

## **Environmental Technology Transfer Opportunities in Venezuela**

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By: Juan Carlos Sánchez M.

### Introduction

The industrialization process in Venezuela started by importing technologies from developed countries. This acquisition of industrial production capacity no necessarily represented an access to technological capacity as well. In many cases the high level of inequity in technological capacities of technology exporting and importing firms resulted in a negative impact on the production cost incurred by the importer. This led toward government and industrial company initiatives to develop local capacities for effective assimilation of the imported technologies to reduce the costs. This in turn conducted to an increase in the ability to evaluate and select technologies and suppliers and hence increase the effective control over the technological dimensions of future industrial projects. However, the magnitude and nature of the developed capacities was very variable and much has still to be done.

Technology needs to improve the current development condition and reduce environmental pollution in Venezuela as well as in other countries in the Region, encompass a broad set of physical, institutional, human and organizational resource development. The environmental consequences of combined population increase and limited economic growth seem certain without the adoption and development of

techniques, processes and management resources that make possible to meet human needs without significant damages to natural resources.

The growing awareness about the regional and global implication of some forms of environmental deterioration, the increase of interdependency of the world economy, and the unbalanced international distribution of technical and financial resources, creates the opportunities for technology transfer; a process where responsible public institutions and corporations in developed countries make advanced environmental technologies available to developing countries, as well as the capacity to use it. Today the cooperation agreements and partnerships for technology transfer are not understood as acts of altruism, but rather as a share of responsibilities and opportunities.

#### Technology Needs in Venezuela.

The Venezuelan economy highly depends on oil; hydrocarbon products, steel and aluminum export revenues. The related industrial activities include oil exploration and production, oil refining, petrochemical, chemical, and cement manufacture, mining and others. The diverse and abundant energy resources available in the country facilitated the development of these activities. The total volume of energy proven reserves is 115 billion barrels of oil equivalent, of which conventional oil represent 64% of the total, natural gas 28%, hydro 0.2% and coal 7.8 %. The total primary energy production is 4.9 million barrels of oil equivalent per day (boe/d), and total domestic consumption of energy is 0.75 million boe/d (15% of total primary production).

Electricity generation is 0.5 million boe/d, and the ratio of hydro to thermal generation capacity 75/25. At present 92% of the country's population has access to commercial electricity services.

Efficient management of environmental pollution risks related to energy production, industrial activities, and land use practices in Venezuela is necessary to comply with the existing environmental protection laws, and represent an important challenge. More than 54% of the national territory is under one or more legal forms of resource protection, natural forest representing more than 50% of the Venezuelan territory harbor valuable and diverse genetic resources. (Venezuela ranks among the first megadiversity countries in the world). The risks of loss and degradation of these ecosystems is a subject of increasing concern. There is a need for the identification, assessment, acquisition, development, adaptation, and integration of technologies for environmental risk prevention and control to face the challenge, which creates opportunities to international technology transfer in the public and private sectors.

These opportunities will increase in the next decade due mainly to the expected increase and improvement of public services, and the expansion of the oil and gas production, as well as mining, agriculture and forest activities, included in the national development plan.

A sample of specific environmental protection activities representing opportunities for technology cooperation and transfer includes the following:

- Minimization and disposal of solids and semi-solids wastes from oil exploration, production and refining
- Reduction of venting of gas in oil and gas production facilities
- Reduction of leaks and recovery of volatile organic vapors in hydrocarbon products storage facilities
- Extension and enhancement of existing gas distribution systems
- Domestic solid waste recycling and disposal
- Efficiency improvement in the generation, transmission and distribution of electricity
- More efficient use of energy in boilers, heaters, engines and some uses of electricity in the industrial sector

- Boilers conversion from liquids to gas in the manufacture industries
- Renovation of motor vehicle fleets for public transportation
- Use of advanced catalytic process to produce clean fuels
- Renewable energy supply to remote communities
- Better selection and control in the use of agrochemical
- Strengthening of native forest protection and management
- Development of sustainable agro-forestry systems

### Capacity Building Needs

The main specific capacity building needs identified in Venezuela includes:

- Preparation of the specialized human resources that provides support to government offices in charge of the international economic relations on the related environmental protection matters
- Preparation of human resources for technology transfer policy formulation
- Preparation of human resources for the assessment, adaptation, development and management of transferred technologies
- Development of more specific government policies, as well as guidelines on technology transfer for the productive sectors, academic institutions, and civil society organizations
- Better access to international information networks for environmental technology research, development and application
- Enhancement of local information networks on technology development, application and use, to enhance the knowledge of available technology options that meet the specific requirements of the productive sectors

## Barriers to Technology Transfer

Today the value that technology provides in most productive processes is understood as a key to business success. Also, the adequate control of environmental risks in the productive processes, the manufacture of clean products and the supply of clean services are an important competitive factor for many industrial companies.

Support for developing, adapting and adopting technologies in Venezuela is provided by public Universities and research centers. Large corporations have developed internal research and development organizations. However the existing interactions mechanisms between the public institutions and the productive sectors need to be improved. Specific requirements includes:

- A better information mechanism about the specific needs of private sectors
- A better availability of the information related to the studies conducted by the public research institutions
- More exchange of human resources between the public institutions and private companies

This situation contributes to the individualism of technological development efforts, which is a significant barrier to international technology transfer in those industrial areas requiring the participation of multidisciplinary and consolidated groups for technological progress. The national oil company, *Petróleos de Venezuela S.A.*, having developed its own research and development branch, which has established exchange network with Universities and research centers at local level and abroad, is an exception to the above mentioned situation.

Other than the limited interest and resources available at local institutions to diffuse the technological efforts and results, the communication media dedicates a very limited

attention to inform about the technological and scientific innovations of relevance to producers. An additional consequence of this is that citizens do not value adequately the scientific and technological activities, and as consumers do not have an adequate level of information and exigencies on products and services that incorporates a high technological component.

Notwithstanding the existing barriers and needs and limited resources, successful experiences of technology cooperation and transfer took place in Venezuela during the last two decades in various sectors, these experiences were linked mainly to the policy of privatization of public services and the steps made toward the opening of the economy to free market conditions. Telecommunications, water supply services, public transport, petroleum industry, medical services, construction and building are sectors that can show successful examples of technology transfer. These examples encourage the development of new initiatives to promote the interactions among governments, public and private industry, multilateral institutions and non-governmental organizations to facilitate the access to new and sound technology to sustain the efforts for development.

#### Elements for successful transfer of technology.

Some key actions identified at the government level as successful element to facilitate technology transfer are as follows:

- Set industrial, economic and environmental policies that facilitates technology cooperation.
- Set strategies to promote the participation of private sector in these cooperative efforts.
- Conduct the necessary institutional reorganization and strengthening to implement the technology transfer policies.
- Establish partnership initiatives to fund cooperative efforts for development and adaptation of environmental technologies, as well as local training on project management, technical knowledge and facilities maintenance.

- Verify alignment of the transfer programs with the national goals of sustainable development.
- Concentrate more efforts on the diffusion of commercially proved technologies and current best practices than in new development and research.
- Take into account the views of private sectors and public institutions concerned with specific technology developments.

Regarding the Industrial sector actions, the following actions were identified:

- Adoption of corporate policies and guidelines for environmental management, establishing environmental criteria that facilitate technology transfer.
- Ensure compliance with environmental standards and adequate environmental risk control when transferring technical and managerial skills.
- Harmonize environmental and economic goals of technology cooperation. Mutual environmental and economic benefits are the most important keys to success in technology cooperation.
- Promote business partnerships that help to spread the use of environmental technologies and the implementation of operational practices aimed at reducing the use of natural resources and pollution prevention.
- Manage technology cooperation as a process to add value to the core business, rather than a public relation activity.

Successful international technology transfer not only requires access to information, local managerial skills, and training, other important aspects are the terms of financing. Difficulties of licensing, intellectual property protection, and trade regulations can also limit the availability of technology.

In this regard, interaction among governments to facilitate technology transfer must be based on the recognition of mutual interests and consideration of the particular needs of

participating institutions including private and public enterprises, financial institutions and non-governmental organizations.

The transfer of environmental technologies that have been developed in response to environmental requirements and settings that are very different to those of the host country usually fails or conduct to poor results.

#### Implementation of Article 4.5 of the Convention

Article 4.5 of the convention on climate Change states that “The developed country Parties and other developed Parties included in Annex II shall take all practicable steps to promote, facilitate and finance, as appropriate, the transfer of, or access to, environmentally sound technologies and know-how to other Parties, particularly developing country Parties, to enable them to implement the provisions of the Convention. In this process, the developed country Parties shall support the development and enhancement of endogenous capacities and technologies of developing country parties”.

The provisions of the Convention on Climate Change and the Kyoto Protocol do not include mandatory greenhouse gas emission reduction targets for developing countries.

Emission reductions in developing countries can only take place under a voluntary basis or through the Clean Development Mechanism, once the Protocol enters into force.

Developing country interest in technology transfer responds primarily to economic progress objectives and to solve local environmental problems. However, there are many opportunities for emissions reductions in developing countries as a coincidental result of projects conducted for other reasons.

Integration of climate change objectives in technology transfers for non-Annex I Parties must remain a voluntary option to be considered, and not a mandatory condition for access to technology. Criteria to accept the integration of the climate change objectives



would include the incidence of these objectives on the main project purposes and also the incidence on the cost for the non-Annex I Parties institutions or enterprises participating in the transfer of technology.