political center. Except for some periods of booming extractive activities (e.g. latex extraction in the Amazon, sugarcane plantations in the North-east, extraction of medicinal plants in the transitional forest in the Midwest or cattle ranching in the Pantanal in today's Mato Grosso and Mato Grosso do Sul) the North and North-east remained the providers of natural resources and labor to sustain the economic growth in the South and the South-east.

Since the late 1870s coffee was a major export commodity, facilitating the accumulation of wealth in the South-east and setting the basic condition for industrialization during the first half of the twentieth century. The initial expansion occurred with the production of consumer goods, textile and food processing industries, which were concentrated in the states of Rio de Janeiro, São Paulo and Rio Grande do Sul. Textile firms made up the largest proportion of the early industrial clusters formed in these states. New firms were established by private initiatives, mainly European immigrants or their descendents. Among the early successful businessmen are the examples of Visconde de Mauá during the nineteenth century and Francisco Matarrazzo, during the beginning of the twentieth century. Subsidiaries of large foreign companies were established after World War I in the chemical, pharmaceutical, motor vehicle (*General Motors, Ford*) and meat processing (*Swift, Wilson, Armour, Anglo*) sectors.

Industrialization was considered the key factor in achieving economic development and greater independence from the core countries. Under the regime of Getúlio Vargas

(1930-45) the consolidation of the New State (*Estado Novo*) was initiated by encouraging the process of import substitution and by building up a strong national basic industry. The key areas of transportation, energy and mineral resource extraction and transformation received financing from foreign, state and private capital. During that period the government pursued a strong policy of inward oriented industrial expansion and incentivated urbanization. The state prevented clashes of interests between the traditional agrarian elite and the emerging industrial power, by accommodating their interests within the prevailing development policies. In 1942 Brazil's first large-scale iron and steel plant, *Companhia Siderurgica Nacional (CSN)*, was built in Volta Redonda (RJ). The construction was financed by USA in return for Brazil's support to the Allies during World War II.

Many iron and steel plants initially relied on charcoal as the basic energy source. The extraction of charcoal encouraged widespread deforestation in several parts of the country. The state of Minas Gerais, originally covered with native forests, had supplied the sector for decades with charcoal, transforming the region into a production center for heavy industries. Coal mining was also incentivated through the iron and steel sector. Other steel plants, such as the CSN used coal instead of charcoal in their production, which was extracted in South Brazil and shipped to the industry out of Imbituba and Laguna harbor (SC).

Volta Redonda was the largest steel production site in Latin America. In the same year a public mining enterprise *Companhia Vale do Rio Dôce* was established, taking over the ore deposits originally exploited by the British group *Itabira Iron Company*. The following development period was influenced by the prevailing ideas of modernization, imperialism and dependency, leading to different regional outcomes. Investment and policies favored the existing industrial centers in the South and South-east, whereas the rest of the country remained backstage.

A unique development model was pursued in the southern state of Santa Catarina, where predominantly European colonization (especially from Italy and Germany) led to a diversified small-scale agricultural and industrial production pattern. Having developed strong industrial clusters from early on, Santa Catarina is now characterized by the absence of state-owned companies or large transnational firms. Five major industrial sectors are present in this state, of which the electrical and engineering industry, established in 1930, in the coastal region near Joinville, is the most important. The textile and garment industry, the second most important sector, is concentrated mainly in the Itajaí valley around Blumenau, in the North-east of the state. The first textile industries were already established during the late nineteenth century. Food processing is the third largest industrial sector in Santa Catarina, the main exponents being chicken, turkey and pork processing. Most of these industries were established during the 1950s. Ceramics, furniture and wood industry form another smaller industrial cluster. The predominance of small to medium-scale industrial clusters puts Santa Catarina into a special position, although, sector-specific firm concentrations can also be found in many other states, as outlined further on.

In 1942, Robert Simonsen, a wealthy and powerful businessman from São Paulo created the *Center for Industrial Professional Training (SENAI)*. This initiative is jointly

sponsored by the government and the business community. Since then the center has played an important role in providing the technical and professional qualification of the workforce, required by the expanding industrial activities.

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Biographical Sketch

The author, **J. Gutberlet**, was born in Langen, Germany, where she received her primary education before moving with her family to Brazil. She completed her secondary education in São Paulo and obtained a Bachelor's degree in Biological Sciences at the *Universidade Estadual de São Paulo* in Rio Claro (UNESP). After a one year research fellowship at the Department of Geography at the *Universidade de São Paulo* (USP) studying the evolution and impacts of changes in land-use in the periphery of São Paulo, she went back to Germany to study Geography at the *Eberhard-Karls-Universität* in Tübingen, receiving her Dr. rer. nat. in 1990. Her dissertation is cross-disciplinary and focuses on social and environmental impacts of industrial production in Cubatão, Brazil. Within this research endeavor she conducted a *moss-bag monitoring* to evaluate the space/time distribution of heavy metal air pollutants in the study area. The work was first published in German and has also been translated to Portuguese and published by the *Universidade de São Paulo* (EDUSP). Since receiving her PhD she has held positions with the World Food Program in Rome (working with disaster relief in Ethiopia and Djibouti), with the Food and Agriculture Organization in Quito, Ecuador (working on agroforestry and environmental education), and as project manager of a German Brazilian research project in Mato Grosso, Brazil (focusing on the social and economic structure and environmental impacts). Her publications include books and journal articles on a wide range of topics in the Brazilian context, such as social and

environmental impacts from industrial production and ISO14000, social exclusion and sustainability questions in rural and urban communities, participant and action research on quality of life in the urban periphery, Agenda 21, and, recently, the evaluation of the social and economic conditions in coastal fishing communities. She has been a research associate of the *Centro de Estudos de Cultura Contemporânea* in São Paulo, and has taught Geography and Environmental Science at the University of Newcastle, Australia from 1996 to 2000. Since 2001 she has been Assistant Professor at the University of Victoria, in Canada. Her current research interests are in the areas of Development and Social/Urban Geography, studying social and economic impacts of restructuring, appropriate resource management, public policies and sustainability.