

CLOSED-LOOPED CYCLE PRODUCTION

in ECUADOR

ECUADOR PRODUCTION SECTOR *DIAGNOSTIC*

March 30th, 2011



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The views expressed in this document are those of the authors and do not necessarily reflect the views of the involved organizations.

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RESUMEN EJECUTIVO – ESPAÑOL

I. ANTECEDENTES GENERALES SOBRE EL PROYECTO DE CICLO CERRADO EN GENERAL

Antecedentes

El Ministerio de Coordinación de la Producción, Empleo y Competitividad de la República del Ecuador (MCPEC), está comprometido con el sector productivo para la introducción de prácticas de uso racional y eficiente de los recursos naturales nacionales y la energía, con la finalidad de crear un sector productivo más competitivo y sustentable. Para ello, el Ministerio presentó un mandato especial para tratar de promover el uso racional y eficiente de los recursos nacionales y la energía, se indica en el Decreto 145, 27 de febrero de 2007.

El Ministerio solicitó al Departamento de Desarrollo Sostenible de la OEA (Organización de Estados Americanos) www.oas.org, estudiar conjuntamente la viabilidad de la implementación de mecanismos e ideas innovadoras para mejorar la competitividad del sector productivo del Ecuador de una manera sostenible. En este sentido, la sección de Energía y Mitigación al Cambio Climático del Departamento de Desarrollo Sostenible de la OEA ha estado llevando a cabo un diagnóstico inicial del sector productivo ecuatoriano para evaluar el potencial y los desafíos de la introducción del método de Producción en Ciclo Cerrado (PCC) en el sector de la producción productivo. Además, el MCPEC y la OEA están preparando las condiciones para la ejecución de un proyecto piloto en Ecuador contemplado para la segunda fase de un programa multi-anual, con una visión de incorporar la experiencia adquirida y los resultados con los esfuerzos en curso del Programa de Recursos Eficientes y Producción más Limpia llevado en conjunto entre PNUMA y ONUDI y la red Latinoamericana y del Caribe de Centros de Producción Limpia.

Objetivo General

El objetivo general de este proyecto es introducir y aplicar la filosofía de producción en ciclo cerrado (PCC)¹ con enfoque en el diseño de la “*cuna a la cuna*” en el sector productivo del Ecuador y mostrar los efectos positivos de este método de estimular la innovación, mejorar el rendimiento financiero y socio-ambiental y la competitividad sobre todo en las pequeñas y medianas empresas PyMEs.

Planificación General del Proyecto de Ciclo Cerrado

Se tiene concebido el desarrollo general del Proyecto en tres fases, detalladas a continuación:

Fase 1: Fase Preliminar del Proyecto que incluye

¹ El método de producción en ciclo cerrado se deriva del Método de Certificación de la cuna a la cuna y criterio de recursos eficientes y desempeño en la producción más limpia de PNUMA – ONUDI.

- ✓ Diagnóstico del Sector Productivo Ecuatoriano
- ✓ Identificación y definición del alcance de la iniciativa de la producción en ciclo cerrado (PCC) en Ecuador
- ✓ Identificación de posibles fuentes de financiamiento para la implementación de la Iniciativa de PCC en Ecuador

Fase 2: Demostración de la PCC en Ecuador para lo cual se tiene contemplado:

- ✓ Ejecución de un Proyecto Piloto en Ecuador
- ✓ Arreglos institucionales para la ejecución del proyecto
- ✓ Desarrollo de capacidades a nivel nacional
- ✓ Diseminación de lecciones aprendidas del proyecto

Fase 3: Incorporación de lecciones aprendidas en esfuerzos regionales en marcha

- ✓ Papel del gobierno
- ✓ Creación y difusión de conocimiento
- ✓ “Acunar” la producción en ciclo cerrado en la industria manufacturera

II. SOBRE EL DIAGNÓSTICO DEL SECTOR PRODUCTIVO EN ECUADOR

Introducción

El presente reporte es un Diagnóstico del Sector Productivo en Ecuador y es un componente del Proyecto de *Producción en Ciclo Cerrado en Ecuador*, bajo el liderazgo del Ministerio de Coordinación de la Producción, Empleo y Competitividad del Ecuador con la asistencia técnica del Departamento de Desarrollo Sostenible de la Organización de los Estados Americanos bajo la *Iniciativa Producción en Ciclo Cerrado en las Américas*.

Descripción del Trabajo

Se presenta una descripción general del concepto del método “producción en ciclo cerrado”. De igual modo, una visión general de la situación nacional incluyendo aspectos económicos, ambientales, legales y energéticos. Posteriormente se realizó un análisis y presentación del sector de manufactura del Ecuador e iniciativas anteriormente ejecutadas y den marcha de proyectos relacionados a la producción más limpia y eficiencia energética que están actualmente en ejecución. Se generaron indicadores generales del sector industrial tales como contribución al PIB, generación de empleo, industrias en cada subsector manufacturero, e indicadores ambientales y de consumo energético². Con la información indicada y sobre la base de la metodología de trabajo definida y un análisis multicriterio se realiza una calificación de los subsectores priorizados donde se podría ejecutar un proyecto piloto.

² Para la obtención de indicadores ambientales / energéticos se hizo uso de la matriz insumo - producto elaborada por el Banco Central del Ecuador (versión más actualizada año 2007); sin embargo, se tenía contemplado la obtención de estadísticas sobre la base de resultados de de encuestas que lastimosamente no fueron distribuidas al sector.

Descripción del Concepto de Producción en Ciclo Cerrado

Como se indicó en la introducción el método de ciclo cerrado proviene de un método de certificación de la cuna a la cuna, a continuación se presenta una breve descripción del concepto. El modelo actual de producción y consumo, heredado de la revolución industrial, se basa en un diseño unidireccional conocido como “cradle-to-grave” (en español, de la cuna a la tumba) en el que, al finalizar el ciclo de vida de un producto, éste se transforma en un residuo sin valor que se desecha. Es necesario reemplazar este modelo por otro en el que los productos que lleguen al final de su ciclo de vida útil se transformen en materiales de igual o mayor valor que aquellos en los cuales se originaron. Este diseño ecológicamente inteligente es conocido como “cradle-to-cradle” (en español, de la cuna a la cuna) e implica el desarrollo de procesos industriales en los que se utilizan materiales que se convierten en residuos valiosos al alcanzar el fin de su vida útil. La Figura 1 presenta un esquema de ambos modelos de producción³.



Figura 1. Ciclos de vida útil basados en los modelos “cradle-to-grave” y “cradle-to-cradle”

El modelo “cradle-to-cradle” involucra el uso de materiales para la fabricación de productos que, tras perder su valor de uso práctico, vuelven a ingresar al ciclo de producción y sirven para elaborar un nuevo producto cuyo valor es equiparable o superior al original (esto se conoce como ciclo industrial cerrado). Este proceso se distingue de los tradicionales procesos de reciclaje en los que los residuos se aprovechan para la creación de materiales de menor calidad y de uso secundario.

El modelo “cradle-to-cradle” también es aplicable en el campo de la energía. Por ejemplo, en la actualidad se promueve a la energía solar como una fuente limpia y renovable. Sin embargo las celdas fotovoltaicas de las que un panel solar está compuesto contienen una variedad de materiales contaminantes que son dañinos para el ser humano y el medio ambiente. Un panel solar diseñado sobre la base del modelo “cradle-to-cradle” utilizaría materiales biodegradables con el objeto de emular el ciclo de vida de una planta.

³ <http://www.eco2site.com/arquit/aprovecha.asp>

Resultados Obtenidos

A continuación se presenta un resumen de las principales variables evaluadas por subsector de manufactura.

Subsector	Industria de Alimentos y Bebidas(*)					Textiles	Plásticos Plásticos	Químicos Químicos	Metal
	Carne	Camarón/ Pescado	Lácteos	Frutas	Aceite & Grasas				
Importancia Priorizada	Sector Industrial Primario Priorizado							Sector Industrial Secundario Priorizado	
Contribución PIB (manufactura)	8,4%	27,4%	3,9%	5,6%	2,2%	14,3%	6,7%		6,4%
Consumo de Energía	0,32%	4,04%	1,27%	2,05%	2,88%	4,52%	4,10%	3,07%	1,39%
Consumo de Combustible Fósil (Emisiones)	1,48%	9,64%	1,66%	2,20%	5,33%	6,08%	2,60%	0,48%	2,69%
Consumo de Agua	0,17%	1,67%	0,25%	0,65%	0,55%	0,67%	0,40%	1,41%	0,18%
Escala y Complejidad ⁴	B	A	C	C	A	B+	A	A	B+
Numero de PyMEs	1,32%	1,42%	3,73%	1,10%	1,03%	10,80%	5,90%	12,60%	5,10%
Empleo Generado PyMEs	2,39%	1,72%	2,68%	1,23%	2,02%	17,60%	7,60%	10,50%	5,40%

A: Alto;

B: Moderado

C: Bajo

⁴ Referido a cadena de suministro y mercado de exportación así como consideraciones ambientales y uso de suelo

RESULTADOS ANÁLISIS MULTICRITERIO

Sobre la base de la ponderación realizada por el consultor con la ayuda del software de análisis multicriterio *expert – choice*, considerando los valores expresados en la tabla anterior se obtiene la siguiente clasificación en orden de relevancia:

1. Procesamiento de pescado y camarón
2. Aceites y grasas
3. Lácteos
4. Producción de químicos
5. Plásticos y polímeros
6. Textiles

CONCLUSIONES

- ✓ Existencia de un marco legal en el Ecuador para la promoción e implementación de proyectos de PCC;
- ✓ Elevado interés de Instituciones Gubernamentales de implementar programas en el sector industrial promoviendo el uso de tecnologías limpias, reducción de impacto ambiental y aporte a la competitividad, a través de la ejecución de proyectos que reduzcan la importación de productos y uso de combustibles fósiles;
- ✓ Experiencia en ejecución de proyectos previos por parte del sector industrial y la Academia, con el centro Ecuatoriano de producción más limpia;
- ✓ Necesidad de definir un adecuado marco institucional para la ejecución del proyecto considerando un enfoque interministerial, intersectorial y multidisciplinario;
- ✓ Carencia de información del sector productivo relacionada a indicadores ambientales y energéticos que facilitarían la decisión que permita identificar con qué sector iniciar el desarrollo de un proyecto de producción en ciclo cerrado, lo cual conlleva a un análisis más detallado.

RECOMENDACIONES

- ✓ Analizar el marco institucional para el desarrollo del proyecto en sus siguientes fases y el mecanismo de asistencia técnica de cooperación internacional no reembolsable;
- ✓ Generar indicadores en el sector industrial asociados con aspectos ambientales, uso de materiales y energía, y generación de residuos y efluentes con la finalidad de identificar con mayor exactitud el sector industrial donde se debe realizar el proyecto de PCC. Esta actividad puede ser desarrollada por estudiantes universitarios de último año de carreras de ingeniería industrial/química/mecánica, procesos;
- ✓ Convocar a mesas de donantes a instituciones como UNIDO / UNEP con la finalidad de analizar opciones de financiamiento para el desarrollo del proyecto y coordinar el alcance de colaboración de cada institución;
- ✓ Analizar la viabilidad de insertar el componente PCC en el proyecto eco-eficiencia industrial ejecutado por el MIPRO con la finalidad de fortalecer componentes productivos y evitar réplicas;
- ✓ Coordinar con los Ministerios de Ambiente e Industrias, cámaras de la producción y centros de educación superior bajo el liderazgo del MCPEC la realización de talleres y mesas de diálogo a fin de concretar los siguientes pasos del proyecto de PCC e identificar más alternativas de ejecución de proyectos bajo el concepto de PCC.

1. Introduction

This *Ecuador Production Sector Diagnostic* is a component of the *Ecuador Closed Looped Cycle Production Project* under the leadership of the Ecuadorian Ministry of Coordination of Production, Employment and Competitiveness (MCPEC) with technical assistance of the Department of Sustainable Development of the Organization of the American States (OAS) under its *Closed Looped Cycle Production in the Americas Initiative*.

The principle goal of this project is to introduce and implement the Cradle-to-Cradle Design Method as a critical component of the Closed Looped Cycle (CLC) production philosophy⁵ in the production sector of Ecuador and showcase the positive impacts of this method in triggering innovation, improve financial, sustainability and socio-environmental performance and competitiveness particularly in small and medium size enterprises.

This *Ecuador Production Sector Diagnostic* serves as the baseline assessment of the current composition and the principle public policies in place affecting the production sector within the Ecuadorian economy. Furthermore it outlines the macro socio-economic and environmental performance of the different sub-sectors of the production sector based on a set of pre-identified criteria. These criteria are established in order to (1) differentiate between sub-sectors and identify the sub-sector that is deemed most suitable to introduce and apply the CLC production philosophy and (2) allow for the measurement and evaluation of the progress and impacts of the proposed *Ecuador CLC Production Project*.

⁵ The C2C design method under the Closed Looped Cycle Production Philosophy is derived from the Cradle-to-Cradle® Certification Method and the UNEP-UNIDO Resource Efficient and Cleaner Production Performance Criteria.

2. Methodology

This section describes the chronological order and methodologies applied in order to complete this *Production Sector Diagnostic*.

At first the production sector of Ecuador is described, highlighting its composition, scale and implications to the national economy as defined by the Government of Ecuador. The sector's evolution as part of the economy is briefly addressed, where more focus is laid on its current performance and conditions. A first order selection is made of the production sub-sectors prioritized by the Government of Ecuador.

Secondly an analysis is made of the applicable policies, laws and regulations that govern the sub-sectors, their goals and objectives are highlighted and compared to the actual conditions. This will establish the basis or confirm the need for particular interventions necessary to bridge the gap in performance and achieve the policy targets and objectives.

As a result of this sector analysis the Closed Looped Cycle production method is introduced and suggested as a tool to make companies or enterprises in the production sector more sustainable and competitive. Furthermore a set of criteria are introduced to allow for the differentiation between the prioritized sub-sectors and assess their suitability for the introduction and implementation of the CLC production method.

Finally, recommendations are made related to how and in what sub-sector the CLC production method may be of added value to both the sector and achieving the government's objectives.

Methodologies applied

Sub-Sector Performance Criteria

In order to select the most suitable sub-sector for the introduction and application of the CLC production method the following criteria are used:

1. Contribution to the Gross Domestic Product (GDP);
2. Material use expressed in [ton/year];
3. Energy consumption expressed in [MJ/year];
4. Water consumption expressed in [M³/year];
5. (Solid/Liquid) waste production expressed in [ton/year];
6. Greenhouse Gas Emissions expressed in [tCO₂/year];

7. Scale and complexity⁶ of the sub-sector qualitatively rated [1-5];
8. Number of SMEs or employment generated in the SMEs per sub-sector⁷

Some of these criteria are derived from the RECP-indicators established by the UNEP-UNIDO Resource Efficient and Cleaner Production Program.⁸ These are absolute indicators (criteria 2-6) that measure basic data in a given timeframe (typically one year) and allow for the composition of the *resource productivity* and the *pollution rate*.

$$\text{Resource Productivity} = \frac{\text{Resources}}{\text{Production}}$$

$$\text{Pollution rate} = \frac{\text{Pollution}}{\text{Production}}$$

Data Collection Method

The data is primarily collected via literature studies, access to public or open web sources via the Ecuadorian Government's website, and relevant Ministries and Departments. Furthermore interviews are held with key sector stakeholders and a data collection survey is prepared and shared with a select group of companies in the different sub-sectors.

Based on available data, the combination of absolute and qualitative scoring of criteria 1 to 8 (multi-criteria analysis) the most suitable production sub-sector is selected for the introduction and implementation of the CLC production method.

The goal of the project is after this selection to perform a more detailed analysis in that particular sub-sector in order to identify one suitable and cooperative Small or Medium Size Enterprise (SME)⁹ to introduce and apply the CLC production method to one of its products.

⁶ *Scale and Complexity* is defined by the type, amount and interdependency of technologies in the production processes being evaluated

⁷ The definition of SMEs in the context of Ecuador is to be determined and assessed for the technical and financial capacity to implement the CLC production method.

⁸ Presentation: Enterprise Level Indicators for Resource Productivity and Pollution Intensity, *A Primer for Small and Medium Sized Enterprises*, UNIDO-UNEP Resource Efficient and Cleaner Production Programme, October 20, 2010, Joao Pessoa, Brazil, sources: www.unido.org/cp or www.unep.fr/scp/cp

⁹ A small business is a business that is privately owned and operated, with a small number of employees and relatively low volume of sales. The term "small" varies by country and by industry; in the case of Ecuador a Small Enterprise is an individual productive unit that has 10-49 employees, a purchase value or gross revenue between US\$100,000 and US\$1 million or an Activa between US\$100,001 and US\$750,000. A Medium Enterprise is an individual productive unit that has 50-199 employees, a purchase value or gross revenue between US\$1 million and US\$5 million or an Activa between US\$750,001 and US\$4 million (Superintendencia de Companias).

3. General Country Overview

Ecuador is located on the equator in the Northeastern part of South America. The country covers a surface area of 271,000 square kilometers. It contains a dramatic geographical and biological diversity with rich economic potential, around 20% of the total area is declared as National Park, including two world natural heritage sites in the Galapagos and Sangay National Parks. The country consists of four distinct regions: the tropical lowlands of the Pacific coast, the mountains and valleys of the Andean Sierra, the Amazon rain forest of the Oriente, and the Galapagos Islands. The country neighbors are Colombia in the North and Peru in the South and Eastern frontier with the Pacific Sea boundary in the west.

According to the results of the last National Population and Housing Census carried out in November 2010 the Ecuadorian population is about 14.3 million inhabitants. The only information available from the 2010 Census is the total population; final results are expected at the end of June 2011. According to the 2001 Census, 61% of Ecuadorians lived in urban areas, while in 1990 this percentage was 55%. The main economic activity of the citizens living in rural areas is agriculture.

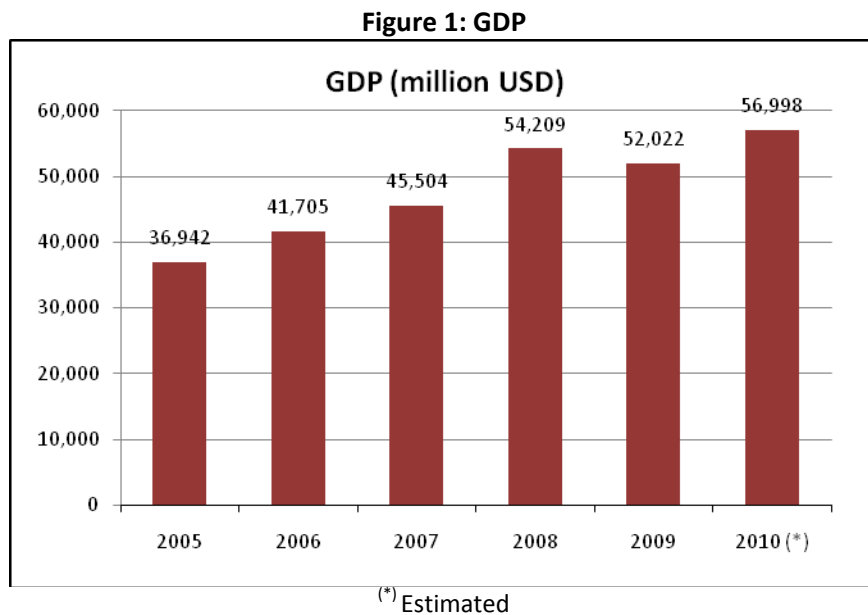
In spite of its impressive wealth of natural resources and other advantages, Ecuador has had economic crisis due to political mismanagement and hyperinflation problems. During the years 1995 to 2005 there were continuous Presidential changes, creating political instability. As the result of hyperinflation during 1999 and 2000, Ecuador's economy collapsed spectacularly, precipitating the adoption of the U.S. dollar as legal tender. Today, the national currency is the US dollar. However the political situation has faced an important shift with the new administration of Raphael Correa which started in January 2007 and its administration has continued working without facing major social and political problems. Correa's administration is highly accepted by citizens throughout the country. After the new constitution approved in 2008 Raphael Correa was re-elected and the second turn started since August 2009.

During Correa's administration considerable changes have been made in order to promote the so called *Revolucion Ciudadana* which tries to recover the role of the Government to promote a welfare distribution to reach social equity, strengthen the role of the Public Institutions and local governments but specially refortify planning agencies since most of them disappeared during the 1990s. As part of the institutional readjustment Correa's administration has created new Ministries, including coordination Ministries grouping specific sectors. One illustration of this institutional change was the creation of the Ministry of Coordination of Production, Employment and Competitiveness which is responsible for

coordinating the activities of the Ministry of Agriculture, Cattle and Fishery, the Ministry of Industry and Productivity, the Ministry of Labor and the National Secretariat of Science and Technology, driven by productivity transformation and public-private partnerships committed to social justice and good living.

The Economic Sector

Ecuador is an oil exporting country and its economy is highly dependent on oil exports but during the last years non-oil products have gained an important contribution because of production policies fostering the export by these sectors. In 2002 oil exports represented 58.2% while in 2010 oil exports represented 55%. The non-oil exports include traditional products exports like Banana, shrimp, cocoa, tuna and coffee and non-traditional products such as flowers, fish, fruit processing, leather, minerals and cars. In 2009, traditional products' exports represented 26.3% while non-traditional 27.4%. Annual GDP has been growing sustainable in the last years, in particular in 2008, mainly caused by the rise in oil prices. In 2009, annual GDP was 52.02 million USD while in 2010 with a higher oil price the estimated GDP will be 57 billion USD. The GDP per capita with 2010 figures is estimated at 4,016 USD.



Source: Banco Central del Ecuador

Another important source of supporting national economy is remittances coming from Ecuadorian immigrants who live mainly in the US and Spain. The migration phenomenon was a result of economic problems in the country caused by the financial crisis at the end of 90's leading to the loss of the national currency *Sucre* and the introduction of US dollar. In 2010 the annual remittances accounted for a value of 2.32 billion USD which compared to 2009

values, 2.49 billion USD, were lower. The reduction in the submission of migrant revenues was a product of unemployment problems in countries like US and Spain.

To finance the national budget, the main sources of income are oil revenues and taxes. In 2009 oil revenues represented 5.05 billion USD, while tax collection represented 7.2 billion USD. An important share of the national budget goes to public expenses, in 2010 the public expenses represented 38.8% of the GDP, subsidies are an important component of the annual budget and represented 7.8% of GDP, including social subsidies to eradicate poverty, housing, social security system, fertilizers, and fuel subsidies. Fuel subsidies represent annually 2.57 billion USD, 53.3% from the total amount of subsidies. Recently, the government is trying to promote policies that regulate the consumption of LPG to heat water, by forbidding the importation of traditional water heaters.

Among the different economic indicators listed by the National Institute of Statistics and Census - INEC the annual inflation rate in 2010 was 3.3%, lower than 2009 figures which accounted for 4.3%. The economic sector with a higher inflation was the agro-industry; with 5.94% while industry 2.02%. On the other hand, according to INEC the unemployment rate in 2010 was 6.1% while in 2009 this was 7.9%, full employment rate in 2010 was 47.1%.

In terms of commercial exchange in USD, the net result is positive with Panama (1,164 MM), USA (1025) RUSIA (494 MM) Venezuela (355 MM) followed by Italy, Peru, Netherlands and Chile. On the other hand, there is a deficit with Colombia (-1,061 MM), China (-969 MM), South Korea (- 686 MM), Brazil (-684 MM), Mexico (-541 MM), and Argentina (- 410 MM).

In order to reduce the dependency of imported products, MCPEC has set different policies aiming to reduce imports and promote competitiveness. According to *Banco Central* during Jan – Oct 2010, Ecuador expended about **USD 15.232 million** on imported products where **31.8%** of these imports were raw materials for the **industrial sector**.

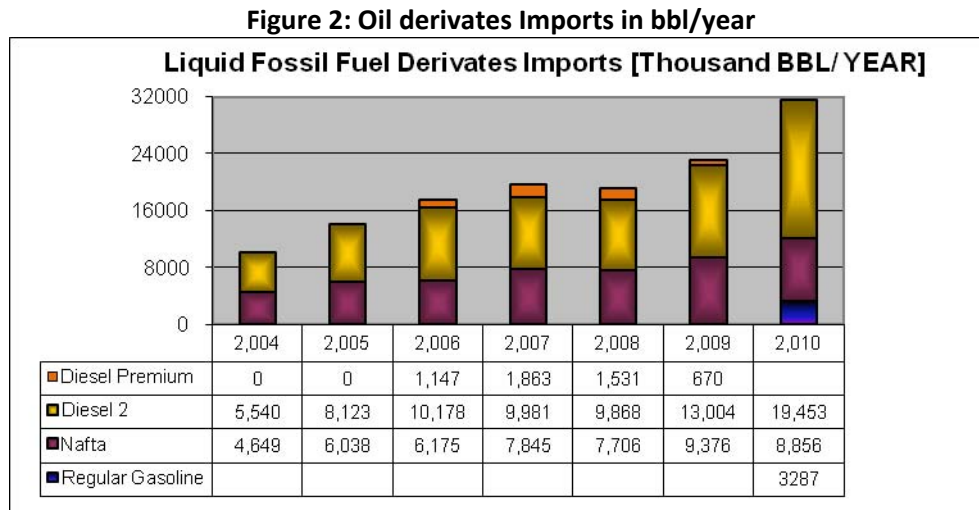
Mexico, Canada and Panama are the three main foreign investors in Ecuador, basically the principle investment sectors or areas are manufacturing industries, mining, transport and telecommunication.

Budget deficit

For 2011 the planned annual budget approved by the National Parliament was USD 23.95 billion acknowledging the existing deficit of USD 4.95 billion. Part of this deficit will be funded by an anticipated sale of crude oil to China; with this purchase Ecuador may receive USD 1

billion. In order to complete the budget gap the government will ask for loans to China Development Bank and some international financing organizations such as CAF and IDB.

In spite of being an oil producing country Ecuador imports fossil fuel derivatives such as LPG, naphtha and diesel. Fossil fuels are highly subsidized in Ecuador. For instance the price of LPG is 0.10 USD/ kg, premium gasoline 0.51 USD/l and diesel 0.25 USD/l. In order to reduce the imports of oil derivatives and make a good use of the existent oil the Ecuadorian Government will build a 300,000 bbl/day refinery, with an estimated investment of USD 12 billion dollars. As figure 2 and 3 show there has been a continued growth of oil derivative product imports, because of the lack of refining capacity in Ecuador. Fossil fuel derivative imports represent more than 20% of annual expenses from the national budget and most of this value can't be recovered due to national subsidy policies. As the figures show, 2010 values are higher because of some problems in the highest capacity oil refinery, which affected the production of regular gasoline (first time imported at national level) and more demand for thermal electricity generation.

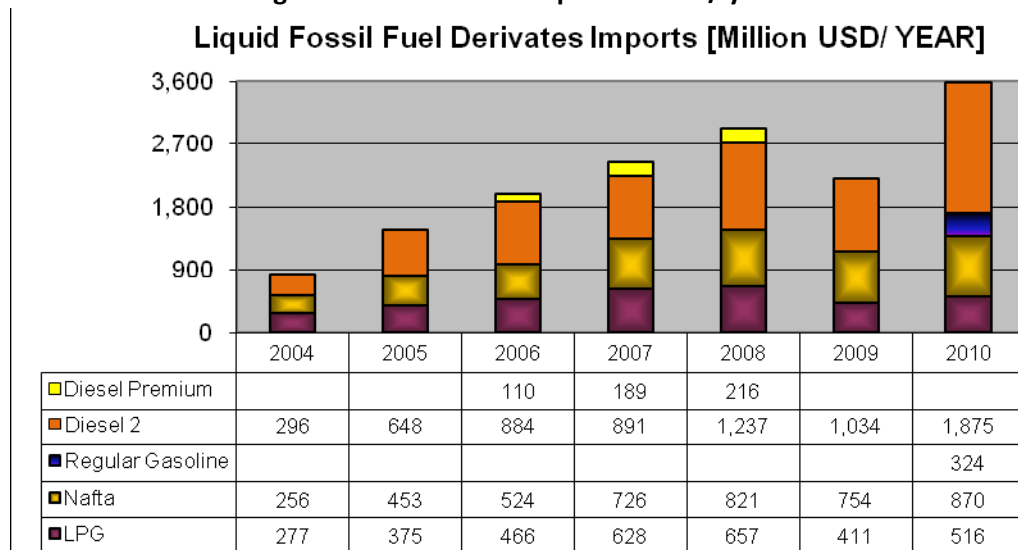


Source: Ministry of nonrenewable energy
Prepared by the Consultant

Figure 3 shows the annual expenses by importing high octane naphthas for gasoline blending preparation, diesel 2 and diesel premium and LPG. In 2010 naphtha and gasoline imports to prepare premium and regular gasoline represented 60.7% of domestic demand, while diesel represented 65.2% and LPG 82.9%. In 2009, 53,8% of naphtha, 50,4% of diesel, and 81,4% of LPG of the national demand had to be imported in order to satisfy local needs¹⁰.

¹⁰ Calculations based on the national energy balance for 2009, prepared by the Consultant

Figure 3: Oil derivatives Imports in USD/ year



Source: Ministry of nonrenewable energy

Prepared by the Consultant

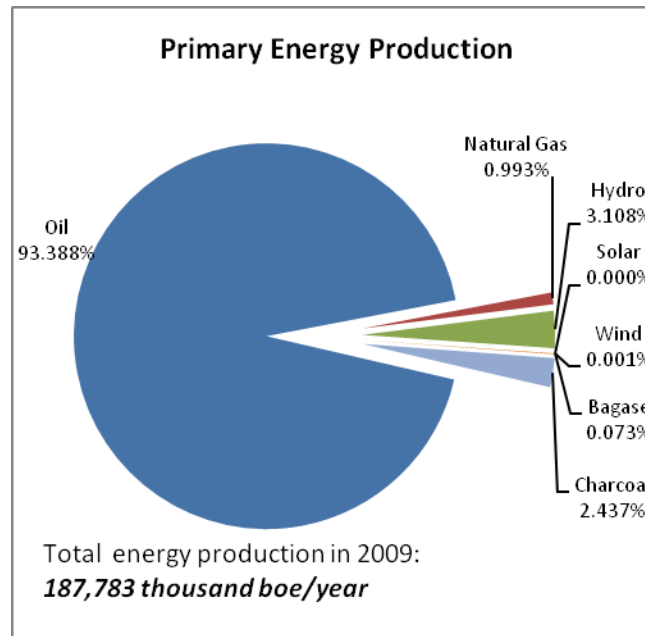
Based on the high yearly expenses and considering the fact that the new refinery will be ready in 2015¹¹, the Ecuadorian government fosters project execution that will promote energy efficiency and use of renewable energy.

The Energy Sector in Ecuador

Ecuador being an oil producing country, has an important influence on the energy supply via fossil fuels. As figure 4 shows, primary energy production in 2009 was 187,783 thousand boe, and fossil fuels accounted almost 95% of the primary energy production, the remaining 5% represented renewable energy sources. Because of the large dependency on fossil fuels the Ecuadorian government is making efforts to change the energy mix to increase the share of renewable energy sources, including hydro, geothermal, biomass, solar and wind energy. This commitment is stated in the *Plan Nacional del Buen Vivir (2010-2013)*.

¹¹ PetroEcuador EP.

Figure 4: Primary Energy Production, 2009



Source: Ministries of electricity and renewable energy, nonrenewable energy, Agenda energética 2007.
Prepared by: Consultant

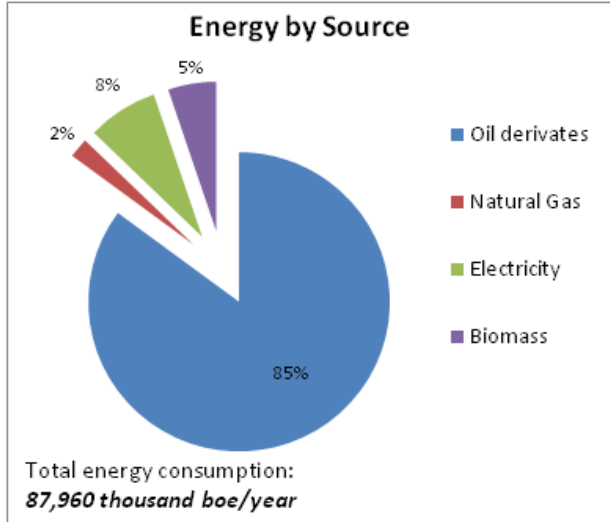
Oil production and power generation are mainly state-owned national utilities. Most of the oil reserves are located in the Ecuadorian Jungle. The Ministry of Natural Resources and Non-Renewables¹² has decided that at these fields companies can extract oil only by having a contract with the Government. *Petroecuador EP* (Public Enterprise) clusters exploration, production, transport, industrialization and commercialization of oil and oil derivatives. In addition to *Petroecuador EP* there is another state-owned company, *Petroamazonas*, responsible for handling the operations of the former Occidental oil company, which contract was cancelled by the Ministry of Natural Resources and Non-Renewables in 2007 because of non-compliance to different contract clauses. As the result of this, the national participation in oil production is currently 56.16%. In 2009 the average daily oil production, including private and state owned companies, was 486,000 bbl/day. The national installed refining capacity is 175,000 bbl/day but in 2009 just 156,000 bbl/day were processed as the result of the limited technological availability of the refineries.

In addition to oil, Ecuador has natural gas reserves located offshore and its production is used in the power sector having a production of 114 Mcf/day. There are some plans to use natural gas for the brick industry located in the Southern part of Ecuador. Coal reserves in Ecuador are 22Mt but there is currently no production of coal in the country. According to the rate of extraction of fossil fuels and the existing proven oil reserves Ecuadorian fossil fuel extraction

¹² See: <http://www.mrnrr.gob.ec/>

has approximately a lifetime of 20 years and this is one of the main drivers to promote energy diversification.

Figure 5: National Energy Consumption

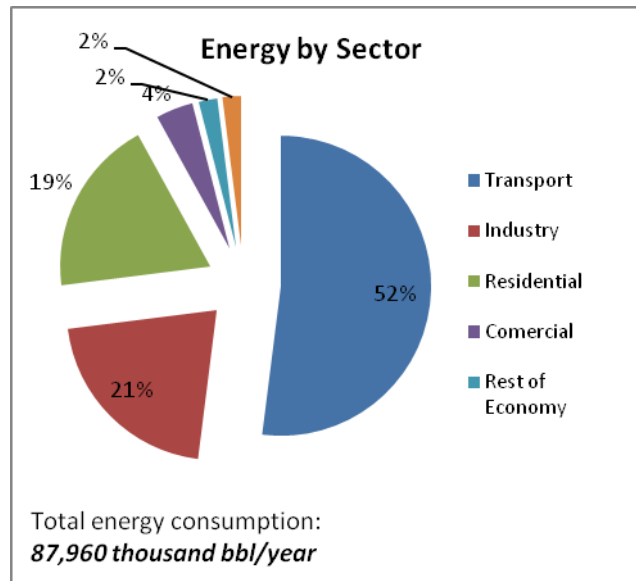


Source: Energy Balance 2009, Prepared by Consultant

On the other hand, the energy consumption in Ecuador is 87,960 thousand boe/year and the main energy source used are oil derivatives, accounting 85% of the total energy, while electricity and biomass represent 13%. As it can be seen there is an important consumption of fossil fuel derivatives, and as was explained before, more than 45% of these are imported because of the lack of refining capacity in the upstream sector in Ecuador.

For the analysis of energy consumption by sector, figure 6 shows that transport represents the majority of the energy use in the country, representing 52%, followed by industry accounting 21% of the national energy needs. It can be seen that the energy consumption for the industry sector has increased in the last years, because in 2004¹³ industry represented 18% of the national energy needs, which may indicate that there has been a growth in this sector. Residential and commercial sector have also a relative participation in the national energy demand.

Figure 6: Energy Consumption by Sector



Source: Energy Balance 2009 Prepared by Consultant

¹³ Balance energético año 2004, Ministerio de Energía y Minas Source: Energy Balance 2009 Prepared by Consultant

Because of the *Amazonas* basin and high rainfall, Ecuador has a big hydropower potential, estimated at 22 GW¹⁴. Because of its location in the volcanic region of the Andes, Ecuador has a large geothermal potential (768 MW). There is also potential to make good use of biomass based on residues from the agro-industrial sector which is estimated to be around 20,000 tons/day¹⁵ which is an important source to produce different goods and services including power generation. Being located in the equator and having a good solar isolation there is a large potential for solar energy project development including PV, thermal solar power and solar water heating. However one of the main constrains for the development of these types of projects is the space availability and accessibility in the Country, especially considering that 20% of the national surface is National Park.

Currently there are some renewable energy projects in operation including from hydro, PV, wind, and biomass from bagasse, residues from sugar cane factories. In Ecuador there is more than 100MW installed capacity from bagasse power plants. In addition, Ecuador produces ethanol, pure vegetable oil from *Jatropha Curcas* and biodiesel from palm oil. Ethanol is used as gasoline additive for a pilot project in Guayaquil city. Pure vegetable oil is produced from *Jatropha Curcas* produced in Manabí province from living fences in decentralized oil mills, and the biofuel produced is used for power generation in the Galapagos Archipelago as part of the *Galapagos Zero Fossil Fuel Initiative*. Finally, biodiesel produced from palm oil is produced and exported to the US and Netherlands. On average the energy consumption per capita at national level is about 6.19 BEO/year.

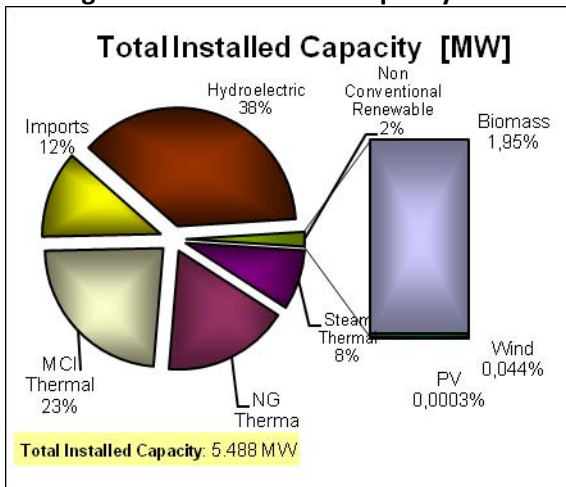
Power sector

By the year 2009, Ecuador had an installed electric power capacity of about 5,488 MW; 38% corresponds to Hydro power generation, 2% to non-conventional renewable energies including co-generation facilities from sugar mills and a wind farm in the Galapagos, 48% represents thermal power from fossil fuels including diesel, bunker and natural gas, 12% represents imports. Ecuador has grid connection with its neighbors Colombia and Peru. The peak power in 2009 was 2,740 MW.

¹⁴ Balance energético 2005, Ministerio de Energía y Minas

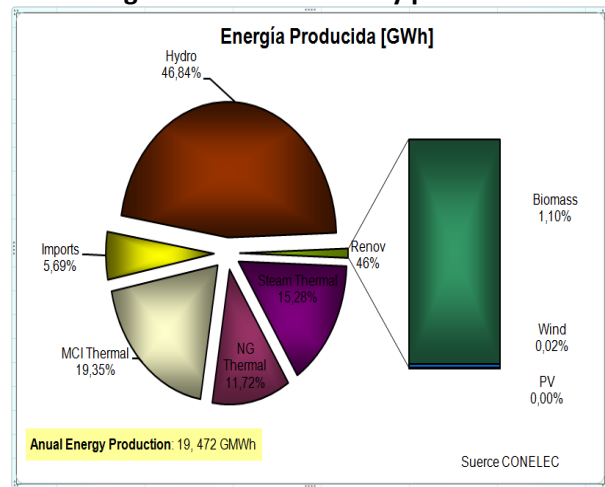
¹⁵ Ministerio de energía y minas, ENYA, 2008

Figure 7: Total Installed capacity



Source: CONELEC

Figure 8: Total electricity production



Source: CONELEC

The electricity produced in 2009 was 19,472 GWh, 48% was produced with renewable energy¹⁶, 5.7% was imported from Colombia and the remaining was produced in thermal generation units. Whilst in 2008 the contribution from renewable energy was 60% in 2009 there was an extensive dry season reducing the contribution of hydropower. The amount of electricity connected to the national grid is 83%, the remaining 17% comes from non interconnected systems basically from the Jungle and Galapagos Islands. According the National Planning agency CONELEC the country has 90.4% of electricity coverage, 92.8% for the urban area and 85.7% for the rural area. The electricity consumption per capita is estimated at 1,361 kWh/year.

Figure 9: Electricity production by sector

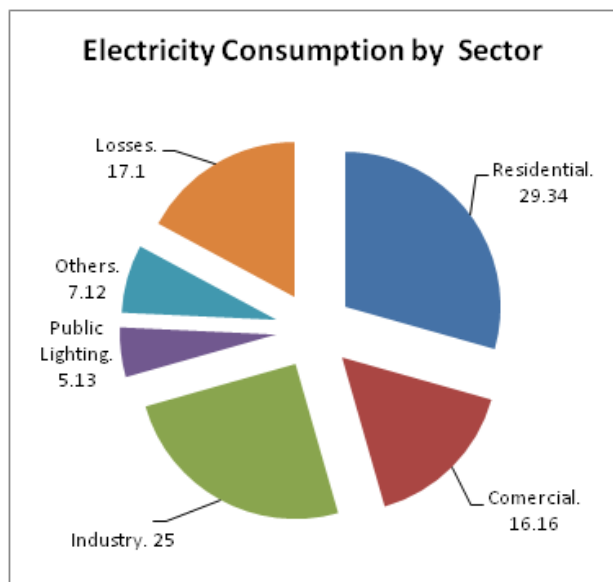


Figure 9 shows the electricity production distribution by sector. The residential sector is the one with the highest consumption, followed by industrial sector representing 25% of the total electricity produced. It is important to mention that electricity consumption for power generation has increased significantly in the last years. In 2006 the electricity demand in the industrial sector was 3,319 GWh, representing 20.3% of the electricity production compared to year 2009 having an electricity production of 3,995 GWh in 2009, representing 25% of the annual electricity production.

¹⁶ 46.8% from hydro power, 1.1% from bagasse/biomass and the remaining from wind and photovoltaic

Annual electricity demand growth rate is 7% which includes the electricity imports from Colombia and demands critical investments in the power sector. Considering the large hydropower potential the Ecuadorian government is making efforts to incorporate new generating capacity to install mainly large hydro projects. There are also private initiatives to install hydro projects but at lower scales compared to the national government. The principle advancement in the hydro power sector is the 2 billion contract with SynoHydro to build a 1,500 MW project called *Coca Codo Sinclair* which will be the largest national hydro project. According to the government it is expected that this project will enter into operation in 2014.

Considering the power outage crisis that took place in 2010, the Ecuadorian government decided to support the execution of wind energy projects. The wind energy projects that will be funded will be the ones placed in the southern part of the country having wind average speeds between 10 – 12 m/s at 40 meters height. Considering financial restrictions the Ecuadorian Government signed a Memorandum of Understanding with the Government of South Korea to finance the wind energy project. Based on the investor's mandate the wind turbines have to be delivered by a South Korean turbine manufacturer. According to the planning 60 MW will be built in the mainland at the end of 2011.

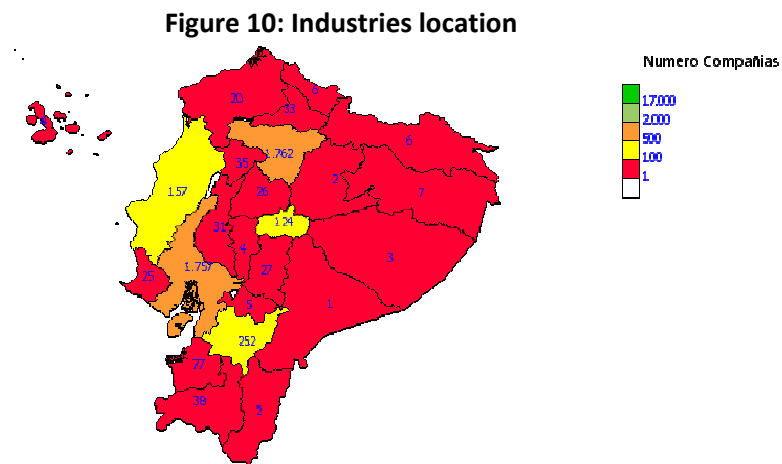
The Environmental Sector in Ecuador

The institution responsible for the environmental control at National level is the Ministry of Environment (MAE). The Ecuadorian Government as included in the Constitution of 2008 commits itself to preserving the environment, acknowledging "environmental rights" as a new and different approach to environmental conservation measures, where the environment is recognized as an important asset for the country.

According to a ministerial agreement there is a decentralized system at the national level to approve Environmental Impact Assessments (EIA) for new infrastructural projects including the ones for industrial operations, and its respective environmental management plans which includes energy efficiency programs, solid waste management and waste water management programs. As the oil sector is the most important economic activity and the one that faces environmental problems, there have been extensive controls of environmental operations and performance in the oil sector. The principle entity responsible is the National Direction of Environmental Protection – DINAPA, which used to be hosted under the Ministry of Energy and Mines, but as a result of the reorganization of the Public Sector triggered under Correa's administration DINAPA is now resided under the Ministry of Environment. Without any doubt the integration of DINAPA to the Ministry of Environment to support the Environmental Control Department with Environmental Impact Assessments (EIA) for industrial activities is of

great value. According to Mario Burbano¹⁷, National Director of Environmental Control Department one of the results of the institutional strengthening of the Ministry of Environment consists of the ability to prepare new procedures to evaluate EIAs for industrial activities including Environmental Management Plans.

Furthermore there are multiple guidelines for controlling air, water emissions as well as solid waste management however there is a lack of enforcement of policies to fulfill such guidelines.



Source: Superintendencia de companias

One of the principle motivations of environmental authorities for the control of industrial activities comes from the fact that most of the industries are located in the largest cities of Ecuador causing urban environmental problems. For a depiction of the geographic distribution of companies (see figure 10). According to authorities the lack of planning of the urban development have in most cases lead city developments to be determined by the industrial development, this is ratified by Southgate Douglas et al¹⁸.

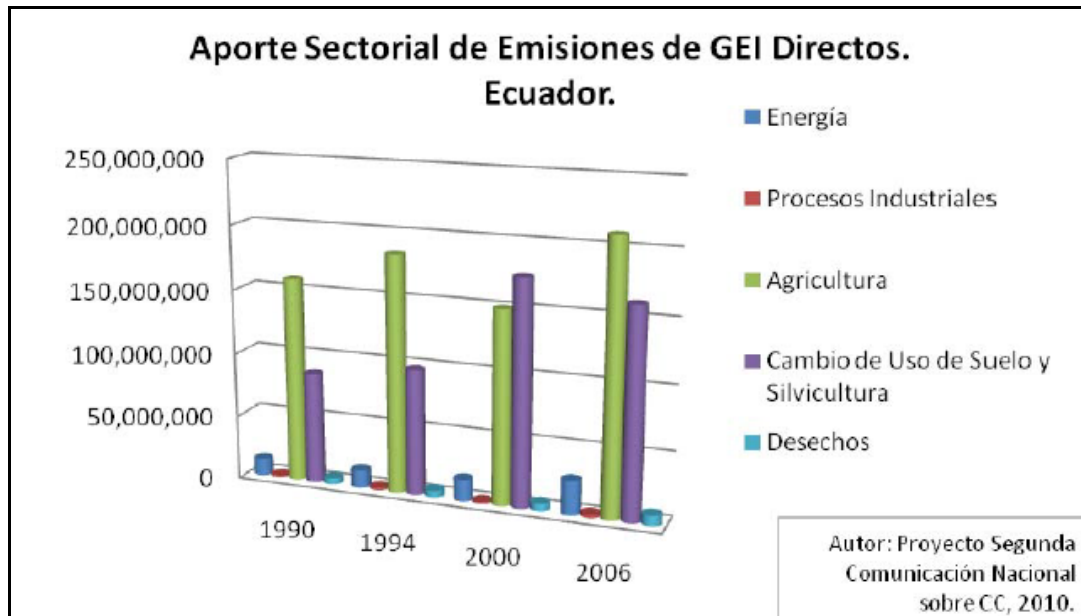
For the agro-industrial sector, an important economic activity in the Country, the main environmental problems are associated with the use of agrochemicals like pesticides, fungicides generating NO_x, and the expansion of the agricultural frontier. There are some sectors where the use of areas for agriculture has expanded drastically in recent years, for instance for cultivation of banana, palm oil and cocoa. This phenomenon also repeats itself in the shrimp industry impacting or diminishing existing mangroves causing significant environmental problems.

¹⁷ Personal Interview, November 11, Ministry of Environment

¹⁸ Southgate Douglas et al, An assessment of Urban Environmental problems in Ecuador, USAID, 2000

In addition to environmental control, MAE leads the Climate Change national programs under the United Nations Framework Convention on Climate Change (UNFCCC) and as part of this program the MAE has prepared the “Second National Communication” to identify the different sources of green house gas emissions (GHG).

Figure 11: GHG contribution by sector in Ecuador (Ton CO2 eq.)



Source: Comunicación Nacional(*)
 (*) Version to be validated

As figure 11 shows the major GHG contribution comes from the agricultural sector, while industrial processes are among the lowest contributors of GHG emissions. This version has been prepared in 2010 and is under technical supervision and still has to be evaluated and validated, but was gratefully shared with the project team for purposes of this diagnostic. According to the report industrial emissions during the period 1990 – 2006 increased by 59.5%, slightly higher than the average growth of the remaining sectors at an average rate of 54.6%.

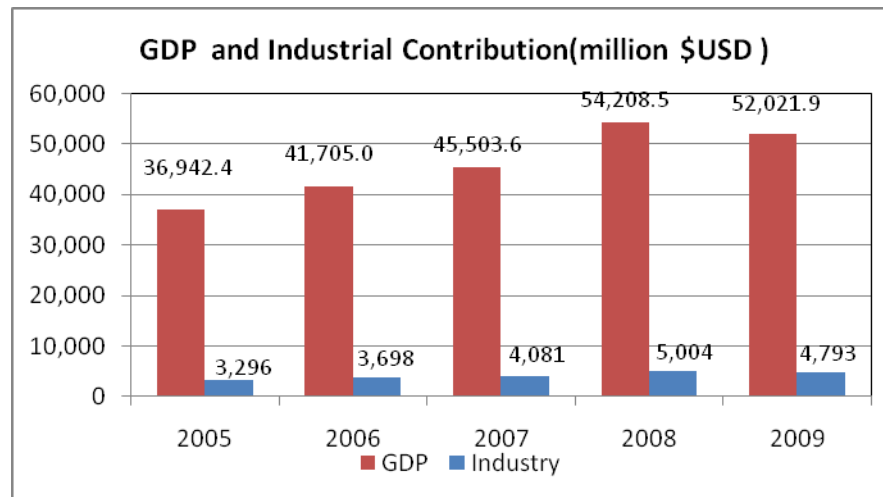
Finally, in general some enterprises from the agro-industrial and industrial sectors have considered product certification to fulfill environmental standards as an important component of their strategy to secure access to external markets and increase their competitiveness.

4. The Ecuadorian Production Sector

How does the production sector of Ecuador look like? How is it defined?
And what is its relative contribution to the national economy?

As figure 12 11 shows the Ecuadorian economy generated a GDP (Gross Domestic Product) of US\$ 52.021,9 million by 2009. In that same year, the manufacturing industry, excluding oil derived products, contributed with US \$ 4.792,8 million to the GDP, representing 9.2%. The most significant sectors contributing into the economy in 2009 were the oil sector, construction, commerce and the manufacturing industry. Figure 11 depicts the contribution of the manufacturing industry to the GDP excluding the oil derivatives related activities. There has been a steady continuous growth in the contribution of industry to GDP having had a peak in 2008 due to higher national and world liquidity.

Figure 12: Contribution of manufacturing industry in GDP



Source: Banco Central del Ecuador

GDP Contribution

According to *Banco Central* statistics, in 2007 the manufacturing industry was clustered in different branches or subsectors as listed below:

- ✓ Food and drinks industry⁽¹⁹⁾ 55,9 %
- ✓ Textiles including leather 14,3 %
- ✓ Timber 9,4 %

¹⁹ This subsector includes shrimp (34%), meat(15%), fish(15%), milk products (7%)vegetable oil (4%), sugar(6%), cocoa production (2%), drinks (6%) and others in terms of contribution to food processing subsector.

✓ Chemical products/ plastics	6,7 %
✓ Metals	6,4 %
✓ Paper	3,7 %
✓ Machinery and transport	3,3%

Updated figures are expected in the second quarter of 2011 for the different economic sectors based on the results of the National Economic Census carried out in the last quarter of 2010.

Export products originating from the industrial sector belong principally to the branch of food processing, timber and metals. On the other hand, according to *Banco Central* during Jan – Oct 2010, Ecuador’s expenses for imported products summed to USD 15.232 million, of which 31.8% from these imports were raw materials for the industrial sector.

Classification of Micro, Small and Medium Sized Enterprises

Table 1 describes the main characteristics of the Micro, Small and Medium Sized Enterprises or also known as *Micro, Pequeña y Mediana Empresas (MIPYMES)* in Ecuador, this classification is country specific including the classification by size of enterprise.

Table 1: MIPYMES classification in Ecuador

Indicator	Microenterprise	Small Enterprise	Medium Enterprise
Number of Employees	1 – 9	10 – 49	50 – 199
Gross annual sells	< USD 100,000	USD 100,001 - USD 1'000,000	USD 1'000,001 – USD 5'000,000

Source: Superintendencia of Companias

Number of Enterprises

According to reports from the *Superintendencia de Compañías* the industrial sector contains enterprises defined by their size. As can be seen in table 2, the industrial sector with the highest amount of industries or enterprises is the food processing and beverage subsector independent on the size of enterprise, other sectors with an important number of enterprises are the textile and chemical production sector.

Table 2: Number of Enterprises

Kind of Enterprise	Micro	Small	Medium	Big
Number of Enterprise	1.213	1.086	514	351
D15 ELABORACION DE PRODUCTOS ALIMENTICIOS Y DE BEBIDAS.	231	202	122	115
D16 ELABORACION DE PRODUCTOS DE TABACO.	1		1	2
D17 FABRICACION DE PRODUCTOS TEXTILES.	33	67	32	19
D18 FABRICACION DE PRENDAS DE VESTIR	82	68	23	8
D19 CURTIDO Y ADOBO DE CUEROS; FABRICACION DE MALETAS, BOLSOS DE MANO, ARTICULOS DE TALABARTERIA, GUARNICIONERIA Y CALZADO.	11	17	14	3
D20 PRODUCCION DE MADERA Y FABRICACION DE PRODUCTOS DE MADERA Y DE CORCHO EXCEPTO MUEBLES; FABRICACION DE ARTICULOS DE PAJA Y DE MATERIALES TRENZABLES.	26	30	8	6
D21 FABRICACION DE PAPEL Y DE PRODUCTOS DE PAPEL.	16	21	9	18
D22 ACTIVIDADES DE EDICION E IMPRESION Y DE REPRODUCCION DE GRABACIONES.	144	92	46	19
D23 FABRICACION DE COQUE, PRODUCTOS DE LA REFINACION DE PETROLEO Y COMBUSTIBLE NUCLEAR.	6	3	1	2
D24 FABRICACION DE SUBSTANCIAS Y PRODUCTOS QUIMICOS.	145	140	70	51
D25 FABRICACION DE PRODUCTOS DE CAUCHO Y DE PLASTICO.	40	69	57	25
D26 FABRICACION DE OTROS PRODUCTOS MINERALES NO METALICOS.	48	54	25	19
D27 FABRICACION DE METALES COMUNES.	11	19	7	10
D28 FABRICACION DE PRODUCTOS ELABORADOS DE METAL, EXCEPTO MAQUINARIA Y EQUIPO.	54	57	33	10
D29 FABRICACION DE MAQUINARIA Y EQUIPO N.C.P.	109	68	19	15
D30 FABRICACION DE MAQUINARIA DE OFICINA, CONTABILIDAD E INFORMATICA.	4	2		1
D31 FABRICACION DE MAQUINARIA Y APARATOS ELECTRICOS	51	35	9	7
D32 FABRICACION DE EQUIPO Y APARATOS DE RADIO, TELEVISION Y COMUNICACIONES.	10	6	1	
D33 FABRICACION DE INSTRUMENTOS MEDICOS, OPTICOS Y DE PRECISION Y FABRICACION DE RELOJES.	57	26	7	1
D34 FABRICACION DE VEHICULOS AUTOMOTORES, REMOLQUES Y SEMIREMOLQUES.	19	20	8	11
D35 FABRICACION OTROS TIPOS DE EQUIPO DE TRANSPORTE.	27	19	2	2
D36 FABRICACION DE MUEBLES; INDUSTRIAS MANUFACTURERAS	75	64	20	7
D37 RECICLAMIENTO.	13	7	0	

Source: *Superintendencia de Companias*

Considering the fact that the food processing industry also contains important groups of enterprises, the distribution of food processing industries varying from food processing, milk industry, beverage and others are shown in table 3. Food processing, meat, fish, and the oil and fats industry result to represent the largest amount of enterprises.

Table 3: Number of Enterprises in the food processing and beverage subsector

Food Processing and Beverage Subsector	Micro	Small	Medium	Big
Number of Enterprise	231	202	122	115
D151 PRODUCCION, ELABORACION Y CONSERVACION DE CARNE, PESCADO, FRUTAS, LEGUMBRES, ACEITES Y GRASAS.	52	40	44	44
D152 ELABORACION DE PRODUCTOS LACTEOS.	55	35	15	13
D153 ELABORACION DE PRODUCTOS DE MOLINERIA, ALMIDONES Y PRODUCTOS DERIVADOS DEL ALMIDON Y PIENSOS	25	19	20	12
D154 ELABORACION DE OTROS PRODUCTOS ALIMENTICIOS.	48	60	29	32
D155 ELABORACION DE BEBIDAS.	51	48	14	14

Source: *Superintendencia de Companias*

Finally the enterprise distribution by size in the food processing, fish and meat products, and oil and fats industries, is detailed in table 4.

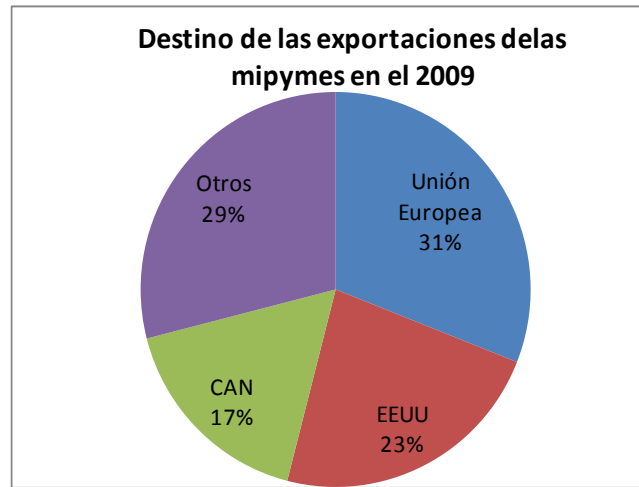
Table 4: Number of Enterprises in the food processing and beverage subsector

Food Processing, fish and meat product, oil and fats	Micro	Small	Medium	Big
Number of Enterprises	52	40	44	44
D1511 PRODUCCION DE CARNE Y DE PRODUCTOS CARNICOS.	16	10	11	5
D1512 ELABORACION Y CONSERVACION DE PESCADO Y DE PRODUCTOS DE PESCADO.	19	13	8	23
D1513 ELABORACION DE FRUTAS, LEGUMBRES Y HORTALIZAS.	13	12	6	8
D1514 ELABORACION DE ACEITES Y GRASAS DE ORIGEN VEGETAL O ANIMAL.	4	5	19	8

Source: *Superintendencia de Companias*

The importance of dividing industries by the size of enterprise allows for a better understanding of their contribution to the local economy. According to the Custom National Service during the period 2005 – 2009 *Mipymes* grew by 18.3%, while in 2009 the growth was 60%. In the same year *Mypimes* exported USD 1880 million, representing 27.8% of the total national exports. The most important market for *Mipymes* is the European Union, see figure 13, other regions where *mipymes* sell their products are the US, Japan, Canada, México, China and Andean Community – CAN. A distribution of *Mipymes* exports is included in Annex 1.

Figure 13: Mipymes export destination



Source: Lideres Magazine

According to Lideres magazine report on mipymes, products exported to the European Union are requested quality specifications and green product labeling and the products that fulfill such standards are the ones with highest probability to access into these markets. International organizations such as GIZ (former GIZ), SIDA, COSUDE, Belgium cooperation have given their technical support to small enterprises in order to get these certification as a way to improve competitiveness and at the same time to eradicate poverty in poor areas from the country.

From the Industry chambers representatives there is a main concern related to the non renewing of the Commercial Preferences agreement and drugs eradication agreement for the Andean Region (ATDEA) with US, one of the most important commercial partners of Ecuador. In this sense market diversification, innovation, eco labeling and good production practices are important tools to be considered to enter into demanding but growing markets. Based on this fact the corporation to foster exports from Ecuadorian products has different alternatives to support enterprises to sell their products abroad. One of the financial options to support enterprises is the export trust that support small enterprises to find markets for their production.

Number of employees by subsector

According to the *Superintendencia de Compañías*, the official entity that register officially the companies in Ecuador, in 2009 722.403 employees were registered in all the formal activities. The manufacturing industry sector represented 18.9%. The geographical distribution of the industry sector is 35% in the Coast, 64% in the Sierra, and 1% in the Jungle. There are no industrial activities in the Galapagos by law. As table 5 shows, the food processing subsector

is the one that clusters 48% of the employment. Other sectors with important contribution to employment are chemical, plastic and polymers, as well as textile industries.

Table 5: Employees depending on the size of industry

Número Empleados	Total	MICRO	SMALL	MEDIUM	BIG
Actividad Económica	722.403	101.346	145.120	144.358	302.349
D INDUSTRIAS MANUFACTURERAS.	156.818	5.278	16.523	22.149	103.642
D15 ELABORACION DE PRODUCTOS ALIMENTICIOS Y DE BEBIDAS.	64.966	860	3.753	5.171	54.432
D16 ELABORACION DE PRODUCTOS DE TABACO.	624	1		5	618
D17 FABRICACION DE PRODUCTOS TEXTILES.	8.279	327	1.376	1.820	4.163
D18 FABRICACION DE PRENDAS DE VESTIR; ADOBO Y TEÑIDO DE PIELS.	5.080	238	1.484	1.345	1.842
D19 CURTIDO Y ADOBO DE CUEROS; FABRICACION DE MALETAS, BOLSOS DE MANO, ARTICULOS DE TALABARTERIA, GUARNICIONERIA Y CALZADO.	2.019	106	419	622	783
D20 PRODUCCION DE MADERA Y FABRICACION DE PRODUCTOS DE MADERA Y DE CORCHO EXCEPTO MUEBLES; FABRICACION DE ARTICULOS DE PAJA Y DE MATERIALES TRENZABLES.	2.707	88	624	403	1.523
D21 FABRICACION DE PAPEL Y DE PRODUCTOS DE PAPEL.	5.927	71	273	483	5.093
D22 ACTIVIDADES DE EDICION E IMPRESION Y DE REPRODUCCION DE GRABACIONES.	7.657	655	1.623	2.549	2.746
D23 FABRICACION DE COQUE, PRODUCTOS DE LA REFINACION DE PETROLEO Y COMBUSTIBLE NUCLEAR.	99	11	16	19	49
D24 FABRICACION DE SUBSTANCIAS Y PRODUCTOS QUIMICOS.	13.557	423	1.748	2.465	8.169
D25 FABRICACION DE PRODUCTOS DE CAUCHO Y DE PLASTICO.	9.449	157	1.224	1.966	5.935
D26 FABRICACION DE OTROS PRODUCTOS MINERALES NO METALICOS.	7.005	176	673	1.144	4.376
D27 FABRICACION DE METALES COMUNES.	4.122	36	348	269	3.458
D28 FABRICACION DE PRODUCTOS ELABORADOS DE METAL, EXCEPTO MAQUINARIA Y EQUIPO.	4.380	243	891	1.219	1.749
D29 FABRICACION DE MAQUINARIA Y EQUIPO N.C.P.	7.438	481	876	1.228	4.769
D30 FABRICACION DE MAQUINARIA DE OFICINA, CONTABILIDAD E INFORMATICA.	150	15	5		130
D31 FABRICACION DE MAQUINARIA Y APARATOS ELECTRICOS N.C.P.	2.830	293	371	719	1.372
D32 FABRICACION DE EQUIPO Y APARATOS DE RADIO, TELEVISION Y COMUNICACIONES.	177	30	72	74	
D33 FABRICACION DE INSTRUMENTOS MEDICOS, OPTICOS Y DE PRECISION Y FABRICACION DE RELOJES.		194	254	165	1
D34 FABRICACION DE VEHICULOS AUTOMOTORES, REMOLQUES Y SEMIREMOLQUES.			493	483	2434

Source: *Superintendencia de Compañías*

Prepared by the consultant

Table 6 presents the distribution of employees in the food and beverage industry, this table shows that food processing including fish, meat, and oil and fats industries concentrate the highest number of employees.

Table 6: Distribution of employees in the food and beverage industry

D15 ELABORACION DE PRODUCTOS ALIMENTICIOS Y DE BEBIDAS.	Total	MICRO	PEQUEÑA	MEDIANA	GRANDE
D151 PRODUCCION, ELABORACION Y CONSERVACION DE CARNE, PESCADO, FRUTAS, LEGUMBRES, HORTALIZAS, ACEITES Y GRASAS.	33.629	144	836	2.257	30.246
D152 ELABORACION DE PRODUCTOS LACTEOS.	4.134	145	359	675	2.759
D153 ELABORACION DE PRODUCTOS DE MOLINERIA, ALMIDONES Y PRODUCTOS DERIVADOS DEL ALMIDON Y PIENSOS PREPARADOS.	2.909	73	424	517	1.571
D154 ELABORACION DE OTROS PRODUCTOS ALIMENTICIOS.	19.761	286	1.307	1.270	16.876
D155 ELABORACION DE BEBIDAS.	4.533	212	827	452	2.980
Total(Actividad Económica)	64.966	860	3.753	5.171	54.432

Source: Superintendencia de Compañías

Prepared by the consultant

Finally table 7 reports the distribution within the food industry. It can be seen that fish industry is the one that concentrates the highest amount of employees but it is important to highlight that it is a large existing industry represented by one or more large enterprises. Considering *mipymes* of the oil and fat industry is the one that concentrates the highest amount of employees followed by meat processing industry.

Tabla 7: Distribution of employees in the food processing sector

D151 PRODUCCION, ELABORACION Y CONSERVACION DE CARNE, PESCADO, FRUTAS, LEGUMBRES, HORTALIZAS, ACEITES	Total	MICRO	PEQUEÑA	MEDIANA	GRANDE
D1511 PRODUCCION DE CARNE Y DE PRODUCTOS CARNICOS.	7.970	68	276	705	6.880
D1512 ELABORACION Y CONSERVACION DE PESCADO Y DE PRODUCTOS DE PESCADO.	16.330	32	357	369	15.512
D1513 ELABORACION DE FRUTAS, LEGUMBRES Y HORTALIZAS.	2.955	31	148	363	2.403
D1514 ELABORACION DE ACEITES Y GRASAS DE ORIGEN VEGETAL O ANIMAL.	6.374	13	55	820	5.451
TOTAL	33.629	144	836	2.257	30.246

Source: Superintendencia de Compañías

Prepared by the consultant

Energy and Environmental Indicators

During the consultancy period, the consultant looked for information related with indicators such as energy consumption by unit produced, amount of water utilized by the industry to produce a good, waste water and solid waste and residues generated in the process by unit of production. Unfortunately this information is unavailable in any of the relevant Ministries that have responsibility for industry and productivity, environment, electricity and renewable

energy, non-renewable energy, as well as in the different chambers of industry and commerce, and small and medium sized enterprises. There was the intention to generate such information during the existence of the Ecuador Cleaner Production Center but this was never executed or finalized.

There is some information associated with mass and energy balances of some enterprises from Ecuador which have been executed as part of engineering theses or by the same enterprises. However they can not be considered representative for the sector because of the limited results and enterprise specific conditions which do not allow for extrapolating the results to the whole sector. However after reviewing mass and energy balances from the palm oil and sugar cane sector there seems to be a potential to implement the CLC method in these sectors, but will mainly depend on the outcome of the multi-criteria analysis.

On the other hand the former Renewable Energy and Energy Efficiency Department of the former Ministry of Energy and Mines (MEM) conducted different energy audits to some different industries including timber, food processing, textiles, chemicals, and non metallic industries. As the results of these audits the MEM team leader indentified good opportunities to implement energy efficiency programs in the textile and timber industries. It is important to highlight that this analysis was carried out in 2007 covering just one industry. But the information is well documented and technically sound.

Considering the lack of indicators to support the decision making process to select one representative industry of the industrial manufacturing sector, the consultant prepared a questionnaire to obtain these indicators. The template is included in Annex 2. This template was submitted to MCPEC in order to get its support contacting industry managers as well as representatives from the chambers of industry. MCPEC submitted this form to the Ministry of Industries because of its direct competence in handling this information. Templates have not been filled out yet but as soon as this information is ready the results will need to be processed and analyzed to include in a report. This information remains critical to complete the multi-criteria analysis to select the most suitable industry or subsector to start the pilot project.

Based on the missing information the consultant looked for different alternatives to gather information that could provide sufficient basis for the diagnostic of the industrial sector. An input-output matrix published by the Central Bank was used for the analysis. This matrix includes the economic expenses from each economic subsector. Next table presents the economic incidence of electricity, fossil fuel derivates and water consumption in each

economic activity of the different sub sectors. This is an indirect tool to indentify energy and water intensity in the different manufacturing industries.

Table 8: Economic incidence on energy and water uses for the food processing subsector

SUBSECTOR	Electricity	Water	Oil derivatives
FOOD AND DRINKING INDUSTRY			
Producción, procesamiento y conservación de carne y productos cárnicos	0,32%	0,17%	1,48%
Elaboración y conservación de camarón	4,04%	1,67%	9,64%
Elaboración y conservación de pescado y productos de pescado	1,11%	0,67%	4,23%
Elaboración de aceites y grasas de origen vegetal y animal	2,88%	0,55%	5,33%
Elaboración de productos lácteos	1,27%	0,25%	1,66%
Elaboración de productos de molinería y panadería	1,15%	0,18%	2,90%
Elaboración de azúcar	1,44%	0,63%	28,01%
Elaboración de cacao, chocolate y productos de confitería	3,02%	0,59%	2,10%
Elaboración de otros productos alimenticios	2,05%	0,66%	4,75%
Elaboración de bebidas	3,14%	4,19%	6,49%

Source: Banco Central del Ecuador

Prepared by the Consultant

As table 8 shows, there is a high energy (electricity and oil derivatives) and water consumption rate in the shrimp, beverage, and oil & fats industry.

Table 9: Economic incidence on energy and water uses for other subsectors

SUBSECTOR	Electricity	Water	Oil derivatives
Elaboración de productos del tabaco	2,25%	0,00%	1,03%
Fabricación de productos textiles, prendas de vestir; fabricación de cuero y artículos de cuero	4,52%	0,67%	6,08%
Producción de madera y fabricación de productos de madera	1,41%	0,07%	8,87%
Fabricación de papel y productos de papel	3,07%	0,47%	4,30%
Fabricación de sustancias y productos químicos	3,07%	1,41%	0,48%
Fabricación de productos de caucho y plástico	4,11%	0,40%	2,60%
Fabricación de productos minerales no metálicos	12,54%	0,54%	31,69%
Fabricación de metales comunes y de productos elaborados de metal	1,39%	0,18%	2,69%
Fabricación de maquinaria y equipo	4,74%	0,72%	4,88%
Fabricación de equipo de transporte	0,52%	0,11%	3,86%

Source: Banco Central del Ecuador

Prepared by the Consultant

Which Ministry is responsible for the growth and sustainability of the production sector?

The Government of Ecuador has established the Ministry of Coordination of Production, Employment and Competitiveness (MCPEC) to increase the cooperation between several relevant ministries and achieve greater effectiveness in the implementation of the national development plan. As part of this job the Ministry of Coordination is responsible for coordinating, promoting, evaluating and executing production, employment, and competitiveness policies, strategies and programs to diversify the production sector and transform the national production scheme.

As part of the creation of the Ministry of Coordination, a Production Sector Advisory Council²⁰ was established bringing together representatives from several Ministries, Institutes and other critical entities to the Production Sector.

The Ministry of Coordination is responsible for coordinating different ministries linked to the national productivity. The ministries and departments under the coordination umbrella from MCPEC are Ministry of Agriculture, Cattle and Fishing, Ministry of Industry and Productivity, Ministry of Transport and Public Works, Ministry of Tourism, Ministry of Labor Affairs, National Secretariat of Science and Technology and the National Council of Training.

What are the policies, laws and regulations that govern the production sector?

Constitution of the Republic of Ecuador

The Maximum Legal body established for the country is the Constitution; the latest version of this was approved in 2008. The different articles linked with Clean and Closed Looped Cycle production are listed below:

Chapter Two: Rights of the good way of living

Art 15. The State shall promote, in the public and private sectors, the use of environmentally clean technologies and nonpolluting and low-impact alternative sources of energy. Energy sovereignty shall not be achieved to the detriment of food sovereignty nor shall it affect the right to water.

Chapter Four: Economic Sovereignty

Section One: Economic systems and economic policy

²⁰ See: http://www.mcpec.gov.ec/index.php?option=com_content&view=article&id=95%3Aintegrantes-del-consejo-sectorial&catid=59%3Aintegrantes-del-consejo-sectorial&Itemid=118&lang=es

Art. 284: The economic policy shall have the following objectives:

1. To ensure an adequate distribution of the country's revenues and wealth
2. To encourage national production, systematic productivity and competitiveness, the accumulation of scientific and technological knowledge, strategic insertion into the world economy and complementary productive activities through regional integration.
3. To promote the incorporation of added value with maximum efficiency within the biophysical limits of nature, and respect for life and cultures.
4. To uphold economic buoyancy, understood as the maximum sustainable level of production and employment over time.

Chapter Six: Labor and Production

Section One: Forms of organizing production and their management

Art. 319: Different forms of organizing production are recognized in the economy, including community, cooperative public and private business, associative, family, domestic autonomous and mixed-economy.

The state shall promote forms of production that assure the good way of living of the population and shall discourage those that violate their rights or those of nature; it shall encourage production that meets domestic demand and ensures Ecuador's active participation in the global economy.

National Development Strategy

National Plan for the good way of living (2009 – 2013)

Plan Nacional para el Buen Vivir (2009-2013)

The production sector is subject to the comprehensive National Development Plan also known as the "*Plan Nacional para el Buen Vivir (PNBV, 2009-2013)*". This national strategy outlines the government's priorities regarding the several sectors of the economy and describes the particular targets and objectives for each sub-sector for the short and medium term. See for more detail Annex 3.

Policies

Agenda for the Productive Transformation (2010-2013)

The Ministry of Coordination of Production, Employment and Competitiveness (MCPEC) has recently released the Agenda for the Productive Transformation (2010-2013)²¹ which lays out a strategy for the diversification and increased productivity of the production sector.

Production Law

Production Code - Código de la Producción

This new law, recently approved, aims to foster local production, improve competitiveness and promote foreign investment based on the following approach:

- Increment the fraction of non oil products exports.
- Diversify the destination of export which is currently basically concentrated in few countries in the Americas.
- Decentralize enterprise ownership promoting a major participation of shareholders in company stocks.
- Reduce imports and promote local development through knowledge and strengthening of local industries.

The law contains six different books. Book number three contains “Entrepreneurial development of micro, small, and mid size businesses, and the democratization of production” and it is created to foster development of micro, small and mid-size businesses (PyMEs), democratization of the Public Transformation and access to means for production as well as equal territorial development.

In addition to PyMEs description, the sixth book named as “Sustainability of Production and its relationship with the ecosystem” contains Eco- Efficiency and Sustainable production policies which promote the use of clean technologies, incentives for cleaner production and provides several dispositions adding or substituting previous national laws in order to strength the role of environmental protection in the production sector.

Environmental Laws

Ley de Gestion Ambiental (Ley No. 37. RO/ 245 de 30 de Julio de 1999)

This law serves to preserve the environment, conserve ecosystems, biodiversity and the integrity of the genetic patrimony of the nation; it establishes a national system of protected nature reserves and in this way guarantees a sustainable development.

²¹ See: http://www.mcpec.gov.ec/index.php?option=com_content&view=article&id=453%3Aagenda-para-la-transformacion-productiva&catid=1%3Alatest-news&Itemid=96&lang=es

Evaluation of environmental laws:

The previous section described that Ecuador is rich in environmental laws and regulations for controlling industrial air emissions, water discharges, toxic solid waste generation and disposal, and noise levels for new and existing facilities, and also mandatory environmental impact assessment studies as requirements prior to new developments. Unfortunately there is little practical implementation or enforcement of these regulations.

There are many different causes for this state of affairs. These can be summarized as:

- Existence of an inadequate legal framework, since this is basically a transposition of other countries' laws.
- Political and limited technical capacity of national and local agencies in enforcing environmental regulations.
- Few developments or little experience in environmental engineering, especially in the field of industrial pollution control.
- Lack of awareness and sensibility of the industrial sector to environmental issues.
- Limited knowledge in the industrial sector about alternative business models and modern environmental management tools, such as pollution prevention techniques and environmental management systems.

On the other hand, in the past decade a growth of public awareness regarding environmental degradation can be experienced, which has led to an increase in pressure from environmental and citizens' organizations demanding more stringent control by authorities on polluting activities, especially in the most industrialized cities.

As a response to that new movement, the Ecuadorian industrial sector has developed a strategic plan as part of the productivity agenda with the objective to promote clean production and environmental consciousness among its members and the society at large.

Additionally, government agencies, the scientific community, NGOs, and the industrial sector itself have become more interested in both reforming current environmental laws for incorporating more realistic performance standards on the basis of local conditions, and implementing modern tools of environmental management in industry, including economic incentives and managerial practices. Unfortunately, the outlook does not seem optimistic, as other more critical factors have forced environmental concerns to take second place with emphasis on economic survival.

On the other hand there are two legal instruments that affect directly the productivity sectors and they are listed below:

1. Administrative, civil and criminal responsibility in pollution generation,
2. Environmental initiatives from administration (with focus on prevention).

What are the gaps between the production sector's conditions and expected targets?

In the past five years the production sector's output has grown. GDP values reported in figure 12 show a growth from US\$ 3.296 million to US\$ 4.793 million, representing an average annual growth of 9.1%. This growth value has direct influence on raw material and energy consumption like electricity which in the same period increased from 2.965 GWh to 3.995 GWh, representing an annual rate of 7%.

However during that same period the industry sector had to implement Energy Efficiency programs based on a request by the government to address the energy needs of the residential sector and to cover for electricity shortages due to the lack of installed power capacity to satisfy the residential energy needs. Despite the execution of Energy Efficiency programs, the industrial electricity demand would have still increased.

Nevertheless these positive interventions, considerable gaps/needs remain in the area of production. Sustainability and securing a competitive edge to other players, both in the domestic as in the international market/industry remains a challenge. In particular when taking international trade agreements, treaties as the Kyoto Protocol (GHG emissions), the newly developed International Standardization Organization's methods as the ISO 50001 into account and on top of this aiming for cost reduction and increased competitiveness through among others, Energy Efficiency programs.

It is very important to mention that because of high subsidies in fossil fuels, except for LPG having a real tariff for the industrial sector, there has not been a significant direct impact to energy production costs. However the main concern for the industrial sector is energy security in which electricity supply has to be guaranteed where this was not the case in the last quarter of 2009. Because of the electricity crisis some industries had to stop their production.

On the other hand the Ecuadorian industrial sector has suffered important crises based on price increments of raw materials, most of them imported and having a price linked to fossil fuels market values. In this sense, industries with the highest dependency on imported products like textile, plastics and chemicals were severely affected during the summer of 2008 when the oil prices achieved record heights up to US\$ 148 per barrel. On the other hand food processing companies having a low dependency and thus lower expenditures on imported products were the most benefited ones in that same year.

Thus changes and increased volatility in the international markets and the existing inadequate regulatory framework are two key impediments to small and medium size enterprises. In particular due to their limited capacity and flexibility to adapt and react to market changes, and their lack of access to information, awareness of innovative business models, and financial markets to secure a greater market share and achieve financial stability.

Are there previous activities similar or related with CLC production?

In spite there has not been a national initiative to specifically implement the Closed Looped Cycle production method in the Industrial sector, the former Ecuadorian Center of Cleaner Production which was a part of the Industrial Chamber of Small and Medium sized Enterprises (SMEs) for the Pichincha Province, had a Cleaner Production Initiative with a national scope.

This program was funded by different international organizations as IDB, Swiss Contact, UNIDO, Belgium Cooperation, and SNV from Netherlands aiming to support the industrial sector to implement clean production practices in Small and Medium Enterprises. This project was broadly accepted and included important capacity building programs including certificate diplomas in Clean Production Consultancy. The National Polytechnic Institute, a prestigious Ecuadorian University, was involved in the capacity building program. However according to the former Clean Production Center's CEO there were difficulties in guaranteeing its financial sustainability.

In addition to the Ecuadorian Center of Cleaner Production there were some initiatives carried out in 1998 under a Competitiveness Program implemented in collaboration with the Ecuadorian Chamber of Industry. This program aimed to match Competitiveness and Environmental protection with the objective of assessing the environmental issues of industrial activities and recommending policies and action plans for improving management and performance. As part of this project fifteen cases were studied in the three most industrialized cities of Ecuador: Quito, Guayaquil, and Cuenca.

The consultant has intended to access the information prepared in that period but has not been able to get information from this project that was executed with financial support from the US.

There have been other individual initiatives carried out by the central government such as energy audits in different energy sectors including the industrial sector. The consultant managed to get access to this information which was technically well prepared and included a comprehensive diagnostic of individual companies. However, after the reorganization of the

energy sector closing the entity responsible for leading the energy audits, the PROMEC project, there was no follow up, monitoring and information documentation or systematization.

The consultant observed that one of the main challenges of the different projects executed is the lack of continuity of these projects. In spite of producing good technical data and proposing sound environmental practices, there remains a need for an adequate institutional set up where clarity is created among the relevant departments or institutions responsible for executing the projects and allow for the introduction and updating a comprehensive knowledge management program to document experiences and results.

Are there any other initiatives ongoing that resemble CLC production?

There are currently three initiatives carried out by different Ministries that are relevant to the topic of CLC production and are listed as follows:

Energy Efficiency Program: The program's objective is to improve energy efficiency nationwide through the implementation of a comprehensive energy efficiency program for the industry through the establishment of regulations, introduce changes in laws and providing training. This project will be co-financed by the Global Environmental Facility – GEF, having as local partners the Ministry of Environment and the Ministry of Electricity and Renewable Energy, further the United Nations Industrial Development Organization (UNIDO) will be the executing agency of the GEF Funds. According to GEF this program qualifies as a medium scale project which means that the GEF contribution is lower than US\$ 1 million.

Clean Production and Sustainable Consumption: According to the project coordinator, Eng. Irma Suarez²², this project aims to foster knowledge management and environmental awareness in the field of clean production and sustainable consumption. In addition this project aims to foster coordination capacities between the different entities involved in the project in order to strengthen public capacities to undertake this project including intensification of financial schemes to carry out the project. This project is executed by the Ministry of Environment.

Industrial Eco-efficiency project: This project is an ambitious project executed by the Ministry of Industries and Productivity (MIPRO) aiming to integrate energy and environmental audits in representative industries from Ecuador including small, medium and large industries with the objective of implementing an eco-efficiency project, which includes closed looped cycle

²² Irma Suarez, Ministry of Environment, Personal Interview.

practices, not only including the assessment but also the implementation of this approach in accordance to the *Plan Nacional Para el Buen Vivir*. According to Veronica Villacis, a MIPRO consultant, this project has an estimated budget of US\$ 19 million and the project proposal is being evaluated by the National Secretariat of Planning and Development²³. The project is financed by the national government. The main components of this project are:

1. Energy efficiency and cleaner production in strategic sectors. It includes baseline analysis, surveys and industry selection for case studies.
2. Environmental services
3. Macro standards for eco-design and productivity reengineering.

²³ Veronica Villacis, Ministry of Industries and Productivity, personal interview.

5. Closed-Looped-Cycle Production

What is Closed Looped Cycle Production?

Closed Looped Cycle (CLC) production, is both a business and a planning model that includes finding innovative ways to optimize the suitability and cost-effective returning of products and materials into the supply chain of the original production process to manufacture a similar or higher quality product.

In such a model, the original equipment or product manufacturer (OEM) takes responsibility of guaranteeing the product's suitability to be re-inserted into the return loop (RL) process. This essential shift in paradigm, putting the responsibility on the manufacturer for the products complete lifecycle, is also known as "*cradle-to-cradle*" design²⁴. This philosophy focuses on the complete elimination of waste. This is done by resolving this at the starting point, thus at the design phase, of the life cycle of products. By focusing on the initial conceptualization and design of the product one should take in mind how to retrieve high quality raw materials that are contained in this new product.

Due to innovations in science and technology we are capable of making the concept of Cradle-to-Cradle a reality. There are three specific characteristics of importance:

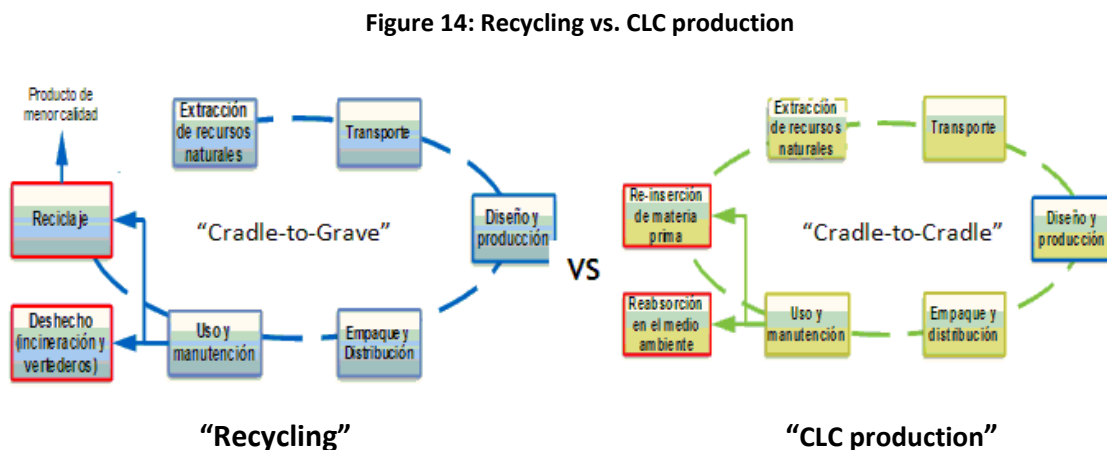
1. The first one is a careful selection of materials and chemicals that are not toxic, carcinogenic, radio-active, or hazardous for the human being or its environment, and using these to manufacture a product. This will result in drastic decrease in emissions and other environmental impacts during the complete life cycle of the product.
2. The second aspect is the careful design and application of the product. The product has to be practical, safe, affordable, aesthetically or socially acceptable, as most other products are currently designed, but more importantly will also have to be easily dismantled, decomposed or degradable to completely concentrate and re-insert the several chemicals, materials or components into either the natural (ecology) or the technical world (industrial manufacturing processes).
3. The third aspect is the need to tailor the existing extraction, production, transport, distribution, marketing, and return loop processes around these new types of products. Supporting mechanisms and systems for the production of the product all have to be sustainable and on their turn also comply with the Cradle-to-Cradle criteria.

²⁴ This term is derived from the *Cradle to Cradle*TM concept introduced in a book by McDonough and Braungart (2002), see: http://www.mcdonough.com/cradle_to_cradle.htm

4. Finally, all the CLC implementation depends strongly on a new logistic paradigm. Usually called “Reverse Logistics” primary distribution is the flow of products or goods from its origin to the place or point of consumption; reverse logistics involves a secondary channel flowing in the opposite direction. It can comprise such diverse transactions as returns, recalls, and waste management. At this point the product reaches the point of end of life when it consumes its intended value. A traditional definition of reverse logistics comes from Rogers and Tibben-Lembke: “The process of planning, implementing and controlling the efficient, cost-effective flow of raw material, in-process inventory, finished goods and related information from the point of consumption to the point of origin for the purpose of recapturing, or creating value, or for proper disposal.”²⁵²⁶²⁷

Imagine thereby the use of a renewable energy system designed and composed of materials and chemicals complying with the Cradle to Cradle concept, as for instance a Photovoltaic (PV) panel that after 30 years of operation does not become a hazardous waste, but instead is completely dismantled and its components re-inserted in the ecology or manufacturing process to produce an improved version of the same PV panel.

Figure 14 shows the key difference between what is conventionally understood as recycling versus closed looped cycle production based on the philosophy of Cradle-to-Cradle design.



As can be seen in figure 14, materials and chemicals contained in a CLC product will, after the consumer has satisfied his/her products use, be re-inserted in the ecology or in an industrial

^{25 25} <http://www.rlec.org/reverse.pdf>

^{26 26} <http://www.oeconomica.uab.ro/upload/lucrari/1020082/33.pdf>

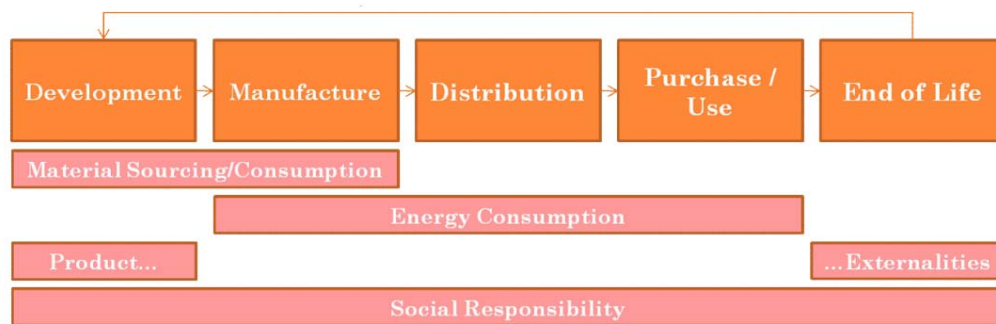
^{27 27} <http://jaibana.udea.edu.co/grupos/revista/revistas/nro055/Articulo%2022.pdf>

manufacturing process to produce a new, similar, equal quality or innovative and improved product.

Manufacturing CLC products will lead to drastic energy and water savings and GHG emission reduction through reducing the need for extraction and processing of raw materials, reduced waste generation and other environmental impacts and sustain a marketable and profitable business in a continuously changing market and regulatory environments.

Acknowledging the challenges to achieve this almost “utopian” scenario, there is a need for a gradual and phased approach and development towards a fully fledged Closed Looped Cycle production in Ecuador. When addressing product returns (also known as cores) these often come directly from customers or retail channels and other alternative channels, but they can also come from production facilities in the form of manufacturing by-products or components that fail to meet the manufacturer's quality control criteria. Returned products are counted as inventory because they can be inspected and resold, refurbished or used for parts. By closing the loop and managing the product lifecycle in a holistic manner, the manufacturer has more control over its supply chain and manufacturing planning, reducing or eliminating waste generated during the process, saving energy, water and the environment.

Figure 15: represents the CLCP model.



The model will be applied once the phase-1 has defined which sub-sector and suitable company is able to do it.

How can CLC production function as a tool to achieve policy targets?

Closed-Looped-Cycle production in manufacturing has increasingly become an attractive alternative for industries operating in the current trend of globalization and increased socio-environmental awareness. The increased interaction between environmental and resource

parameters, and product development, gravitate towards the optimization of resources use and increasing the efficiency of operations.

The usual framework for analyzing performance aspects interlinked with environmental and energy issues, is called the “resource productivity” or “Porter’s Hypothesis”²⁸. That basically proclaims “doing more with less”. Existing resource productivity measures for evaluating industrial performance are in most cases compatible with environmental preservation. Reducing waste and inefficiencies in production processes, signifies increased productivity or efficiency in resource utilization, consistent with value engineering (VE) and cost reduction techniques that have become synonymous to environment-friendly operations. The quality of resource materials and the environmental aspects of manufacturing processes are also inextricably linked, such that materials are to be identified in order to ascertain their environmental significance in each step of the production process²⁹.

²⁸ www.smallparty.org/yoram/research/porter.pdf

²⁹ McDonough W. and Braungart M., Cradle to Cradle: Remaking the Way We Make Things

6. Selection of Sub-sector

Why do we want to select a production sub-sector?

The rationale for selecting a sub-sector among the prioritized sub-sectors by the Government of Ecuador, as well as by the Ministry of Industries and Productivity is to identify the most suitable sub-sector to implement the CLC production method to demonstrate its applicability and benefits that this new paradigm has to offer to production sector in Ecuador. This method is a new innovative approach to manufacturing of products that has up to now only been implemented in so-called industrialized nations with access to finance, technology and technical support. There are currently no practical applications of the CLC production method in Latin America and therefore requires a careful pre-feasibility assessment to implement a CLC production pilot project. Considering the fact that the Ministry of Industry and Productivity (MIPRO) is already planning to implement the Industrial Eco-efficiency project, that includes a CLC methodology application component for the different industries in Ecuador, it is recommended that next phase of the CLC project (Phase 2) evaluates the feasibility of joining with MIPRO project. This may be a valuable partnership to both strengthen their proposal and complement with a specific focus on showcasing the viability of the CLC production process. The general goal is to start generating local capacity and at the same time earn time and experience through the implementation of a pilot project with an important emphasis on institutional arrangements and fostering capacity building in a new field. If successful, MIPRO may commitment to replicate the activities nationwide.

How are we going to select the sub-sector?

Since the prioritized sub-sectors represent a large variance of types of companies and production activities it is important to differentiate between them. Also the level of complexity of the processes and services provided determine the viability of implementing the CLC production method.

Prioritized sub-sectors³⁰ are:

- Tourism
- Fresh and Processed Food
- Renewable Energy (bioenergy and alternatives)
- Pharmaceutical and chemical products
- Biotechnology (biochemistry and biomedicine)

³⁰ http://www.mcpec.gov.ec/index.php?option=com_content&view=article&id=389&Itemid=197&lang=es

- Environmental Services
- Metalworks
- Technology: Hardware and Software
- Plastics and synthetic rubber
- Apparel and Footwear
- Vehicles, automotive, auto bodies and parts
- Transport and logistics
- Construction
- Sustainable agroforestry chain and their processed products

These pre-selected sub-sectors are further scrutinized based on the economic performance or productivity, energy and water consumption, solid waste generation, and other criteria.

Criteria 1: Prioritized importance of the sub-sector according to the productivity agenda, MIPRO and MAE.

In addition to the prioritized sectors listed above, industrial sectors were also prioritized by the Ministry of Industry and Productivity (MIPRO) (this includes criteria like technology innovation and lower annual revenues), as well by the Ministry of Environment (MAE) (including sectors with higher records of environmental non compliance) are considered in the analysis.

Criteria 2: Contribution to the GDP

Already described in section 4

Criteria 3: Material Use

It can be determined with the input – output matrix

Criteria 4: Energy Consumption

Already described in section 4

Criteria 5: Water Consumption

Already described in section 4

Criteria 6: (Solid/Liquid) waste production

There is no information available

Criteria 7: Greenhouse Gas Emissions

The level of detail provided in the Second National Communication does not match with the subsector distribution and just provides information for mining, and chemical processes.

Criteria 8: Scale and complexity³¹ of the sub-sector

It is very specific depending the kind of activity carried out in each subsector.

- supply chain and export market
- land uses / environmental aspects

Criteria 9: Number of SMEs and Employment generated per sub-sector³²

Already described in section 4

³¹ *Scale and Complexity* is defined by the type, amount and interdependency of technologies in the production processes being evaluated

³² The definition of SMEs in the context of Ecuador is to be determined and assessed for the technical and financial capacity to implement the CLC production method.

Summary of main results

Subsector	Food and drinks Industry(*)					Textile	Plastics	Chemical	Metal
	Meat	Fish/Shrimp	Milk product	Fruits	Oil& Fats				
Prioritized importance	Primary Prioritized Industrial Sector							Secondary Prioritized Industrial Sector	
GDP Contribution	8,4%	27,4%	3,9%	5,6%	2,2%	14,3%	6,7%		6,4%
Material Use									
Electricity consumption	0,32	4,04%	1,27%	2,05%	2,88%	4,52%	4,10%	3,07	1,39%
Fossil Fuel consumption	1,48%	9,64%	1,66%	2,20%	5,33%	6,08%	2,60%	0,48%	2,69%
Water consumption	0,17%	1,67%	0,25%	0,65%	0,55%	0,67%	0,40%	1,41%	0,18%
Scale and complexity	B	A	C	C	A	B+	A	A	B+
Number of SMEs	1,32%	1,42%	3,73%	1,10%	1,03%	10,80%	5,90%	12,60%	5,10%
Employment Generated at SMEs	2,39%	1,72%	2,68%	1,23%	2,02%	17,60%	7,60%	10,50%	5,40%

A High

B Moderate

C Low

7. Multi-Criteria Analysis

For the multi-criteria analysis the different criteria listed in section 6 will be utilized. Each criterion will be reported and evaluated per subsectors of the manufacturing industry sector. Considering the fact that in order to select the appropriate industry to conduct the pilot project, it is necessary to know the contribution or weight of each criterion. Taking into consideration the lack of information to determine the contribution of each criterion as a first approximation all of them will have an identical value. However after the results of the first analysis a sensitivity analysis will be done based on suggestions by the project partners and stakeholders.

As a supporting tool for the analysis, the Expert Choice Multi Decision software will be used for such analysis; the consultant has used this software for different multi criteria projects and deems this suitable for the purposes of this study.

The Consultant recommends that based on the complexity of the analysis, the missing information could be gathered via the survey proposed as part of the industrial Eco-Efficiency program of MIPRO. There is a need to establish a clear procedure to interact with the different project stakeholders as well as considering important criteria to select one or different industries to start with the implementation of CLC production pilot project.

However, preliminary results of Expert Choice software recommend the pre-selection of following industries:

1. Fish processing
2. Oil and fats
3. Meat processing
4. Chemical production
5. Plastic and polymers
6. Textiles

8. Stakeholder Analysis

As part of the work carried out during the consultancy relevant stakeholders for a CLC project have been identified, the exact stakeholders can be identified after the execution of a workshop aiming to integrate different stakeholders.

1. Governmental Institutions

- a. MCPEC: The Ministry of Coordination of Production, Employment and Competitiveness is an umbrella Ministry responsible for setting policies and integrating governmental programs from the so called coordinated ministries such as agriculture, industry, tourism, transport. Its participation is very important for a CLC project considering the political backup and inter-ministry relations.
- b. MIPRO: The Ministry of Industry and Productivity is responsible for project execution. MIPRO has the human and technical capacity with working experience in environmental projects for the industrial sector. It has also assisted Small and Medium size Enterprise projects. MIPRO is working to implement the Eco-Efficiency program and has developed several projects in the past with the support of international organizations such as UNIDO.
- c. MAE – the Ministry of Environment is the national institution for the national environmental policies. This Ministry manages a production and consumption program and it has been the focal point for UNEP and GEF projects.
- d. MEER – the Ministry of Electricity and Renewable Energy is responsible for determining policies in the power sector aiming to reduce fossil fuel dependency and diversify the energy matrix. Together with UNIDO it is implementing an energy efficiency program.
- e. SETECI – the Ecuadorian Technical Secretariat for International Cooperation is the institution responsible for setting the policies and procedures for international cooperation. There are different kind of project executions depending on the cooperation scheme to be used, such as technical assistance and financial assistance. Financial assistance projects demands a number of requirements which are listed in Annex 3.

2. Industry Chambers

- a. Small Chambers of Pichincha: This Chamber has been an active organization that promoted and created the Ecuadorian Cleaner Production Center, which was physically located in the installations of the Chamber.
- b. Chamber of Industry of Guayas: Guayas is the most industrialized province in Ecuador and clusters the highest number of industries in the country. It is a

very well organized institution, it includes an environmental analysis department and it produces important information from the sector.

3. Universities and Research Centers

- a. In general Universities have actively participated supporting execution of innovative projects basically for *mipymes*. However it is important to highlight some characteristics of the following centers:
- b. The National Polytechnic Institute: Located in Quito, functioned as the technical support for the Ecuadorian Cleaner Production Center. A teacher from Chemical Engineering Faculty trained managers and technicians from large enterprises and *mipymes* during the execution of the project. There was a Cleaner Production certificate program and a MSc. being developed before the Cleaner Production center closed.
- c. Universidad Andina Simon Bolivar: The University has a regional postgraduate center, with different specializations including management. Currently it is conducting a so called program Observatorio *pymes* aiming to become a Analysis Information Center for the Ecuadorian Productive sector.

9. Conclusions

Based on this sector diagnostic and review of the current conditions the following conclusions can be made that relate to the potential for implementation of a CLC production project in Ecuador:

- ✓ The legal framework of Ecuador promotes and fosters planning, and implementation of projects with similarities to CLC production.
- ✓ There is a high interest from government institutions to implement programs in the industrial sector that promote the use of clean technologies, reduce environmental impacts and contribute to the improvement of enterprise competitiveness. The main area of interest is through promoting the execution of projects that promote the reduction of imported products as well as fossil fuel consumption.
- ✓ For the baseline analysis there is a lack of information related to indicators or criteria to quantify energy and water consumption, GHG emissions, as well as residues generation including waste water and solid waste in the different subsectors of the manufacturing industry. There are some indicators for specific industries, but most of these belong to multinational firms, which nevertheless have little experience in implementing CLC production practices.
- ✓ Because of environmental awareness as well as international demand there is a high interest of industries and governmental institutions to implement projects with a similar approach to CLC. Industry and enterprise managers are looking for clean and environmentally friendly products and production including certification as a measure to access to new markets and improve their competitiveness.
- ✓ There were experiences of clean production programs, with an important participation of stakeholders from the industry sector as well as academia, however the centre (the former Ecuador Cleaner Production Center) responsible for conducting such program closed because of financial and institutional problems.
- ✓ The proper institutional organization of any CLC production project is key to guarantee project sustainability; securing governmental contribution to this project could guarantee program continuation and avoid its extinction.
- ✓ The food processing sub-sector is the most important sub-sector as contributor to the GDP, employment generation and that clusters 48% of the employment. The most

important activity, based on preliminary data, indicate shrimp preservation as having energy and water consumption as important contributing factors to their production cost.

- ✓ Among other sub-sectors with important contribution to employment generation, GDP contribution, energy and water consumption are the textile, dairy and non metallic minerals sub-sectors.
- ✓ According the Second National Communication the industry's contribution to the GHG emissions has increased in the last period but remains relatively low compared other important sectors or categories such as agriculture and land use changes.
- ✓ There are other initiatives related with CLC production being executed or to be executed by the Ministry of Environment (MAE) and the Ministry of Industry and Production (MIPRO). The approach of the MIPRO's project is the one that fits best to the scope of the phase 2 of the MCPEC-OAS Ecuador CLC project.

10. Recommendations and Funding Opportunities

- ✓ In order to profit from the execution of national projects such as the Eco-Efficiency project and avoid duplication of work it is recommended to collect data for indicators of consumption and by-product and residues generation in the scope of these projects. However because of its technical complexity it is recommended to integrate University engineering students to collect this information.
- ✓ Because of participation of different projects to be financed by different international organizations such as UNIDO, UNEP and others it is recommended to prepare a donors round table to coordinate properly the scope of support of each organization.
- ✓ There is a national commitment to finance the execution of Eco-Efficiency programs, however because of the lack of information in the industrial sector, decision makers and national consultants will have to support primary data collection activities to make informed decisions and recommendations to the implementation of CLC production practices. Phase 2 of the MCPEC-OAS CLC production project has to highly focus and dedicate resources to create local capacity and gather critical primary data via strategic links and partnerships.
- ✓ As part of the Phase 2 of the MCPEC-OAS CLC production project it is recommended to put emphasis on the adequate institutional set up or configuration guaranteeing the leadership and ownership of national institutions such as MIPRO, MCPEC, MAE. Another important lesson learned is the necessity of implementing an adequate knowledge management program and a process ownership framework in order to avoid the loss of valuable information at the end of the project lifecycle.
- ✓ The industrial Eco-Efficiency program executed by MIPRO includes CLC production component. It is advisable that phase 2 of the MCPEC-OAS CLC production project is integrated into this national project putting emphasis on primary data gathering, capacity building, process ownership framework and an adequate institutional set up to guarantee the objective expected in phase 3, which is to replicate the experience of the pilot project and disseminate this further in the industrial sector which is in line with the objectives of the MIPRO project. However MCPEC's role in the future phase is very critical because of its mandate to propose policies and coordinate activities from different relevant sectors.

- ✓ For pre-selecting the sub-sector and eventually selecting the enterprise(s) to conduct a CLC production pilot project it is recommended to conduct a workshop inviting at the minimum the different stakeholders listed in section 8. The workshop can be used to present the methodology used in this diagnostic and allow for the use of the multi-criteria software and make a participative selection process that guarantees a wider acceptance base.

Possible funding mechanisms for the Ecuador CLC Production Project:

The Ministry of Industry and Productivity in Ecuador

The Ministry of Industry and Productivity of Ecuador (*MIPRO*) has an ongoing program called *FONDEMYPE*³³ that serves Micro, Small and Medium Size Enterprises (*MIPYMES*) to improve their conditions and capacities as a group or at an individual level that produce quality products or provide services at the national level.

MIPRO defines *MIPYMES* in different categories as follows:

- (1) Micro enterprise – individual productive unit that has 1-9 employees, a purchase value or gross revenue less than US\$100,000 or an activa up to US\$100,000.
- (2) Small enterprise – individual productive unit that has 10-49 employees, a purchase value or gross revenue between US\$100,000 and US\$1 million or an activa between US\$100,001 and US\$750,000.
- (3) Medium enterprise - individual productive unit that has 50-159 employees, a purchase value or gross revenue between US\$1 million and US\$5 million or an activa between US\$750,001 and US\$4 million.

FONDEMYPE allows for the following interventions:

- (1) Provide Technical Assistance – activities that require the contracting of specialized consultancy services regarding improving management, production, quality assurance and commercialization.
- (2) Improve national human capacity – activities that contribute to the improvement of capacities of operational and administrative staff specialized training and workshops.
- (3) Improve human capacity outside the nation – cover parts of the costs that beneficiaries may incur during visits to companies, technical research centers, technical fairs, seminars, business meetings or other activities abroad, with the objective to gain new knowledge and awareness for the productive sector in Ecuador.

³³ Ministry of Industry and Productivity Ecuador, website: http://www.micip.gov.ec/index.php?option=com_content&view=article&id=1226&Itemid=176 (visited November, 2010).

- (4) Innovation and transfer of technology initiatives – cover parts of the costs to produce new products and services or improve existing ones. Development of new methods for production that improve the production capacity of the *MIPYMES*.
- (5) Support in the investment of production equipment – this relates to the purchase of equipment and machinery for production, but is only applicable to Associated Productive Units or established MIPYMES networks. Up to 60% of the value of the purchase may be considered.
- (6) Support commercial development and access to markets – this relates to co-financing fairs and creating commercial networks and expositions of Ecuadorian products.

The eligible sub-sectors of the production sector are:

- (1) Fresh and processed food
- (2) Metalworking
- (3) Plastics and Synthetic Rubber
- (4) Apparel and Footwear
- (5) Bodies and Parts
- (6) Sustainable Agro forestry and their processed products

Ministry of Coordination of Production, Employment and Competitiveness

See document “Potenciales inversiones en Ecuador”³⁴.

³⁴ See: <http://www.mcpec.gov.ec/images/stories/inversionespotencialesecuador.pdf>

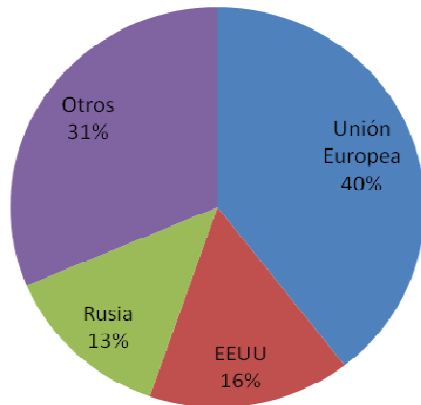
List of Annexes

- ANNEX 1: MYPIMES MARKET
- ANNEX 2: SURVEY FOR BASELINE
- ANNEX 3: CONSIDERATIONS FOR IMPLEMENTING INTERNATIONAL PROJECTS IN
ECUADOR

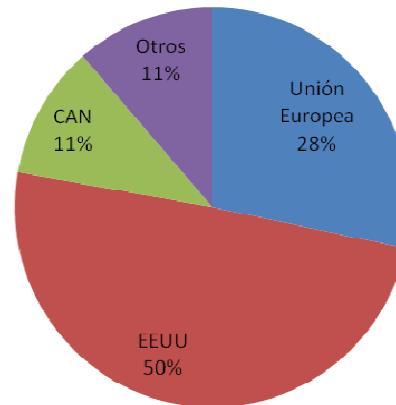
ANNEX 1: MYPIMES MARKET

MIPYMES EXPORTS

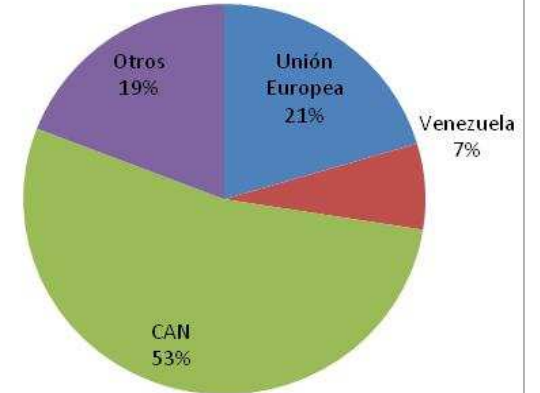
Frutas, legumbres y plantas



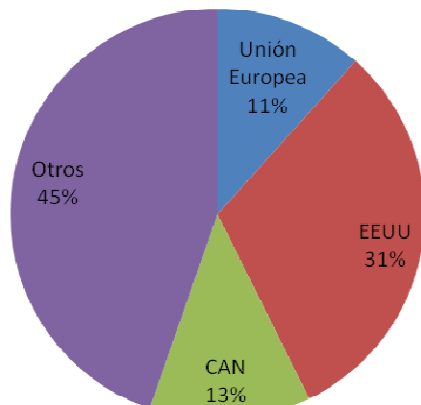
Pescado y mariscos



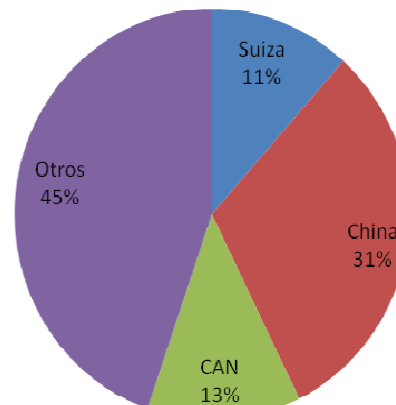
Textiles



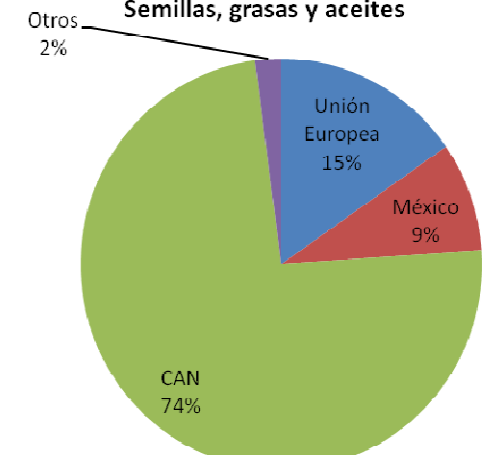
Madera y Papel



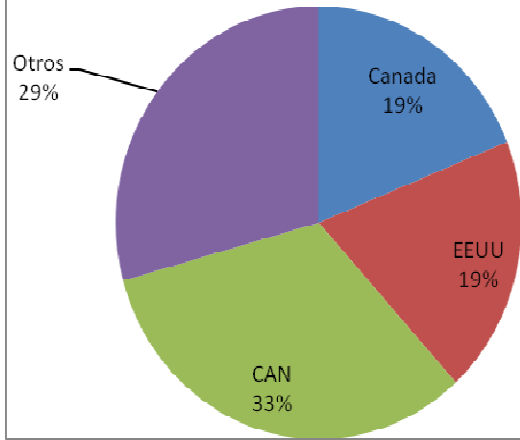
Minerales



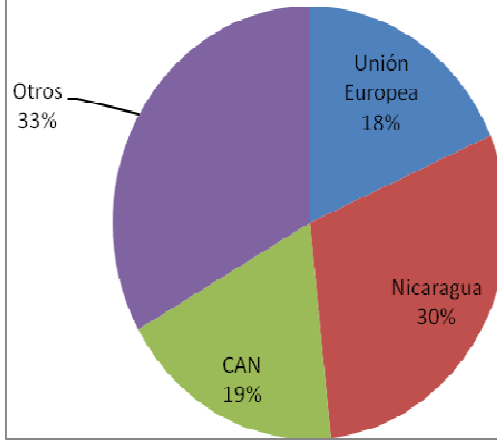
Semillas, grasas y aceites



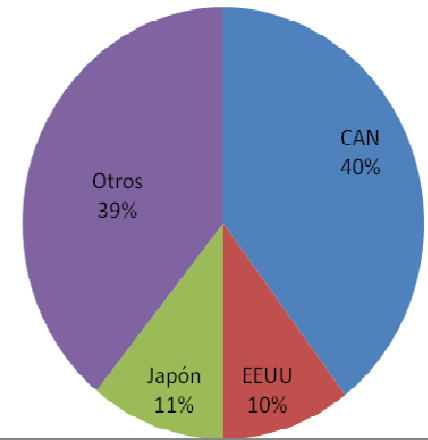
Máquinas no eléctricas



Bebidas y Tabaco



Productos Químicos



Source: Lideres Magazine

ANNEX 2: SURVEY FOR BASELINE

SOLICITUD DE INFORMACIÓN AGUA Y ENERGÍA

favor completar lo resaltado en amarillo

INFORMACIÓN

Nombre de la Organización, Empresa o Planta	
Tipo de actividad productiva	
Subsector	
Capacidad de producción anual	Favor reportar en unidades como Ton, m3, m fácilmente cuantificables. Si existen varias detalla
Horario en producción (#horas/día)	
Días de Producción al año	
Ubicación	
Contacto Suministro Información	Nombre Telefono email

I. Breve diagrama de flujo de la situación actual. Favor identifique insumos de agua y energía eléctrica y térmica y productos, emisiones (efluentes)

II INDICADORES DE PRODUCCIÓN

	Evaluar SI /NO	VALOR	UNIDAD	Notas (por favor inclúyalas si existe alguna observación)
a) Se cuantifican indicadores de producción en su empresa				
b) Su negocio produce uno o más productos. Favor reportar capacidad de producción				
c) Conoce la generación de residuos sólidos/ unidad productiva o toneladas de desecho/ toneladas de materia prima			ton / ton; ton/ m ³	
c) Conoce el consumo de electricidad / unidad productiva			MWh / m ³ ; MWh/ ton	
d) Conoce el consumo de combustible /unidad productiva			Gal/ m ³ ; Ton / m ³	
e) Conoce el consumo de agua / unidad productiva			m3 / m ³ ; m ³ / ton	
f) Conoce la generación de agua residual /unidad productiva			m3 / m ³ ; m ³ / ton	

III ASPECTOS PRODUCTIVOS. GENERACIÓN RESIDUOS

1) Consultas generales				
	Evaluar SI /NO			Notas (por favor inclúyalas si existe alguna observación)
a) Tiene cuantificado la generación de residuos en el procesc				

b) Existe alguna aplicación de producción más limpia en el procesc				
c) Existe balance de materiales o masa de la Planta.				
d) Los residuos producidos tienen un valor comercial				
e) Comercializa los residuos a otra empresa/ agente				
e) Algún residuo producido se aprovecha en el proceso. Favor				
f) Utiliza los residuos generados para generación de energía				
2) Consultas mas específicas				
a) Favor describa tipo de residuo generados. Es sólido o líquidc				
b) Clasificar el tipo de residuos sólidos generados				
c) Cuantificar la producción de residuos sólidos				Ton / mes; Ton /año
d) Cuantificar la producción de residuos sólidos por unidad de				Ton / Unidad
e) En caso de generar residuos orgánicos favor describir su				
f) Cantidad de residuos sólidos empleados en generación				Ton/ mes
g) Porcentaje del costo de producción en disposición de residuos				%
III. ASPECTOS ENERGÉTICOS				
1) Consultas generales				
		Evaluar SI /NO		Notas (por favor inclúyalas si existe alguna observación)
a) Se ha realizado alguna auditoría energética en la empresa				
b) Existe alguna aplicación de producción más limpia en el procesc				
c) Existe balance de energía y materiales de la Planta.				
d) Existe autogeneración eléctrica				
e) Existe utilización de energía renovable en el Proceso				
f) Se realiza cogeneración				
g) Existe otro consumo energético además de electricidad				
h) se emplea algún desecho en la producción energético				
i) Se realizan auditorías ambientales en la planta, favor indicar				
j) Conoce el porcentaje componente del consumo eléctrico en el costo de producción. Es posible conocerlo				
k) Conoce el porcentaje componente del consumo combustibles en el costo de producción (excluye los reportados en generación eléctrica). Es posible conocerlo				
2) Con relación a la generación/ consumo electricidad				
a) Capacidad Instalada				MW
b) Tipo de generación eléctrica instalada				
c) Tipo de combustible empleado				
d) Energía producida al mes				MWh/mes
e) Horas de Operación				horas/ año
f) Factor de carga				%
g) Consumo de electricidad mensual				MWh/mes
3) Con relación a la generación térmica				
a) Capacidad Instalada				Mwcal
b) Tipo de generador termico instalado				
d) Tipo de combustible empleado				
e) Horas de Operación				horas/ año
f) Eficiencia grupo térmico				%
g) Consumo de combustible mensual				Gal/ mes; kg/ mes

IV. ASPECTOS ASOCIADOS AL CONSUMO DE AGUA				
1) Consultas generales		Evaluar SI /NO		Notas (por favor inclúyalas si existe alguna observación)
CONSUMO				
a) Posee fuentes propias para el suministro de agua				
b) Conoce el consumo de agua por unidad productiva.				
c) Se trata el agua que ingresa al Proceso				
d) Conoce el porcentaje del componente consumo de agua en el costo de producción				
e) Conoce la operación en su proceso que mayor cantidad de agua consume				
DISPOSICIÓN FINAL				
f) Trata el agua empleada en el proceso				
g) Recicla el agua tratada al proceso o para otro uso				
h) Conoce el porcentaje del componente de agua tratada en el costo de producción				
2) Uso de agua en el proceso			Unidad	Notas (por favor inclúyalas si existe alguna observación)
a) Consumo de agua			(m3/día) o (m3/ lote)	
b) Consumo de agua por unidad de producción			(m3/ unidad de producción)	
3) Agua Tratada				
a) cantidad de agua a ser tratada				
b) tipo de tratamiento de agua				
c) horas de operación de la planta			días al año	
d) días de operación en el año				
e) en caso de existir plantas anaerobias señalar uso de biogas				
f) producción de biogás			m3/day; kg/ día	
g) sistema de tratamiento para el biogas				
h) El biogas producido se quema o se usa en producción				

**ANNEX 3: IMPORTANT CONSIDERATIONS FOR PHASE 2
IMPLEMENTATION OF THE CLOSED LOOPED CYCLE PROJECT**

IMPORTANT CONSIDERATIONS FOR PHASE 2 IMPLEMENTATION OF THE CLOSED LOOPED CYCLE PROJECT

A brief description of the main consideration for execution of International Cooperation Projects funded with non reimbursable funds is introduced. There are some administrative and operational issues listed in the document.

There is an excellent document, which explains the procedure to access to international cooperation funds it was prepared by the Ecuadorian Agency from International Cooperation – AGECI nowadays so called SETECY (Secretaría Técnica de Cooperación Internacional). More information can be found in the document ***“Proceso de aprobación y ejecución financiera de recursos para proyectos y programas financiados con Cooperación Internacional no reembolsable en el Ecuador”***¹.

Page No. 12 of the document describes the procedure. Page 42 shows a flow diagram showing in easy way the procedure. I made a brief transcription of the procedure:

Fase I: Aprobación del proyecto

- P.1.** No Objeción del Proyecto
- P.2.** Formalización de la Cooperación Internacional

Fase II: Preparación de la Ejecución del Proyecto

- P.3.** Modificación del Presupuesto Institucional
- P.4.** Modificación del Presupuesto Global de Cooperación Internacional
- P.5.** Validación y Resolución presupuestaria del Ministerio de Finanzas
- P.6.** Apertura de Cuenta de Transferencia Exclusiva (TE).

Fase III: Ejecución del proyecto

- P.7.** Depósito de Fondo Inicial en la Cuenta TE.
- P.8.** Ejecución Financiera del Proyecto.

Key issues

In order to get P1. “non objection of the project”, the **applicant organization** has to prepare the results of the feasibility study of the project using the form ***“Elaboración del Perfil de Proyecto de acuerdo al Formato SENPLADES”***². For similar experiences (with the renewable energy projects funded by International Cooperation) to complete this big document (more than 50 pages document) it takes most one month.

¹ The document can be downloaded:

http://www.ageci.gob.ec/index.php?option=com_docman&task=cat_view&gid=89&Itemid=20

² The electronic version of the document can be downloaded:

http://www.senplades.gov.ec/c/document_library/get_file?uuid=b65eb0c4-83fd-4b77-85c7-a909b4daf241&groupId=18607

However to start completing this document it is important to define the **applicant organization**. In the case of our project we have not decided yet which organization will be the one who lead the project. We have different option:

1. Ministry of Coordination of Production, Employment and Competitiveness – MCPEC,
2. Ministry of Industry and Productivity (MIPRO),
3. Ministry of Environment (MAE).

Some of the criteria that has to be taken to select the Applicant organization should consider willingness from the applicant to support the process, infrastructure availability in terms of human resource, and the institutional set up.

Once the document E is presented to SENPLADES the following steps are needed to get P2:

1. Statement from the Coordination Ministry. For MCPEC is not needed because it is a Ministry of Coordination. For MIPRO needs MCPEC statement and from MAE the Ministry of Coordination of Heritage,
2. Technical analysis from the document from SETECI,
3. SETECI request assent from SENPALES
4. Non objection announcement from SETECI to the applicant, the Ministry of Coordination applicant (it it is the case) and the International Cooperation Agency (OAS) to formalize the cooperation.

Once this is completed to formalize in a Memorandum of Understanding of non reimbursable cooperation between the applicant organization and the international cooperation agency, this MofU has to be registered in the Ministry of Foreign Affairs and SETECI. With these requirements the applicant can start officially the phase 2 of the process, preparation for project execution.

For the project execution a relevant issue to consider is that economic contribution from the International Cooperation Agency has to be deposited in a special national account (TE account, this funds are treated as Public Funds).

OPERATIONAL ASPECTS

In this section the current situation from the national procurement systems will be presented in order to make easier the execution of the project, especially when specialized consultancy of services is needed.

Bellow there is a transcription from the National Procurement Law which deal with project supported by International Cooperation.

Artículo 3.- Contratos Financiados con Préstamos y Cooperación Internacional.- *En las contrataciones que se financien, previo convenio, con fondos provenientes de organismos multilaterales de crédito de los cuales el Ecuador sea miembro, o, en las contrataciones que se financien con fondos reembolsables o no reembolsables provenientes de financiamiento de gobierno a gobierno; u organismos internacionales de cooperación, se observará lo acordado en los respectivos convenios. Lo no previsto en dichos convenios se regirá por las disposiciones de esta Ley.*

As you can see it is advisable to determine the procurement procedures for the project and include this in the MofU. In case, the procurement procedure is not included in the MofU the project has to use mandatory the “Sistema de Contratación Pública”.

NEXT STEPS

1. Define the international cooperation agency which jointly with OAS will support the execution of Phase 2 of the project,
2. Select the applicant organization,
3. Depending on the necessity of needing co financing for CLC phase 2, the applicant should look for additional funds from private companies beneficiary of the project (like in kind) and support from existing projects from the applicant (such as Eco-efficiency project from MIPRO),
4. Prepare SENPLADES REPORT; it has to be clear the contribution of international cooperation and the local contribution.