



TOGETHER
for a sustainable future

OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.



TOGETHER
for a sustainable future

DISCLAIMER

This document has been produced without formal United Nations editing. The designations employed and the presentation of the material in this document do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations Industrial Development Organization (UNIDO) concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries, or its economic system or degree of development. Designations such as “developed”, “industrialized” and “developing” are intended for statistical convenience and do not necessarily express a judgment about the stage reached by a particular country or area in the development process. Mention of firm names or commercial products does not constitute an endorsement by UNIDO.

FAIR USE POLICY

Any part of this publication may be quoted and referenced for educational and research purposes without additional permission from UNIDO. However, those who make use of quoting and referencing this publication are requested to follow the Fair Use Policy of giving due credit to UNIDO.

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org

CTCN - Technical Assistance Response Plan

*Monitoring and Evaluation of Colombian national promotion
for Energy Efficiency (EE) against national targets*

FINAL REPORT

Executive Summary



This report presents a summary of the results of the technical assistance to Colombia under the Climate Technology Centre and Network (CTCN). Many aspects mentioned here are disclosed in detail in each of the Preliminary Reports (I to IV), and it has not been possible to fully develop everything in this executive summary due to restrictions of size. The interested reader is referred to the preliminary reports for more detail.

Index

<u>1</u>	.....	<u>Introduction</u>
<u>2</u>	.....	<u>Study Methodology</u>
<u>3</u>	.....	<u>Evaluation of effectiveness of Tax Incentives in Transport and Industry in the 2010-2015 Action Plan</u>
<u>3.1</u>	.....	<u>Revision of Tools and Instruments for the promotion of EE in Industry and Transport sectors</u>
<u>3.1.1</u>	.....	<u>Industry Sector</u>
<u>3.1.2</u>	.....	<u>Transport Sector</u>
<u>3.1.3</u>	.....	<u>Specific references to Fiscal Instruments</u>
<u>3.2</u>	.....	<u>Evaluating compliance in established goals in incentive schemes</u>
<u>3.3</u>	.....	<u>Barriers and problems identified for implementing actions for EE</u>
<u>4</u>	.....	<u>Sector Prioritization</u>
<u>4.1</u>	.....	<u>Priority Sectors</u>
<u>5</u>	.....	<u>New Courses of Action, Regulatory Instruments and Measures</u>
<u>5.1</u>	.....	<u>Prioritised Proposals, Instruments and Measures</u>
<u>5.1.1</u>	.....	<u>Freight Transport Sector</u>
<u>5.1.2</u>	.....	<u>Human Transport Sector</u>
<u>5.1.3</u>	.....	<u>Industry Sector</u>
<u>5.1.4</u>	.....	<u>Hotel/Hospitality Sector</u>
<u>5.1.5</u>	.....	<u>Hospital/Health Sector</u>
<u>5.2</u>	.....	<u>Cross-Cutting Measures</u>
<u>6</u>	.....	<u>Developing indicators for Evaluation and Monitoring</u>
<u>6.1</u>	.....	<u>Proposals for Monitoring Objectives for Energy Policy</u>
<u>7</u>	.....	<u>Conclusions and Synthesis of Key Aspects</u>
<u>8</u>	.....	<u>References</u>

Annexes

Annex I: Proposals and Opportunities in identified Sectors

Annex II: Strategic Directions, Instruments, Measures and Actors for EE in each Sector

- I. Interurban Freight Transport Sector
- II. Human Transport Sector
- III. Industry Sector
- IV. Hotel/Hospitality Sector
- V. Hospital/Health Sector

Annex III: Indicators for promotion instruments for EE in each Sector

- I. Freight Transport Sector
- II. Human Transport Sector
- III. Industry Sector
- IV. Hotel/Hospitality Sector
- V. Hospital/Health Sector

Acronyms

ACHC	Colombian Association of Hospitals & Clinics (Asociación Colombiana de Hospitales y Clínicas)
ACOPI	Colombian Association of Small and Medium Enterprises (SMEs) (Asociación Colombiana de Medianas y Pequeñas Industrias)
ANLA	Colombian National Authority on Environmental Licenses ¹ (Autoridad Nacional de Licencias Ambientales)
CIURE	Colombian Cross-Institutional Commission for the rational use of Energy and Energy from non-conventional sources ² Comisión Interinstitucional de Uso Racional de Energía y Fuentes no Convencionales de Energía
COP	Conference of the Parties, (UNFCC) (Conferencia de las Partes)
CTCN	Climate Technology Centre and Network ³ (Centro y Red de Tecnología para el Clima)
DIAN	Colombian National Directory for Taxation and Customs (Dirección de Impuestos y Aduanas Nacionales de Colombia)
DNP	Colombian National Department for Planning ⁴ (Departamento Nacional de Planeación)
ECN	Energy research Centre of the Netherlands
EE	Energy Efficiency (Eficiencia Energética)
END	Designated National Entity (Entidad Nacional Designada)
ESCOs	Energy Service Companies
ECDBC	Colombian National Strategy to Reduce Atmospheric Carbon Emissions (Estrategia Colombiana de Desarrollo Baja en Carbono)
FB	Fundación Bariloche (Bariloche Foundation)

¹ www.anla.gov.co/

² Mining and energy planning unit, Colombian Ministry for Mining and Energy www.si3ea.gov.co/

³ www.ctc-n.org/

⁴ www.dnp.gov.co/

GEF	Global Environment Facility ⁵ (Fondo para el Medio Ambiente Mundial)
GG	Greenhouse Gases
GIZ	Gesellschaft für Internationale Zusammenarbeit (German Corporation for International Cooperation) ⁶
IDB	Inter-American Development Bank (Banco Interamericano de Desarrollo) (BID)
MADS	Colombian Ministry for the Environment & Sustainable Development (Ministerio de Ambiente y Desarrollo Sostenible)
MINCIT	Colombian Ministry for Trade, Industry & Tourism (Ministerio de Comercio, Industria y Turismo de Colombia)
MME	Colombian Ministry for Mining and Energy (Ministerio de Minas y Energía)
MRV	Monitoring, Reporting and Verification
NAMAs	Nationally Appropriate Mitigation Actions
NREL	National Renewable Energy Laboratory (US)
PAS	Plans for Action by Sector (Planes de Acción Sectorial, ver NAMAs)
PROURE	Colombian programme for the rational and efficient energy use & non-conventional energy sources (Programa de Uso Racional y Eficiente de la Energía y otras fuentes no convencionales de energía)
UPME	Colombian Planning Unit for Mining and Energy (Unidad de Planeación Minero Energética ⁷)
VAT	Value Added Tax (Impuesto al Valor Agregado)

⁵ www.thegef.org/

⁶ www.giz.de/

⁷ <http://www.upme.gov.co/>

1. Introduction

This document stems from a study developed in response to a request for technical assistance from the secretariat of the *Climate Technology Centre and Network (CTCN)*⁸, for the Colombian Unit for Mining and Planning (UPME) via the Colombian National Designated Entity (END)⁹. This work was implemented under the programme of technical assistance of the CTCN for developing member countries and, on this occasion, via a group of three members of the CTCN consortium: *Energy research Centre of the Netherlands (ECN)*, *The US National Renewable Energy Laboratory (NREL)* and the *Fundacion Bariloche (FB)*, who headed it up.

Terms and scope of this report are contained in the *Response plan* signed in January 2015 by mutual agreement by authorities in both the CTCN and the END. As stipulated, the principle objective of technical assistance was to provide a performance evaluation and also provide an evaluation of the effectiveness of economic incentives, thereby implementing resolution 186 (2012). Two economic sectors were stipulated: Industry and Transport. Also evaluated was the appropriateness of including other courses of action in other sectors in the incentive programme (services and construction), as well as the expansion of the instruments used for the promotion of Energy Efficiency (EE).

To achieve the above-mentioned objective, FB, in conjunction with UPME, developed a work plan and a timetable explicitly mentioning the technical proposal consisting of five specific products to be delivered to the counterparty and to END:

- I. Evaluation of the effectiveness of the incentives in the five active courses of action in the Transport and Industry sectors to promote energy efficiency and achieve the targets set in the 2010-2015 Indicative Action Plan.
- II. Evaluation of expansion opportunities for incentives in other courses of action within the strategies prioritized in Industry and Transport; and evaluation of the feasibility to including two additional sectors in the incentive system: Services and Construction.
- III. A summary of proposals for other incentives and actions in other sectors subject to economic, technical and legal criteria.
- IV. A proposal document for Monitoring Indicators and Evaluation to be used in the future evaluation of policies for implementation in other sectors.
- V. A summary document of proposals and policy recommendations, including new active directions and ways to instrument and measure them.

This Final Report corresponds to the Final Document referred to in item V, and summarizes the four previous report sections containing the corresponding products. The document is divided into six chapters. Following the Introduction, Chapter 2 presents the general methodology used throughout the technical assistance. Chapter 3 presents the main results of evaluating tax incentives designed to promote EE in the Industry and Transport sectors (in the framework of Joint Resolution 186). The next chapter elaborates on the results of the prioritization of sectors

⁸ For more information on the CTCN and its principal activities see: <http://ctc-n.org/>

⁹ Tasked with addressing climate change

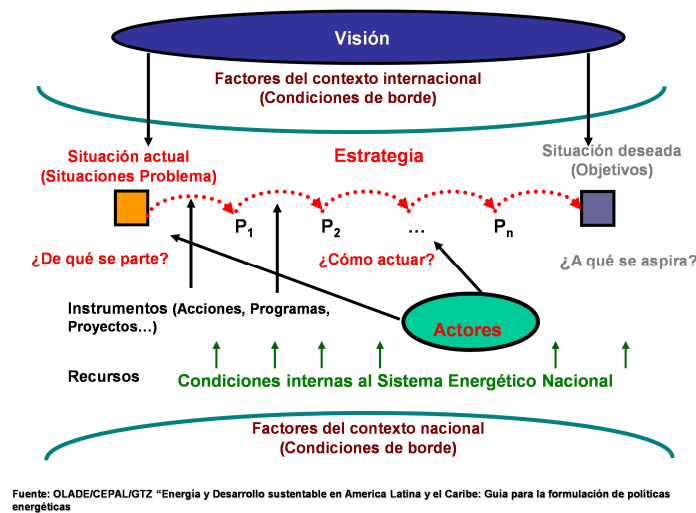
for expansion of EE promoting instruments. These instruments are presented in chapter 5. The issue of both Monitoring and Evaluating suggested measures is covered in chapter 6, followed by chapter 7, which presents the general conclusions of the study.

2. Study Methodology

The conceptual framework that underlies this development analysis consists of a process of implementing policy at a sectoral (or sub-sectoral) level, as shown in *Figure 2.1*. In such models, strategies are outlined in order to attain a desired output. Specifically, in this consultation, this entails moving from current levels of sectoral energy consumption towards increased EE with a reduced environmental impact.

In such an approach, it is crucial to analyze obstacles and barriers faced in such a process, these issues to be overcome by public policy intervention. By so doing, it is hoped that the strategies, actions, and measures adopted would respond to the objective to be met in a consistent manner, overcoming identified obstacles and leading to the desired goal, as shown in *Figure 2.1*.

Such obstacles include boundary conditions (both external and internal) representing real issues that are unmodifiable by simply making a choice or taking a decision, but which are recognized as essential elements in order to make the proposal viable. They are conditions that are outside the decision-making scope of authorities in the energy sector that can be labeled: *enabling conditions*. Barriers encountered (both sectoral and specific) represent modifiable factors, which must be overcome by various strategies and instruments. A great deal of the success of any policy is dependent on the proper diagnosis of the barriers faced and the ability to layout strategic guidelines and instruments for removing them. This has been conducted in this study for the first product via a review of available information and through interviews with key players.

Figure 2.1. The process of policy implementation

Source: OLADE/ECLAC/GTZ (2003)¹⁰

In this consultancy project, the Terms of Reference presented were not duly made explicit. In particular the development of a diagnosis that could identify the problems to be overcome by public policies was left open. Neither were the specific objectives to be followed in each of the sectors made explicit. That said, these aspects have emerged from the assessment made of tax incentives (although in a partial way, specifically for the Industry and Transport sectors) and in meetings conducted with actors and with officials.

¹⁰ Key to diagram in Spanish (from top to bottom). Beginning with a vision [*visión*] (taking into account the border conditions [*condiciones de borde*] in the international context. The start point is the current problematic reality [*Situación actual / Situaciones problema*], passing from phase to phase (P1, P2, ..., Pn) asking the following questions: 1) What is the start point? 2. How to act? 3. What is it that is hoped for? [*¿de que se parte? ¿como actuar? ¿A que se aspira?*]. The aim is to attain the objective (the desired end-situation) determining the actors, and instruments, activities, programmes and projects [*Instrumentos: Acciones, Programas, Proyectos*] and the resources [*recursos*] needed – taking into account the internal conditions of the national energy system [*Condiciones internas al sistema energética nacional*]- the border conditions being contextualized by national factors. The diagram is adapted from a source entitled “Energy and sustainable development in Latin America and the Caribbean: a guide for the formulation of energy policy” (OLADE/ECLAC/GTZ)

Table 2.1: Steps toward EE policy formulation

Step	Phase	Question / Result
1	Diagnostic	Characterising the current reality, (the basis for intervention)
2	Objective	What is it that one wishes to achieve from the policy? What are the desired and achievable results?
3	Strategic Directions	How does one plan to move from the current undesirable reality to a desired and achievable state in the future? Sequential steps that define this path.
4	Means/ instrument	How can one bring strategic directions toward an operative reality? How can one coordinate the <i>how</i> with the <i>what</i>
5	Course of Action	By what means can one bring into practice the selected tools and resources (instruments)? What actions are necessary to implement these? ¹¹

Source: OLADE/ECLAC/GTZ (2003)

In addition, since policy for energy efficiency oriented toward consumer sectors is made up of subprogrammes divide by sector for EE in each of the relevant sectors (residential, industrial, transportation, etc.), it is also necessary to prioritize each one of these, in so doing it is advisable to use properly defined criteria, sensitive to national circumstance and to the objectives of energy policy in particular.

3. Evaluation of Effectiveness of Tax Incentives in Transport and Industry in the 2010-2015 Action Plan

The primary objective of the first product was to ***evaluate the level of effectiveness and the results achieved through tax incentives implemented by resolution 186 (2012) in the industry and transport sectors***, identifying the barriers to be overcome and then, the process of elaboration for the relevant policy to drive this.

In this Chapter we hereby present the environmental circumstances and the barriers identified in the case of Colombia, as elaborated by a review of information and through conducting interviews during the first mission.

¹¹ The scope of this report cannot include this step as it would require a more extensive and meticulous format.

3.1 Revision of the tools and instruments to promote EE in the Industrial and transport sectors

3.1.1 Industry Sector

There are many ways to address the policies and strategies of industrial efficiency. The state of the art enables the identification of those that are most prevalent in terms of the strategic directions to follow and the challenges identified at a global level. It is considered relevant to highlight a series of key findings that emerge in many countries (with a variety of characteristics and differing degrees of development).

1. Policies and Programmes: based on a necessary and contingent role of government in setting guidelines, objectives, goals and priorities for the industrial sector.
2. Energy Management Systems (EMS): Systematic energy management is considered one of the most effective approaches to improve efficiency in industrial production processes and in services. EMS generates a culture of efficiency and a demand to maintain continuous improvement in energy performance while updating practices and procedures to take advantage of new opportunities.
3. Transparency and access to energy information: The development of energy balances for sources and uses of energy is a tool in the policy space that is gaining ground as a condition for identifying appropriate intervention strategies.
4. Transparency and access to environmental information: Another trend that is gaining ground is assigning responsibility to carbon emissions. Companies that measure their environmental risk would be in a better place to manage that risk strategically.
5. Assigning a Price to Carbon: Valuing and monetizing carbon emissions is shown to be an increasingly valuable tool to leverage efficiency projects and to improve their rate of return in the long term, even though it is still essentially based in secondary markets.
6. Benchmarking: This helps to determine and to evaluate the benefits obtained by implementing using Best Available Technology (BAT) to compare performance with that of other actors.
7. Supply Chain: Improved cooperation in EE in the value chain (for any goods or services) can substantially reduce energy consumption. By seeking transparency and better information in the supply chain, one can open the door to identifying efficiency options and also provide better information to authorities to define and implement strategies.
8. Innovation and Recycling: Despite advances in technological innovation there is still ample scope for increasing efficiency by recycling parts or products.
9. Funding: It is agreed that funding is one of the biggest challenges for accelerated industrial efficiency.

Strategies are concentrated in four dominant directions presented in the following table.

Table 3.1.1.1: Principal instruments and identified measures to promote EE

Categories of Instruments		Specific Means
Economic Instruments	Taxes	Energy Taxes
		Taxes on the generation of waste or unnecessary (energy) loss
		Carbon Credits such as Clean Development Mechanism (CDM) or other markets
		Trading in Green Certificates
	Subsidies	Subsidies (e.g. for energy audits) or directly for equipment substitution
		Fiscal incentives (e.g. for fuel replacement, thereby contributing to increased process efficiency)
Regulations	Equipment Standards	
	Voluntary Energy Management	
	Voluntary Agreements (associated with regulation)	
	Labelling initiatives an public regulations	
Informational Programmes	Energy Audits	
	Benchmarking	
	Information for industrial cooperation	
Provision of public goods or services	Training and Education	
	Free Energy Audits	
	Detailed information on available technologies	
Voluntary Activities	Voluntary accords on energy goals or the adoption of energy management schemes or the efficient use of resources.	

Source: *Elaborated from Somanathan et al. (2014)*

There is no single policy and strategy that can respond to the overall improvement of efficiency in industry and which can address the variety of options and possible solutions. It is generally recognised that countries apply a mix of strategies and instruments. Current practices also recognize the importance of portfolios of policies and strategies, while taking account of the national context and conditions and the rationality of actors in their decision-making processes¹².

As for Latin America, one finds a trend toward policy portfolios, as found in Brazil or Mexico with multiple cross-sectoral strategic lines. Chile meanwhile has developed an Action Plan in the industrial sector that aims to promote the implementation of energy management systems (EMS), promoting cogeneration and technical assistance to energy efficiency projects and incorporating efficient production processes.

¹² Put another way, our experience was not to be recommended, if one wishes to obtain the required results, best to rest with just one strategic direction and a single selection of instruments.

3.1.2 Transport Sector

Gains in energy efficiency in the transport sector is one of the biggest challenges since the continuous increase in vehicle fleet size sterilizes gains from technology improvements and any efficiency measure implemented.

The courses of action postulated more frequently treat the avoidance of, or reduction in trips, modal shifts resulting from behavioural changes, technological developments that improve vehicle efficiency or fuel switching, investments in the infrastructure and in construction, and changes in territorial occupation¹³.

Table 3.1.2.1: Principal possible measures

Technology or Practice	Measures
Levels of activity: demand reduction	Replacement mobility needs, reducing travel for better communication.
	Behavioural changes, reducing car use through pricing policies (tolls, parking, etc.)
	Behavioural changes, education and awareness for reduced car use
Structural: efficient infrastructure system	Changing transport modes; private to public passenger transport
	Modal shift replacement cars for cycling
	Modal shift replacement car for walking.
	Urban planning to reduce the need for certain travel distances
	Urban planning by reducing the possibilities of using cars. Parking and traffic restrictions
	Modal shift, moving air transportation to high speed trains.
	Replacement of truck haulage, replaced by rail freight
	Replacing truck haulage and other land transportation by water transport (where possible)
Combined systems for improved cargo systems, logistics and efficiency in ports and airports optimization.	
Energy Intensity: Enhanced Technology	Enhanced technological efficiency of vehicles and on-board high technology information systems
Switching Fuels	Electric, hybrid or hydrogen vehicles based on electricity generated from renewable sources

Source: Prepared based on Sims et al. (2014)

¹³ In practice we noted that a combination of a variety of these led to better results.

Table 3.1.2.2: Principal instruments and identified measures to promote EE in the transport sector

Instruments category		Measures
Economic instruments	Taxes	Fuel Taxes
		Congestion charges, different prices for registration plates, tolls.
		Vehicle Taxes
	Subsidies	Subsidies on biofuels
		Subsidies for buying more efficient cars
		Reduced tolls for certain hours or for higher vehicle occupancy
Regulations	Vehicle Standards	
	Efficiency standards in fuel consumption	
	Fuel quality standards	
	Emissions standards.	
	Regulatory restrictions that can promote modal shifts	
	Circulation/Traffic Restrictions.	
	Urban planning and traffic restrictions.	
Information Programmes	Labelling information programmes quality and fuel emissions	
	Vehicle labelling	
Public provision of goods or services ¹⁴	Investments in infrastructure and travel pathways for human powered transport	
	Investments in infrastructure for alternative fuels.	
	Promoting the development of efficient vehicles	

Source: *Elaborated from Somanathan et al. (2014)*

As in other sectors, a combination of strategies is required to achieve effective results. In the case of the road transportation of people policies are aimed at restricting automobile traffic, promoting mass transit, managing traffic congestion and promoting new fuels to reduce fossil fuel consumption, emissions and local pollution. There is a combination of policies to reduce activity levels, focused primarily on land use planning, public transport and prices. Other measures include intelligent traffic management, restrictions on, or the designation of, truck routes, or smart parking. In promoting rail transport measures are geared towards fuel switching by electrification of intercity and metropolitan suburban rail lines.

3.1.3 Specific references to Fiscal Instruments

Fiscal mechanisms come under the category of economic instruments or market-based instruments. They are understood, as economic instruments of a fiscal nature, such as direct

¹⁴ In the case of public goods we are referring to which the government should implement so that efficiency is improved or so as to have the basic infrastructure in place for these technologies to be developed.

subsidies, that provide incentives to switch to alternatives that meet the desired objectives for the sectors under analysis.

Broadly speaking, fiscal instruments can be divided into two main categories:

- Taxes,
- Subsidies, the latter being of three categories
 - Direct subsidies;
 - Incentives given through taxes in the form of tax credits or other concessions;
 - Differentiation in levels of charges or tax rates.

The results indicate that subsidy policies can complement taxation instruments and may have broader effects than merely applying a tax. Again complementary strategies demonstrate greater effectiveness, depending on products and on markets.

Empirical evidence shows, in the first place, that fiscal instruments can play an important role if they are complemented by other market-based instruments and regulatory measures; second, that the advantage of tax instruments, when compared with regulatory instruments, is their effectiveness, and the fact that they can help reduce distortionary rates elsewhere in the economy; and thirdly, that the basic rates prove to be very effective when addressing aspects have no physical specificity (location) and which don't vary with pollution source. However, as mentioned, fiscal instruments may be insufficient and may require supplementation by other instruments, especially when there are information costs or deep market failures. The latter is of vital importance throughout this study, for this reason we shall take it up again later¹⁵.

3.2 Evaluating compliance in established goals in incentive schemes

The joint resolution 186/2012, adopted as environmental goals, the targets for energy saving and efficiency shown in Table 3.2.1¹⁶

¹⁵ The effectiveness and the empirical evidence regarding these fiscal incentives is extensively discussed in section 2.1.4 of *The Preliminary report on the First Product*, and we recommend that those who are interested refer to same for more details on empirical and theoretic aspects.

¹⁶ It is important to call attention to the established goals, which seem to be saving through the reduction in the consumption of energy projected for BAU-type scenarios the ownership and pertinence of which cannot be verified in reality and which depend on an hypothesis on a group of variables and parameters.

Table 3.2.1. Combined environmental goals for the industry and transport sectors

Sector	Goal for 2015 energy savings (%)	
Industrial	Electrical Energy	3.43
	Other Sources of Energy	0.24
Transport	Other Sources of Energy	0.33

Source: *Resolution 186/2012*

The same resolution states that all applications submitted to MADS, opting for VAT exclusion or deduction of net income should be framed in one of the courses of action referred to in that resolution (two for industry and three for public service vehicles used in transportation).

According to the process established in Resolution, and in its regulation, UPME constitutes the first step in the evaluation chain through which agents pass in the process of applying for benefits; since the logic of the implementation of the incentive program has three distinct stages, and each of these stages has its own deadlines, information requirements and resolution period, which are:

- I. Application to UPME (Energy Mining Planning Unit)
- II. Request to the ANLA (National Environmental Authority Licensing)
- III. Application of tax incentive, corresponding tax declarations subject to verification by the DIAN (Directorate of National Taxes and Customs of Colombia).

According to information analyzed, up until May 2015, the UPME had received a total of 51 applications, of which 34 were for Transport and Industry (the rest were in the category of promotion of non-conventional energy sources). The largest numbers of applications received correspond to the courses of action related to using waste heat generated in combustion processes (44%) and the promotion of clean mass transport systems (38%).

Of the 34 requests for Transport and Industry, 27 received a favourable (or partially favourable) technical concept classification (79%), 4 were in evaluation, the rest being rejected or having received non-favourable technical concept classifications. The highest levels of success were courses of action promoting the use of electric and hybrid vehicles, and those that encourage clean mass transport systems and promoting engine replacement (50% success). The less successful cases were those related to the promotion of the reuse of waste heat. With regard to the geographical location of applications, most of them came from the cities of Bogota, Cartagena and Cali.

While the highest degrees of success have been achieved in the transport sector, and lower rates of approval in the case of waste heat, it is these latter projects that achieve greater contributions to the goals of reducing energy consumption, according to calculations by UPME.

Taking into consideration the degree of industrial development and transportation of Colombia, the first conclusion that emerges from the evaluation is that the number of applications received is low relative to the size of the sectors. *One of the main reasons identified for this low degree of reaction from the agents to incentives is that Resolution 186 established very narrow courses of action, and that many potential energy efficiency measures, particularly in the case of the industrial sector, fall outside these courses of action.* Additionally, it is noted that factors related to the complexity of the process (in the three stages mentioned above), plus the overlapping initiatives and other national energy market conditions, have contributed to this low level of penetration.¹⁷

3.3 Barriers and problems identified for implementing actions for EE

The following environmental conditions, and barriers in general, have been identified for EE improvement, in an attempt to identify strategies and tools to overcome them. Among the main environmental conditions identified are:

- 1) *The political, legal and regulatory framework:* the actors express concern about certain political instability, arguing that there are uncertainties when it comes to making long-term decisions which limits their decision space when it comes to long-term strategic planning, and they point out that the tax system is complex and lacks clarity and transparency in its rules.
- 2) As for the *organizational and institutional capacity:* agents doubt the capacity of institutions in charge of the processes for the implementation of the instruments. The concern is regarding the scale of the institutions themselves and not their human capacities. They argue that this situation will be even more relevant to Law 1715 and how that Law is regulated; also they fail to recognise a single entity responsible for promoting EE nor coordination of institutions with any level of impact.
- 3) *Sectoral economic issues:* the lack of evidence for energy shortages and energy pricing policy do not provide a reference framework that creates concern or uncertainty about energy issues.
- 4) *Recognition of the importance of energy efficiency* by Colombian society is a task still pending. However various actors consider that this could be changed through following the new plans and actions developed by the MME and UPME. They note the lack of an integral recognition of the transverse nature of the EE, tightly bound as it is with institutional framework, since the implementation of EE actions goes beyond

¹⁷ As mentioned in the next section, these aspects emerged from personal interviews conducted during the first working mission to Bogota and you can find a complete version of these in the *First Preliminary Report*.

environmental, energy and taxation issues, rather it is linked to policies for industry, housing, transport and other sectors where changes are yet to materialise.

- 5) *The quality of the socioeconomic and energy information*: the analysis developed during the diagnosis and evaluation of the energy sector revealed doubts about the accuracy of quantitative data.

Tables 3.3.1 and 3.3.2 demonstrate general barriers and also barriers specific to the tax incentive program identified during fieldwork. In this kind of analysis it is necessary to note the inherent difficulty in distinguishing between these two categories of barriers. While the former are understood as those associated with the lack of autonomous actions of efficiency and the need for intervention via public policy, there may be overlap with the enabling or environmental conditions. The second category of barriers confronts the very strategies and instruments which we are trying to implement.

Annex I presents some proposals and opportunities to overcome these barriers. These were developed based on what was mentioned by the actors (both in the public and the private sector) who were interviewed during the first work mission. Also, based on this initial identification of general and specific barriers, we developed the proposal for new instruments to be applied presented in Chapter 5 of this report¹⁸.

¹⁸ As an addition exercise, in the Second Preliminary Report, a SWOT analysis (Strengths, Weaknesses, opportunities, and Threats) for the tax incentives in Transport and in Industry, accompanied by means to overcome weaknesses and confront treats. To those interested we recommend: Section 3.2.1 of the second preliminary report: Applying SWOT analysis to three clear elements in Colombian EE policy, pages: 16-22

Table 3.3.1: Principal General barriers to the implementation of policies promoting EE in the case of Colombia.¹⁹

Category	Description / Aspects Highlighted
Institutionality for electrical supply and regulation	<p>Vertical disintegration of the production chains for natural gas and electricity does not encourage consumption efficiency. That said, there is a vertical direct and indirect integration that gives market power to the companies.</p> <p>A procurement procedure of energy for the regulated market which is clearly inadequate, in a market where supply is concentrated and there is a high degree of vertical integration, both direct or indirect.</p>
Economic / energy costs / Regulation	<p>Low incidence of energy costs in production costs. The administrative and technological effort required by actors to implement the targeting of efficiency gains in very specific aspects turns out to have very low cost-effectiveness.</p> <p>Inefficient pricing on gas. The charge distribution of natural gas is decreasing with increasing consumption giving a distorted signal for efficiency.</p> <p>Insufficient and inadequate price signals in tariff structures. There is no different tariff regulation that changes depending on the time of day (time differential rate). No rewards for electric mobility.</p> <p>Perverse incentives in the regulations for distribution and marketing of gas and electricity.</p> <p>The profitability of bidders is sensitive to the level of sales with no incentive for the sales to decline.</p>
Awareness	<p>When our first mission took place, energy shortages not seem to be perceived as critical, thus this did not result in preferential policy conditions for EE.</p> <p>The society has not sufficiently internalized environmental awareness to act in a way that encourages energy efficiency. Neither did we perceive a culture for saving energy or for the use of clean energy from renewable sources.</p>
General Information	<p>The action plan in question, its goals and programs was generally unknown to the public. There was no permanent strategy for outreach or awareness. We considered that the level of achievement of goals is low and the responsibilities of the entities related to the Plan are unclear.</p> <p>We perceived low levels of knowledge on the tax incentives and on other funding mechanisms and low levels of user information on the supply of efficient technologies.</p>

¹⁹ As previously mentioned, in some cases the barriers mentioned in this Table are border conditions for the PROJURE (as in the case in the first three barriers). When this isn't so, the barriers have been covered in the recommendations of the directions and the proposed measures. See Chapter 5, Annex II, in this report, or take a look at the *Preliminary Reports I and II* for more detail on the environmental conditions, barriers, and measures.

<p>Convergence and synergy with other PROURE's other strategic directions, such as the development of the ESCO's</p>	<p>There is no entity responsible for promoting EE and we did not note institutional coordination with any level of impact: in this respect the role and importance of the CIURE is unknown.</p> <p>Lack of knowledge and information about the business model and idea of an ESCO (by the financial sector and potential ESCO customers).</p> <p>Lack of access to specialized financing that fits with the characteristics of small-scale ESCO projects.</p> <p>Lack of credibility of diagnosis / energy audits and feasibility studies (as often prepared by independent agencies). These issues complicate procurement processes to cover perceived risk.</p> <p>Absence of a legal framework for the identification and establishment of quality standards and certification mechanisms for ESCOs.</p> <p>Absence of a national association of ESCOs who could position themselves as a platform to optimize the use of resources for the dissemination of information, training and working in a network.</p>
---	--

Table 3.3.2: Barriers, obstacles and failures blocking tax incentives from functioning properly

Category	Problem/Barrier
<p>Design and Procedures</p>	<p><i>Scope of the program:</i> narrow restrictions on activities/directions. Exclusionary, fails to be inclusive, only reaches a limited number of actors.</p>
	<p><i>Scope of the program:</i> No incentives for engine manufacturers nor are there incentives to those who commercialise them either.</p>
	<p><i>Scope of the program:</i> Direct buyers from abroad bypass the local salespeople, which may lead to failure for marketers to find out about the incentive.</p>
	<p><i>Scope of the program:</i> The stimulus applies only to equipment replacement, not for expansion, which does not act as an incentive to attract new investment.</p>
	<p><i>Scope of the program:</i> The courses of action have been too specific. Often the team which can apply the incentive is a component of a larger team that can't dissociate component costs. This may inhibit them from applying for the incentive.</p>
	<p><i>Process Steps:</i> Time overly extended for effective access to the incentives.</p>
<p>Economical</p>	<p><i>Difficulties related to equipment replacement:</i> the need to ensure that the equipment is disposed of when it is replaced, to avoid a transfer of the environmental loading to another link in the chain of the same company or to another company. This adds complexity to the decision process evaluation, acting as a disincentive</p>
	<p><i>Kind of tax incentive:</i> In some cases the incentive of offering income tax relief did not seem to be found to be very attractive. The rationality of actors could lead to them trying to minimize profits and so the incentive would be of limited value.</p>
	<p><i>Transaction costs:</i> very high due to the complexity of the procedures especially for medium and small businesses and even for larger ones. Companies express interest but when they observe the process they give up. This could get worse if a fee is charged to apply for the incentive.</p>
	<p><i>Type of tax incentive:</i> If the benefits only apply at a certain level of income, the level of uncertainty will be higher, or such was the opinion of some actors, though this was controversial and the opinion lacked unanimity. In some cases we were told that some companies prefer the incentive on income, others on VAT. This seems to depend on the size and profitability of companies.</p>
	<p><i>Uncertainty</i> in the result from management. The approval process involves taking on a certain cost but with only an uncertain benefit of uncertain value.</p>
	<p><i>Lack of advice:</i> -- as a public good – the lack of advice in the process increases the costs of decision-making. When the company requires external advice the costs applicable in such a process don't justify the action.</p>
<p>Technologies</p>	<p>Difficulty in gaining access to <i>finance</i>, especially for small businesses.</p>
	<p>There are many <i>funding programs</i> but they lack a comprehensive coordinated approach.</p>
	<p>There isn't sufficient take-up of the <i>funding mechanisms</i> to encourage efficient investments.</p>
<p><i>Difficulties in accessing technology</i>, applies particularly for medium and small manufacturers.</p>	

	<p><i>Technological barrier:</i> In some cases (particularly in the transport sector) it is necessary to have technical assistance to evaluate a new technology and the costs of such implementations have been higher than was originally anticipated.</p> <p><i>Lack of knowledge</i> about available technologies</p> <p><i>Uncertainty about the performance</i> of technologies.</p> <p><i>The existence of a very developed market in used equipment</i> – a barrier to take-up of more efficient equipment. This is also observed in the transport sector because there are no incentives to scrap/decommission the vehicles.</p> <p><i>Institutions involved in the process and the time taken to make decisions:</i> The process of having to navigate three different government offices take too much time and is not pertinent to the decisions that need to be made for investment in or replacement of equipment which sometimes may need to happen within a matter of days or weeks. Very long delay when compared with the urgency of equipment acquirement or the length of the bureaucratic procedure.</p> <p><i>Institutions involved in the process:</i> Lack of internal capacity to process all requests. In the current mechanism the ability to process orders would be impaired if the universe expands. This is due to the size of the institution and not because of a lack of human capacity.</p> <p><i>Institutions involved in the process:</i> The act in the ANLA involves a risk to the person who makes the decision. There is a fear of approving something that involves public funds above and beyond the administrative act. The above problem is related to the lack of clarity of the standard and the room for interpretation. If the rule is clear the officer should be assured.</p>
<p>Institutional Aspects / Capacities</p>	<p><i>Institutions involved in the process.</i> The multiplicity of agencies involved in the process (UPME-ANLA-DIAN) creates barriers to presentations by private actors in different stages. Projects are approved in one organism and then get backlogged in another. Our observations indicate that the greatest degree of dissatisfaction with the processing delay is particularly at ANLA.</p> <p><i>Institutions involved in the process:</i> The forms to fill in and the information required in the various offices differ in major aspects.</p> <p><i>Institutions involved in the process and timing in making investment decisions.</i> The process can work for large investments but not for small actions. In short, the standard does not consider smaller, effectively excluding them.</p> <p>Limited number of players in the supply of energy services (ESCOs)</p> <p>It should expect more interaction and collaboration between the participating public institutions in the process. The need for greater alignment manifests.</p> <p>Absence of experts to advise on the implementation of the processes, especially for small businesses. Individual, institutional and organizational capabilities are required.</p> <p>The diffusion process was implemented from UPME achieved a very thorough and comprehensive coverage of large industries, but there are still some areas without information.</p> <p>Not enough use of DIAN informative mechanisms.</p> <p>Need to emphasize more leadership at government level in publicising the mechanism. This requires an <i>institution to lead</i> the entire process</p>
<p>Information and Diffusion of Instrument</p>	

	<p>We perceived an <i>ignorance on the part of the manufacturers and importers</i> in their knowledge of the mechanism and this does not encourage the sale of more efficient equipment.</p>
<p>Culture and rationale of actors</p>	<p>The financial sector <i>does not know the instrument</i> and not use it as a tool to promote financing and make it more attractive to the investor</p>
	<p><i>High discount rates and short-term rationality</i>, linked to manifestations of uncertainty raised.</p>
	<p><i>Reluctance</i> of actors to conduct audits.</p>
	<p>As to economic aspects; we note a culture that focuses on up-front investment costs rather than life-cycle (costs).</p>
	<p>There is no clear awareness of the importance of energy and environmental issues.</p>

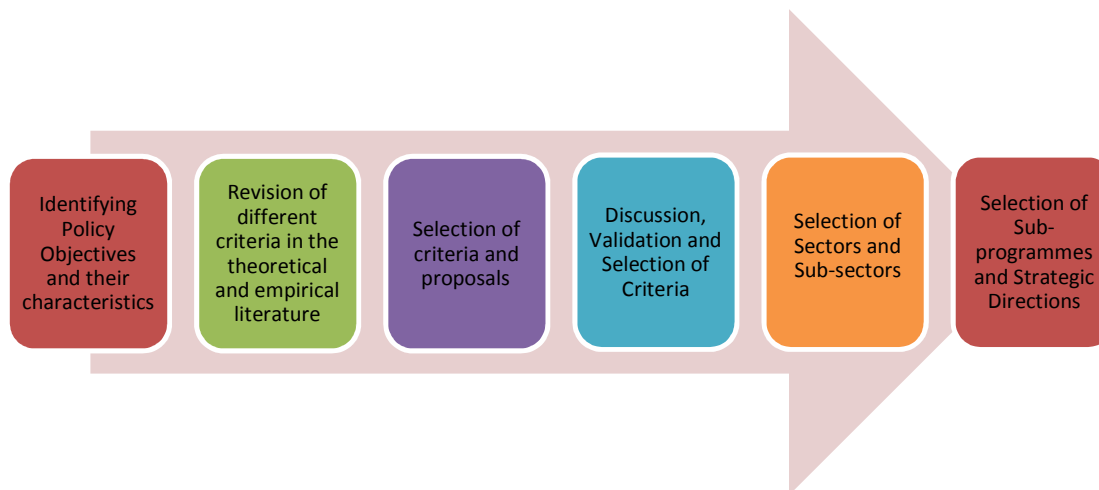
Source: *Compiled based on information gathered from interviews and meetings*

4 Sector Prioritization

Here we present in an abbreviated form the results of this component of the work, whose main objective was to study **what were the priority sectors at the national level to establish energy efficiency policies**. Then, on that basis, we analyze what mechanisms or instruments (other than tax incentives) which might be most convenient, presenting them here briefly. It is important to highlight that these proposals are concentrated in the consumer sectors, so they leave out sectors such as the energy sector itself.

In three specific moments of the work methodology, the explicit collaboration of the counterpart, both the UPME and the MADS in its role as the 'END', was required: 1) the definition of explicit policy objectives of energy efficiency and the other goals required from the new strategic priority lines; 2) During the discussion, validation and the selection criteria and, finally, 3) sector selection, sub-programmes and strategic directions.

Figure 4.1: Methodology applied for the selection of new sub-programmes and courses of action



From empirical experience a set of criteria were proposed for the selection of sectors, sub-programmes and action plans that were validated by the counterpart. These are shown in Table 4.1. It is important to note that the application of the defined criteria requires certain enabling conditions such as: knowledge of the identified efficiency potential, the internal

management of available technologies and, especially in the case of the industry sector, energy consumption by industry.

Table 4.1: Criteria for the selection of sectors and sub-sectors

Criteria	Definition
Importance / Priority	Magnitude of the percentage share in the national energy matrix
Effect	Structure of consumption by source, compared with the gross domestic supply of energy resources and their structure by origin
Potential	EE potential according to different definitions of potential and goals posited.
Feasibility of Intervention	The sector's level of concentration of the sector and the potential of a dialogue with few partners to agree on actions.
Economic Relevance	Relevance economic importance of the sector, sub-sector or section of the socio-economic system.
Economics	Importance of energy costs in the production costs in the sub-sector or branch
Technological Feasibility	The availability and reliability of technology and the degree of internal knowledge about them.

Source: From our own research

Next, in Table 4.2²⁰ we present possible criteria for the evaluation of sub-programmes or strategic lines, from those that were discussed with counterparts.

Table 4.2: Proposed criteria for selection of sub-programmes

Sub-criteria	Definition
Technical Criteria	
Energy Savings / Energy Efficiency	Total energy savings in relation to the total energy consumed would have without the programme.
Time to implement measure	Time taken for measure or policy to achieve the first improvements in EE
Economic Criteria	
Cost-Effectiveness	Relationship between action cost and its effectiveness in terms of defined objectives
Environmental criteria	
Reductions in GHGs	CO ² emitted or saved as a result of the programme
Policy Criteria	
Implementation Feasibility	How easy is it to implement instruments for various reasons
Institutional Feasibility	Feasibility of implementation given the level of existing institutions. Related to the complexity and simplicity of the policy
Policy Alignment	Relationship with the themes of the political agenda and national priorities
Co-benefits / Multiple Products	Contribution to multiple additional objectives beyond the energy component

²⁰ This table is a simplified version of the original in which the proposed indicators for the analysis were also included. For the complete version please refer to Table 5.1.2 of the Preliminary Report II.

Source: *From our research*

The selection of the criteria to be used for the choice of sub-programmes or courses of action, first requires a preliminary identification of the desired objectives to achieve at the political level. For these reasons the criteria bringing about the widest EE is fundamental, because within the objectives of PROURE it states that: "*the entire energy chain, is constantly meeting the minimum levels of energy efficiency.*" There is also an environmental criterion since the PROURE set within its overall objective "... *in a sustainable way for the environment and for natural resources*". For this category and in this opportunity we selected the reduction of GHG, although that criterion may be replaced by another considered by the UPME to be more relevant. Moreover, it is considered important to include criteria related to policy alignment and the existence of co-benefits, as this would be following another component of the PROURE objectives "*Full and timely energy supply, competitiveness of the Colombian economy, consumer protection...*". In this context, the more co-benefits generate any of the selected sub-programmes, the greater attainment of the non-energy objectives mentioned above. Regarding the indicator of cost effectiveness, it is one of the most widely used in different cases, since, given the importance of a good allocation of resources, it is desirable to select the strategy option that generates the greatest benefits and positive impacts at the lowest cost. Finally, attentive to the recent experience with tax incentives, and of the barriers faced by same in implementing the selection of programmes submitted, which are the easiest to implement, greater institutional viability is desirable, since this has been one of the main problems of the recent performance of tax incentives.

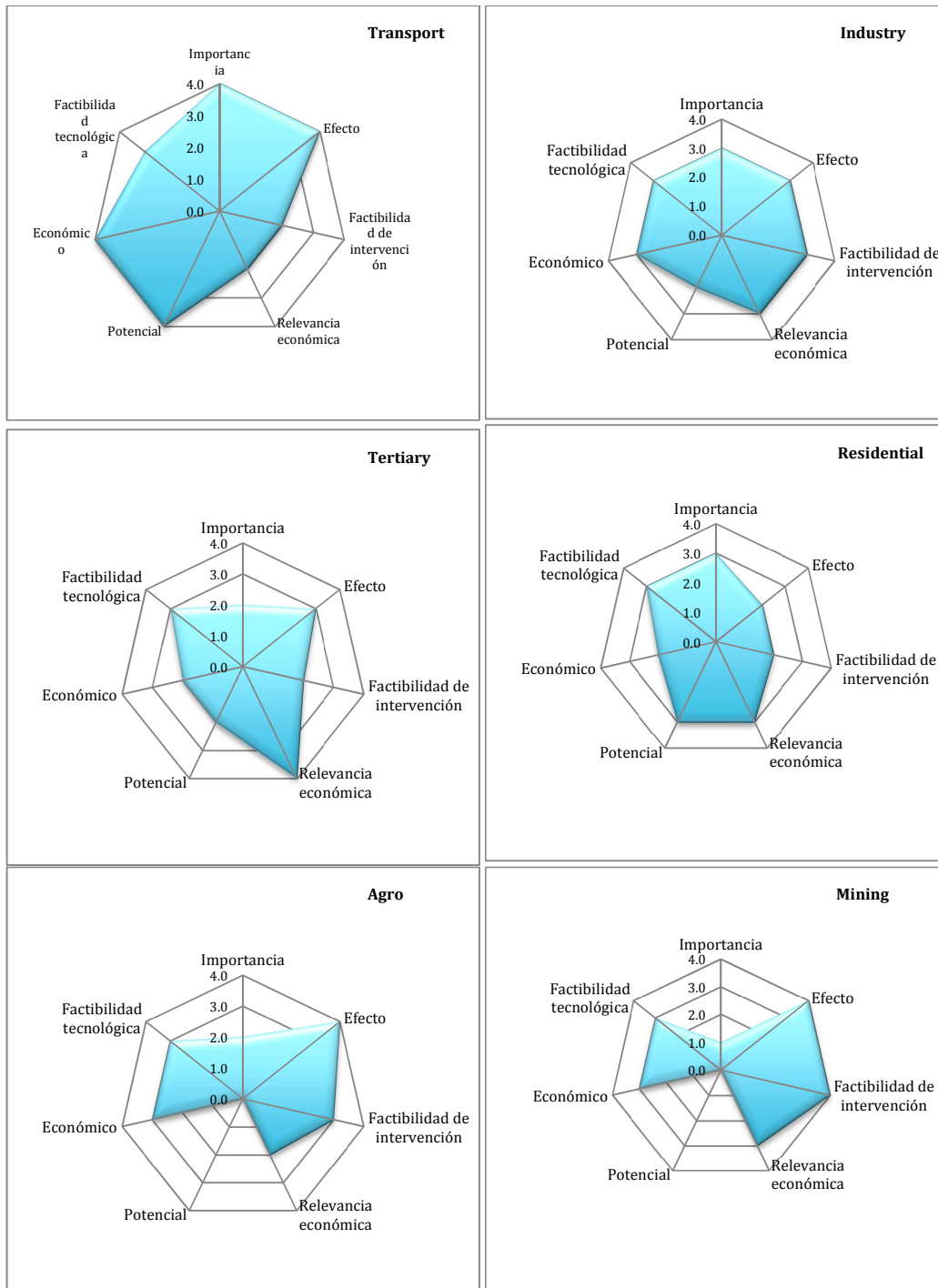
4.1 Priority Sectors

Our categorization of sectors taking into account the relevance of criteria for these sectors, is divided into four levels: very high (4.0), high (3.0), low (2.0), and very low (1.0)²¹. This categorization was carried out after an assessment of available information, in particular based on, energy balances, economic information and analysis EY (2015). Figure 4.2.1 presents a graphical representation of these criteria for each of the sectors²².

²¹ In the cases where no information is available to catalogue the indicator takes a zero value.

²² It is important to highlight, that evaluation of two or the characteristics is difficult, given the current level of information available in Colombia: the Economic Criteria and the Criteria for the feasibility of the technology. In the first case, it would be important to have detailed studies noting the importance of energy costs in each area of production in all sectors. This aspect, apart from allowing one to evaluate and prioritise sectors, would also permit the removal of certain barriers in the First Report, in particular those related to the existence of information and the awareness in those sectors. It is possible that absent the availability of minutely detailed studies which might show the impact of the economic costs in the scheme of production, that these would be undervalued and so the incentives to develop EE actions would not be take into serious consideration.

Figure 4.2.1: Priority graphic for each sector²³



Source: From our research

²³ Graphical axes -- read clockwise from 12:00 O'Clock -- can be translated as follows: Importance (Importancia), Effect/Change (Efecto), Feasibility of Intervention (Factibilidad de intervención), Economic Relevance (Relevancia Económica), Potential / Chances of putting this into place (Potencial), Economical/Affordable (Económico), Technical Feasibility (Factibilidad tecnológica) – for a detailed description see Table 4.1

Based on the analysis presented, three sectors have been prioritized and their respective sub-sectors. In this sense it is necessary to clarify that the prioritization made here does not mean neglecting any sector, but given the recognition of the difficulty of intervention, and the need for optimal results, we suggest launching with sectors that can have the biggest impact. Therefore the selected sectors are: **Transport (both freight and people), Industrial and Tertiary (Hotels and Hospitals).**

5 New Courses of Action, Regulatory Instruments and Measures

For each the sectors identified as priorities, an analysis of possible strategies and a policy proposal was elaborate with the objectives of *“analyze what strategic courses of action and promotional tools would be most appropriate to achieve the objectives set by the policy to promote EE”*.

The methodology used in this phase was outlined in Table 2.1. In each one of the sectors specific proposals were conducted for *strategic guidelines* or programmes in PROURE terminology (**How?**), The instruments to be applied in the strategic course (**What?**), Actions by which the instruments will be implement (**By What?**), those who are responsible for these actions (**Who?**) and the execution time proposed for the instrument in each case (**When?**).

The analysis was conducted in three stages. In the first instance, we reviewed the state-of-the-art measures implemented at international level for the sectors under analysis as well as initiatives carried out at national levels in Colombia. Based on these reviews a preliminary proposal of lines of strategic lines and courses of action was performed. Next, the proposals were socialized and discussed at a second mission to Bogota. Based on the results of these missions the proposal contained in this document was developed.

It is important to note that Colombia shows a significant degree of progress on the issue of EE and various studies have been done on different sectors (both public and private). A clear illustration of this is reflected in the proposals: Sectoral Action Programmes (PAS) and the Colombian Strategy for Low Carbon Development (ECDBC) as well as various sectorial studies conducted by the UPME, which formed the basis for developing new strategies. For these reasons, the proposals presented in many cases include measures that have already been proposed and that have been under development. It is relevant to highlight the importance of aligning (coordinating) both implemented programmes and those to be implemented in the different government institutions to gain synergy and greater impact, as well as to achieve alignment with the commitments made by the country at COP 21.

5.1 Prioritized Proposals, Instruments and Measures

A proposal was made for lines of prioritization by sector, as presented in Table 5.1.1²⁴. This table highlights what are the lines to begin with first. This follows the same logic with the following factors²⁵:

- Higher expected energy savings,
- Shorter implementations,
- Increased effectiveness / cost of the measures,
- Improvements in ease of implementation.

In some cases, the lines also meet the criteria to achieve greater co-benefits, such as where the industrial and transportation lines, in addition to reducing energy consumption, is also lead to increases in competitiveness activities (by reducing the costs thereof) or tending toward better territorial planning. On the other hand, in the case of cargo transport it is included as a priority in terms of time and cost effectiveness, but a freight line, in the case of Colombia, could not demonstrate a positive impact in the short term (though its future potential to reduce energy consumption and reduce cost reductions was high *vis-a-vis* freight transported by road over long distances). What we are attempting to recognise here is that *promoting a modal shift from road freight to rail* does deserve consideration.

The implementation of the strategic lines presupposes the implementation and feasibility of the necessary tools and the corresponding actions. The definition of the priority, therefore presents a challenge to implement the necessary institutional structure, show or locate the required skills, this will show the effectiveness and the diligence of all institutions linked to instruments (public institutions in their design and implementation, financial sector, institutions that monitor and provide technical assistance, organisms responsible for making the regulatory or economic changes necessary), as with the effective management strategies for its complete implementation and complying with their results. In this regard, **the lines prioritized here should only be considered as a preliminary proposal, and it would be advisable to review the full list of proposed strategic lines in the Preliminary Report of the Third Product, also presented in Annex I of this report.**

Presented below for each of the prioritized lines is a justification of their choice and a table showing the attendant proposed instruments.

²⁴ The proposed instruments for each strategic direction are made up of a series of activities and persons responsible, as presented in *Annex II*.

²⁵ In Chapter 4 of the third preliminary reports the different criteria that can be employed to evaluate the proposed instruments are described. E.g., in the case of the category 'Simplicity of Implementation', what is referred to here is the facility for implementing the vehicles taking the following factors into account: the existence of a basic institutional framework for the proposal, the existence of related instruments; limited resistance to, (or clear support for), the measures proposed or the number of actors with which one must negotiate, etc.

Table 5.1.1: Prioritised Measures and Execution Time Frames

Sector	Strategic Directions	Term
Freight/Cargo Transport	Measures for acquisition and replacement of the fleet: Scrapping/decommissioning old trucks	SHORT/MEDIUM TERM
	Shifting modes of transport -- Promoting alternative transport as a complement to or alternative to road transport. Rail Freight Promotion	LONG TERM
Human Transport	Improvement and replacement of public transport fleet	SHORT/MEDIUM TERM
	Upgrade/replacement of private vehicles with greater efficiency and/or electric cars	SHORT/MEDIUM TERM
Industry	Improve productivity & efficiency in an integral manner	SHORT/MEDIUM TERM
	Efficient Energy Management	SHORT TERM
Hotels	Characterization, technical assistance and identifying energy opportunities	SHORT TERM
	Energy reconversion and efficiency in refrigeration, air conditioning and water heating	MEDIUM TERM
Hospitals	Energy reconversion and efficient energy use in air conditioning, refrigeration and lighting	MEDIUM TERM

5.1.1 Freight Transport Sector²⁶

❖ Measures for acquisition and replacement of Road Freight fleet

This line is justified by the need to reduce the average age of the fleet of trucks as an objective that could contribute to better efficiency in production and allocation of resources in the transport of cargo. The measure would have multiple co-benefits, in addition to greater energy efficiency, connected to general and sectoral economic aspects. This is a strategic line that already is under development by the Ministry of Transport, so many of the proposed instruments are contained as elements of these plans, our proposal is to deepen or improve them.

²⁶ Each one of the proposed instruments for each strategic direction is made up of a series of activities and persons responsible, as presented in *Section I of Annex II*.

Table 5.1.1.1: Type of instruments, category and description
Scrap/Decommission Freight Trucks

Category	Instrument	Instrument Description
Voluntary Schemes	Refitting Schemes	Adoption of the existing regulatory framework, accompanied by a process of simplifying implementation
Regulatory Instruments	Mandatory age levels for units	Establishment of a standard mandatory for unit age, accompanied by impact studies of the measure
	Minimum level of efficiency for all vehicles and minimum traffic volume	Evaluation of existing regulations and studies of the suitability of standards for minimum volume routes (traffic).
Economic instruments tax	Tax reductions or tax extensions	Schemes for tax deduction for acquisition of replacement vehicle in combination with scrapping/ decommissioning vehicle
Financing Instruments	Soft loan schemes (preferential finance) for decommission certificates for the purchase of a new unit	Utilization, dissemination and deepening of existing schemes in BANCOLEX and the National Guarantee Fund scheme.
Control Instruments	Control / Monitoring of Policy	Clarify responsibilities, deepening of control actions that are mandatory policy.

❖ Measures for changing mode -- Promotion of rail freight

Rail transport is more efficient than any transport by road for long distances, thus by replacing modes *one can get gains in both efficiency and effectiveness in both economic and environmental dimensions, and, by extension, by impacting positively on the price of the end product, even social gains can be made by reducing transportation costs for goods or raw materials*. Where international trade is involved, a positive impact could bring a gain in competitiveness for the economy. Moreover, by requiring major infrastructure development, which would also generate employment and spillover effects with the strong demand in rail development.

In this case, we are speaking about a measure that requires, as a fundamental instrument, infrastructure investment by the state. This involves meeting a series of steps:

1. Making a diagnosis and an evaluation of the current status of existing lines; with studies of infrastructure costs, something almost non-existent in the country;
2. Modernization and updating lines where necessary;
3. Analysis of the demand for the electric transmission infrastructure required and the impact on the field of electricity generation in the case of electric trains;
4. Incorporation of truck owners as actors in the process to reduce opposition to (and increase the feasibility of) implementing the policy;

5. Evaluation of the feasibility of incorporating the large industrial players in the process, transportation is a huge cost for them is (even beyond efficiency of production).

5.1.2 Human Transport Sector²⁷

❖ Improvement and Replacement of Fleets used for Public Transport

Mechanisms for the reduction of transport by private car and promote greater up-take in public transport (by improving its quality). This is a direction that could result in an adequate response in the short or medium term, but which would require alternative analysis in the long term.

Table 5.1.2.1: Type of instruments, category and description for replacement public mass transit transportation fleet

Category	Instrument	Instrument Description
Regulatory Instruments	Establishing efficiency standards / engine operation quality and other standard components	Establishment regulatory instruments taking into account specific regional characteristics
Fiscal Economic Instruments	Tax reductions or tax exemptions for the purchase of more efficient units, electric or hybrid vehicles	Extension of existing tax incentives with modifications implementation proposals to overcome their barriers units.
Financing instruments	Preferential (soft) loans for the purchase of more efficient, electric or hybrid units	Deepening and promotion of existing credit lines in BANCOLDEX
Informative Instruments	Energetic and environmental audits	Programmes in transport companies to identify opportunities and establish regular inspections.

❖ Improvement or Replacement of Fleets of private vehicles for more efficient models and/or electrical

A policy aimed at *reducing energy intensity and to substitute energy sources in private car fleet*. Within this course of action we find measures included, both for locally made vehicles and imports, that local vehicles must comply with standards of efficiency and equipment similar to those already in place in more developed countries. These are conditions and regulatory frameworks preventing differences in the type of engines and other equipment from being below the standards in the countries of origin of the automakers, such standards are not always incorporated into vehicles circulating in third world nations.

²⁷ Each one of the proposed instruments for each strategic direction is made up of a series of activities and persons responsible, as presented in *Section II of Annex II*.

Table 5.1.2.2: Type of instruments, category and description for Direction on Replacement Fleets of Private vehicles with Mass Transit

Category	Instrument	Description of Instrument
Instruments for Direct Action	Public investment in basic infrastructure for electric cars	Investment in electricity infrastructure.
Voluntary Instruments	Standards and also voluntary Labelling	Mandatory standards adoption for imported vehicles, development of related labelling.
Combined Economic Instruments (Fiscal & Financial)	A Bonus-Malus styled Scheme	Reducing tax rates for the purchase of vehicles accompanied by destruction policy -. (Tax + Financing) Bonus Scheme style combined economic instruments
Financing instruments	'Soft' (preferential) loans for the purchase of more efficient units, or electric and/or hybrid units	Evaluation of the different alternatives of financing schemes units.

5.1.3 Industry Sector²⁸

❖ *Improving productivity and comprehensive/integral efficiency*

The strategic objective is aimed at achieving better comprehensive efficiency in Colombian industry. It is estimated that there are opportunities for efficiency in various industrial branches and these opportunities are not currently being exploited. An improvement in energy efficiency would contribute to greater competitiveness, cost reduction, not just with energy, and the incorporation of technological advances, innovations and improvements in production processes in the sectors in which interventions are being made.

²⁸ Each one of the proposed instruments for each strategic direction is made up of a series of activities and persons responsible, as presented in *Section III of Annex II*.

Table 5.1.3.1: Kinds of instruments, category and description for the direction for productivity improvements and integral/comprehensive efficiency in Industry

Category	Instrument	Description of the instrument
Regulatory Instruments	Fixing levels of efficiency and systems performance end-use energy efficiency levels	Establishing protocols and system optimization, accompanied by labelling systems, control and decommissioning vehicles.
	Setting goals for energy efficiency in industrial processes (intensity indicators)	Setting goals & responsibilities and public-private partnerships.
	Legislation / Regulation requiring the deployment of next-generation technologies ²⁹	Mandatory use of latest technologies and approval of equipment to be added.
Support tools, information and voluntary action (Public Good)	Voluntary & free energy audits for Small and Medium Enterprises (SMEs)	Establishing a programme to identify opportunities and establish a list of measures. Align this with funding for financing needs.
Economic Instruments	Special scheme for accelerated depreciation	Accelerated amortization for efficient equipment.
Fiscal Economic instruments	Tax Incentives	Tax deductions for the purchase of efficient equipment taking into account implementation recommendations.
Finance Instruments	Financing at concessional rates (soft loans)	Promote existing lines of credit and creation of new lines for acquisition and expansion.
	Specific financing for SME's	Analyze the need for (and desirability of) systems of guarantees.

❖ ***Energy Efficiency Management (EMS)***

This is a measure that converges with global trends related to the implementation of energy management systems under the requirements of the ISO 50001 standards widely available globally and in several countries in the region. *This measure goes beyond technological change also involving the internalization of a culture of energy efficiency at all levels and strata of the company, incorporating best practices and process improvements as energy performance of the organization giving access to a seal of quality that bring advantages in international markets.* Systematic energy management is one of the most effective approaches to improve efficiency in industrial production processes because it generates a culture that encourages the maintenance of continuous updating of practices and procedures to seize new opportunities.

The previous phase of PROURE has focused on technological change. It is considered that energy management is a complementary step and should be considered a second stage of energy management.

²⁹ The attainment of this measure can be done gradually, (piece by piece).

Table 5.1.3.2: Type of instruments, category and description for Efficient Energy Management in “Industry”

<i>Instrument Category</i>	<i>Instruments</i>	<i>Instrument Description</i>
Regulatory Instruments	Energy Management	Implementation of ISO 50001 Standard. (Strengthening the infrastructure in so doing). Voluntary agreements and defining monitoring indicators.
	Energy Saving Goals	Establishment of agreements on production volumes and goal setting; accompanied by monitoring schemes
	Quantifying General Goals	Setting goals and accompanying programmes to substitute energy sources.

5.1.4 Hotel/Hospitality Sector³⁰

❖ *Characterization, technical assistance and identifying opportunities for efficiency*

The strategic objective of “**generation and transfer of information to identify opportunities for incorporating EE actions**” implies responding to the need to overcome the barrier of the lack of information. As in other sectors, improved EE would contribute to greater competitiveness, cost reductions (not just energy costs) and the incorporation of technological advances, while at the same time, allowing one to transmit an image of environmental friendliness.

As far as strategic direction goes, the proposal is to implement an informational tool which might also be characterized as a public good: **The free provision of energy audits for small and medium sized hotels**. This instrument involves, among other steps, identifying possible sources of funding and local capacity in technological universities for the service. Also covered would be the application of the Sustainable Building Code in certain cases, as sanctioned in 2015.

❖ *Retraining and efficient energy use in refrigeration, air conditioning and water heating*

Particularly when it comes to smaller national hotels, there are low levels of efficiency in thermal energy uses not associated with cooking. This is about seizing this opportunity and reaching the greatest number of actors. The rationale for this line is associated with the goal of expanding opportunities for the hotel business in general and, in particular, to support those hotels that are disadvantaged due to size, location, seasonality, or other factors that may have lesser capacity or access to take advantage of EE opportunities.

³⁰ Each one of the proposed instruments for each strategic direction is made up of a series of activities and persons responsible, as presented in *Section IV of Annex II*.

Table 5.1.4.1: Type of instruments, category and description for Hotel Energy Retrofit

Instrument Category of Instrument	Instrument	Description of Instrument
Regulatory Instruments	<i>Mandatory labelling</i>	Definition of labels and measurement laboratories, accompanied by training for selection.
	<i>Setting minimum energy efficiency for equipment</i>	Identification of the most relevant for the establishment of minimum standard equipment, and development of regulations for labelling based on that which already exists.
Informational Instruments and Voluntary Public Action	<i>Public-Private Agreements</i>	Implementation of ISO 50001 standards for energy management, accompanied by economic instruments.
Economic and Fiscal Instruments	<i>Fiscal Incentives</i>	Tax Extension of existing tax incentives with proposed modifications for implementation to overcome barriers.
Financial Instruments	<i>Access to soft loans/preferential finance</i>	Credits - Access Use and further promotion of existing credit line BANCOLDEX.

5.1.5 Hospital/Health Sector³¹

- ❖ Energy efficient reconversion and efficient use of ambient temperature control systems, cooling and lighting

Table 5.1.4.1: The kinds of instruments, their categories and description of directions for energetic reconversion in hospitals

Category	Instrument	Description of Instrument
Regulatory Instruments	<i>Minimum efficiency standards for equipment</i>	<i>Identifying the most relevant for the establishment of minimum standard.</i>
Fiscal Economic Instruments	<i>Fiscal Incentives</i>	<i>Extension of existing tax incentives with modifications proposed implementation to overcome their barriers.</i>
Financial Instruments	<i>Access to soft loans/preferential finance</i>	<i>Use and further promotion of existing BANCOLDEX credit line.</i>

³¹ Each one of the proposed instruments for each strategic direction is made up of a series of activities and persons responsible, as presented in Section V of Annex II.

5.2 Cross-Cutting Measures

Some of the proposals for instruments as well as the measures to be implemented in the various sectors cut across all sectors analyzed. This section provides a brief description of these recommendations, aimed at overcoming barriers identified, and also to create the necessary conditions so that the strategic directions and the proposed instruments can be effective in their implementation³².

First, one of the main aspects to consider is the ***simplification of the scheme of tax or fiscal incentives*** that could be importance for all sectors. This is particularly relevant in a scenario of an extension of tax incentives such as the one presented by Law 1715. The following proposals for easing the administrative difficulty in applying for incentives are highlighted:

- Unified Policy integration between governmental institutions involved in the evaluation or granting process for an incentive.
- It is suggested that there would be just a single 'one-stop' window for agent access and that the remaining process be government internal.
- Develop an instruction manual or a tutorial that allows businesses to see clearly whether or not they can receive the incentive and to do this exercise before applying.
- It has been suggested that formats be standardised for the applications that must be submitted for each different level of approval.
- The forms must be accompanied by very clear instructions, which will not leave any doubts about the data that has to be collected.
- Generate a standard labelling mechanism or a list of eligible equipment to facilitate the approval process for proposals, so reduce transaction costs.
- Implement automatic reduction for import duties of equipment classified as more efficient.

Second, regarding the implementation of quantitative tools such as **general quantified targets**, we highlight:

1. Generate a fund to implement energy audits and a clear and certain way to ensure the establishment and permanence of sustainable funding for same.
2. Creation of an energy audit programme which should be first focused on SME's. They may find it more difficult to sink money into such studies and which don't have internal capabilities.

³² We recommend that the reader take a look at sections 5.1 and 5.2 of the *Preliminary Report on the First Product*, when will be found presented in tables 5.1.1, 5.1.2 and 5.1.3 which develop in an extensive way the main barriers identified and the proposals for overcoming them.

3. Establish the necessary protocols for measuring efficiency. Analyze capacity needs within the entity responsible for such measurements.
4. Implementation of the results of audits by regulatory or economic measures.
5. Combine different promotional tools, such as the establishment of specific regulations on standards or quality levels via economic instruments like tax breaks or access to credit.

Finally, with respect to **Information Systems and dissemination**, we would highlight:

- *Creating an information centre on activities and options for EE or something similar as an adjunct of the Mining and Energy Ministry or UPME.*
6. *Provide information to the Ministry of Mines and Energy on prioritization and to the directorate on associated public policies.*
 7. *Design and implement outreach and awareness programmes on the benefits of efficiency in small and medium enterprises.*
 8. Consolidate knowledge networks on EE, such as the Colombian Knowledge Network on EE (RECIEE) begun in 2014.
 9. Implement a consultation table (a.k.a. desk-mechanism) that provides online real-time answers to questions that arise on the instruments and mechanisms.

6 Developing indicators for Evaluation and Monitoring

Target product IV was the development of indicators for monitoring and evaluation of proposed policy instruments for EE in the identified priority sectors: Transport, Industry and Tertiary Sectors.

In order to advance this proposal we performed a review of major international experience on monitoring indicators in the area, and their national applications. In addition, we studied the proposal made in the document EY (2015) from which some of the above indicators were adopted.

Based on a review of studies, and on a battery of indicators from the Colombian Energy Policy consultancy (EY, 2015), a set of indicators was proposed for each of the sub-programmes or strategic directions and for the instruments proposed in the previous chapter.

All proposals are presented in Annex II of this document. Also included there for each proposed instrument, and in each course of action, a set of monitoring indicators to follow (with the rationale for each) as well as the institutions in charge of gathering information. For example, in the case of mandatory instrument standards for the course of action "Scrapping/Decommissioning Trucks", the following indicators are proposed: Average age of trucks; and number of trucks with under twenty years old in a specified period; also it states that the institutions in charge are: the Ministry of Transport, the Union for Freight Handlers and, in the Automotive Industry, vehicle dealers and importers, among others. Incorporating

indicators for all instruments exceeds the submission of the final report, but is considered essential to refer to the aforementioned sources.

6.1 Proposals for Monitoring Objectives for Energy Policy

Recognizing that Colombia has had many EE projects and programs whose monitoring and organisation has not been an easy task for the national government, we propose – in addition to the proposal of indicators presented in the previous section – unified registration for these so that they might evolve toward a format like that presented in Table 6.1.1.

Firstly, we include a number of identification variables, in addition to some basic data (Code, Name, and Sector applicable). Classification data is also included: instrument type, subtype and nature (private / public / mixed). In addition there are also categories for 'sources of funding' and 'aligned with international program'. Later monitoring variables are included (current status, date entered into force); the related BIEE indicators ("database Indicators for EE for Latin America and the Caribbean"), and the expected impact (high, medium, low) as well as the indicators and monitoring established for the initiative.

We considered that this tool would become an important input for recording, monitoring and coordination to the many initiatives of public and private sector; as well as in the development and the evaluation of government programs like PROURE.

Due to their importance and the progress made at the global, regional, and national levels, ODYSSEE-MURE³³ and BIEE³⁴ projects were taken as reference points. Other countries in the region, like Brazil, Argentina, Chile and Uruguay, have also joined this global strategy. Colombia (via the UPME) has initiated activity and participation in the regional process. Indicators used for policies, programs and actions (in international systems for measuring effectiveness, performance and impact) are required to be primary or secondary sources that are verified, relevant, timely and qualified information sources. In Colombia, in most cases, these were not so. For this reason UPME has decided to update and revise the sources and information flows for construction of the National Energy Balance.

³³ The EU's ODYSSEE-MURE: <https://ec.europa.eu/energy/intelligent/projects/en/projects/odyssee-mure-2010>

³⁴ ECLAC BIEE;

https://www.iea.org/media/training/presentations/latinamerica2014/6A_ECLAC_BIEE_Programme.pdf

Table 6.1.1: Unified Token Categories from the initiative registry for the promotion of EE

IDENTIFICACIÓN	
Variable	Possible Values
Code	Alphanumeric value
Name	Text
Sector	Transport, Residential, Industry (one can tick more than one option).
Nature	Public, Private or Mixed
Instruments	<ul style="list-style-type: none"> ● Compliance with regulations and mandatory standards ● Voluntary Compliance Standards ● Economic & Taxation Instruments ● Lines of credit / financing ● Voluntary agreements ● Energy Audits ● Education Programs / Awareness ● Research Programs ● Other (specify)
Finance Sources	N/A.
Aligned with the following International programmes	N/A.
Annex	Files that elaborate on the information in PDF format.
MONITORING	
Variable	Possible Values
Current State of Play	In planning / being executed (underway), finished.
Start / Effective Date	mm/yyyy
Expected Start Date	N/A
Completion Date (real)	N/A
Related BIEE indicators	List of indicators per BIEE sector
Expected impact	For each and every registered indicator in the previous field: High, Medium or Low
Impact Indicators	As selected
Monitoring Indicators	As selected

7 Conclusions and a Synthesis of Key Aspects

Based on the results achieved in the first stage of PROURE in the implementation of instruments to be promoted in industry and transport, in particular economic and fiscal instruments, we have tried to advance on a proposal for new courses of action and a new combination of regulatory instruments. Highlighted below are some of the most important points that arose from the study.

First, it is important to note that the main difficulties identified in the implementation process of existing tax incentives in the Transport and Industrial sectors (from Resolution 186) are linked to a set of economic and institutional barriers that we have not been able to remove with the selected instruments. As is clear from the lessons learned from international experiences, countries apply a mixture of tools and strategies, while not neglecting national context and the rationality of the actors in their decision-making processes. At the same time, in the case of Colombia, we highlight the problems in the implementation of the instruments themselves, which relate to the steps that are necessary to access tax benefits and the capabilities of the institutions in charge of this process. Thus, the tax incentives applied in the PROURE framework require a sincere and a thorough review, and serious doubts might be raised about its virtues as an appropriate and cost-effective mechanism to improving EE, as seen from the results attained. This would appear to be particularly relevant in the context of the recently passed Law (1715) that would extend the use of such instruments to various sectors of the economy.

Secondly, we would like to highlight the relevance of the use of criteria to select sectors and/or programmes or strategic directions upon which action can be taken, since the key for a good energy policy is that it is aligned with national objectives and priorities and complies to a convergence of local factors and specific objectives. As such the prioritization of sectors presented here in this report should be understood in the context of a process of applying criteria based on the information available. Encountering new information could change the prioritization of sectors in each criterion, and thus modify the sectors selected in the future.

Third, in the methodological framework introduced at the beginning of this document, and upon which we based all of this study, it is crucial to recognize that the choice of instruments has to begin with a study of the barriers faced by energy efficiency actions at the national level. Once this has been accepted, and recognizing the need for a combination of instruments to address the issue, we endeavoured to advance the proposal of instruments for the promotion of EE in each of the priority sectors. The first aspect was the proposal of developing strategic directions. Here we tried to answer the question: *“How to attempt to move from the current undesirable situation to a required future situation, which is both desirable and feasible?”*

Once these directions were laid out, we progressed to proposing a set of tools for each of them, attempting to operationalize the proposed directions and to respond to the question: *How does one articulate the ‘How’ with the ‘What’?* Finally, we proposed activities to be undertaken to implement each of the proposed instruments, trying to answer the question:

What can one use to put in practice the selected instrument? In addition, proposals for both actors and for institutions were made that might be able to bring about these kinds of actions.

Fourth, one can observe that one of the main problems faced by EE policies has been the absence of a comprehensive system for monitoring activities, we attempted to harmonize the structural elements from recent work and consulting, attempting to make them more functional and more effective. Among the instruments postulated, a unified information register of EE projects, which would enable facilitating the task of monitoring by the MME, with the support of a Manager of Information on EE (EEIG), which was a proposal in the Policy study entitled: "Policy and Energy Efficiency" (EY, 2015). Also, we propose energy indicators, compatible with those in the aforementioned study, and based on BIEE indicators, indicating specific implementation guidelines for the sectors prioritised in this consultancy project.

It is important to emphasise that monitoring using the proposed indicators enables performance assessment instruments over time, and therein lies its importance. However, the attainment or not a specific goal, or of a particular outcome, cannot be attributed to the performance of a single instrument. The development of energy efficiency strategy depends on a set of actions that are implemented to attain the desired results proposed for each strategic direction, as well as other circumstances that influence the results. As such the final results of the policy depend on a combination of effects that occur when implementing various instruments and is very complex to isolate the effect of each one of them.

Finally, it is appropriate to recall that strategies, instruments and actions implemented are done so in a dynamic system that requires continuous monitoring and verification to check that results are aligned with the desired path and with the objectives and goals that were recognized as desirable. Changes in environmental conditions or other economic, social or political factors, could imply the need to review policies and strategies which have been laid out and to re-direct intervention mechanisms, or the type of instruments or actions, or even the sectors themselves to which those efficiency policies are oriented.

References

EY. 2015. Informe Final. Política de Eficiencia energética. Consultoría desarrollada para el Ministerio de Minas y Energía. Bogotá, 2015.

Ministerio de Minas y Energías. *DESARROLLO DEL PLAN DE ACCIÓN SECTORIAL DE MITIGACIÓN PARA SECTOR ENERGÍA (PASm) | COMPONENTE MINAS*, en “Estrategia Colombiana de Desarrollo Baja en Carbono”.

Sathaye, J., Bouille, D. 2001. Barriers, Opportunities, and Market Potential of Technologies and Practices, en “Climate Change 2001: Working Group III: Mitigation”.

Sims R., R. Schaeffer, F. Creutzig, X. Cruz-Núñez, M. D’Agosto, D. Dimitriu, M.J. Figueroa Meza, L. Fulton, S. Kobayashi, O. Lah, A. McKinnon, P. Newman, M. Ouyang, J.J. Schauer, D. Sperling, and G. Tiwari, 2014: Transport. In: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

Somanathan E., T. Sterner, T. Sugiyama, D. Chimanikire, N.K. Dubash, J. Essandoh-Yeddu, S. Fifita, L. Goulder, A. Jaffe, X. Labandeira, S. Managi, C. Mitchell, J.P. Montero, F. Teng, and T. Zyllicz, 2014: National and Sub-national Policies and Institutions. In: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.