



TECHNICAL ASSISTANCE
FOR
GREATER DATA HOSTING IN COLOMBIA

DELIVERABLE 9
TASK 11: FINAL REPORT

PREPARED FOR:



CÁMARA COLOMBIANA DE INFORMÁTICA Y TELECOMUNICACIONES

AUGUST 2015



This report was funded by the U.S. Trade and Development Agency (USTDA), an agency of the U.S. Government. The opinions, findings, conclusions, or recommendations expressed in this document are those of the author(s) and do not necessarily represent the official position or policies of USTDA. USTDA makes no representation about, nor does it accept responsibility for, the accuracy or completeness of the information contained in this report.



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TASK 11: FINAL REPORT
(MR-2601-3397)**

AUGUST 2015

Prepared for:

**Cámara Colombiana de Informática
y Telecomunicaciones
Bogotá, Colombia**

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SUMMARY AND OVERVIEW

The purpose of this Technical Assistance (TA) was to conduct economic, technical, and legal/regulatory analysis, along with an assessment of U.S. best practices and their applicability to the Colombian environment, of the data hosting market in Colombia, and to develop corresponding policy recommendations and an action plan to present to the GOC.

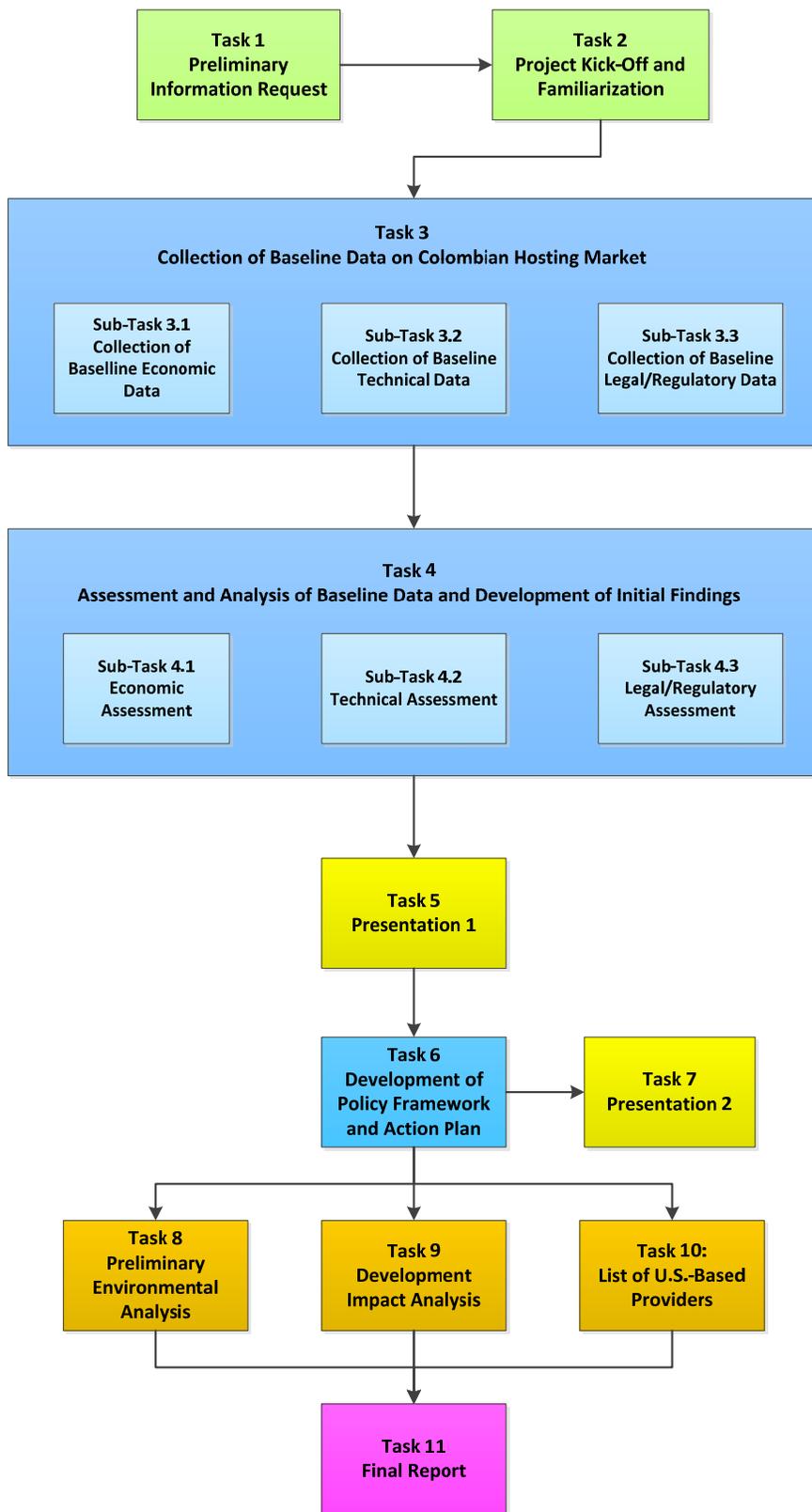
The TA was performed under a USTDA grant to the Cámara Colombiana de Informática y Telecomunicaciones (CCIT). CCIT is an ICT industry organization headquartered in Bogotá;. This organization represents the interests of its members and acts as industry spokesman vis-à-vis the Government Colombia (GOC). CCIT is also the administrator of NAP Colombia, which handles the great bulk of all Internet traffic exchanged in Colombia.

The work on the TA was divided up into 11 Tasks, listed below:

- Task 1: Preliminary Information Request
- Task 2: Project Kick-Off and Familiarization
- Task 3: Collection of Baseline Data on Colombian Hosting Market
 - Sub-Task 3.1: Collection of Baseline Economic Data
 - Sub-Task 3.2: Collection of Baseline Technical Data
 - Sub-Task 3.3: Collection of Baseline Legal/Regulatory Information
- Task 4: Assessment and Analysis of Baseline Data and Development of Initial Findings
 - Sub-Task 4.1: Economic Assessment
 - Sub-Task 4.2: Technical Assessment
 - Sub-Task 4.3: Legal/Regulatory Assessment
- Task 5: Presentation 1
- Task 6: Development of Policy Framework and Action Plan
- Task 7: Presentation 2
- Task 8: Preliminary Environmental Analysis
- Task 9: Development Impact Assessment
- Task 10: List of Potential U.S.-Based Providers of Relevant Goods and Services
- Task 11: Final Report

The policy recommendations and action plan that resulted from this work comprehensively address certain distortions that currently inhibit the Colombian Internet sector from achieving its full potential. Achievement of the policy recommendations are expected to result in the creation of a more “hosting” friendly” climate such that greater amounts of Internet data will be maintained on servers within the country, and will generally stimulate more rapid growth of the sector.

This Final Report summarizes the activities and results of all the tasks in the TA, and all the task reports are attached. The general flow of the tasks is depicted in the chart below.



1. TASK1: PRELIMINARY INFORMATION REQUEST

In Task 1, the ASTRO Team submitted its Preliminary Information Request to CCIT. This was not specified as a formal deliverable in the Terms of Reference (TOR); nevertheless, ASTRO submitted this request in writing. The Preliminary Information Request covered economic, technical, and legal/regulatory aspects of data hosting in Colombia.

For the economic aspect, the information request covered costs, prices, and the Colombian ICT market. For the technical aspect, the request covered power, facilities, human capacity, and vendor support. For the legal/regulatory aspect, the request covered relevant laws and regulations that affect data hosting in Colombia.

CCIT was responsive, cooperative, and helpful in obtaining the desired information. This information laid the foundation for the other tasks.

2 TASK 2: PROJECT KICK-OFF AND FAMILIARIZATION

Task 2 consisted of introductory meetings between the ASTRO Team and representatives of CCIT and NAP Colombia, as well as meetings with other stakeholders, so that the Team could become familiar with the market and the players. Over 18 meetings were conducted with government agencies, telecom operators, data hosting companies, and equipment manufacturers to understand their outlook and strategies for the market, among other topics.

The ASTRO Team reviewed with CCIT the historical and operational data obtained in Task 1, and identified any gaps or needs for additional or updated information, and how to fill any such gaps.

3. TASK 3: INCEPTION REPORT

The first formal deliverable for the Project was the Task 3 report. This report summarizes the activities and findings of Tasks 1-3.

This task addresses the collection of baseline economic, technical, and legal/regulatory information, which the ASTRO Team requested from CCIT. The information sought encompasses all relevant aspects of the data hosting market and served as input to subsequent tasks. It enabled the ASTRO Team to become familiar with the current situation regarding networks and services, traffic, and to forecast expected future traffic volumes and type of usage.

Section 1 of the Task 3 report sets forth the items requested in the Preliminary Information Request; and it displays the information that was obtained as a result of the request. It encompasses information requested regarding economic, technical, and legal/regulatory aspects of the project.

Section 2 of the Task 3 report provides background information on key organizations, as well as summaries of meetings held, including the date and time of the meeting, the individuals participating in the meeting, and a summary of the discussion.

Section 3 of the Task 3 report displays the information obtained as a result of the Preliminary Information Request. Information may be in the form of tables with illustrative charts, with explanatory text.

Section 4 of the Task 3 report discusses any gaps or issues with regard to the Preliminary Data Request and the information obtained as a result of the request. For example certain organizations specified in the Terms of Reference (TOR) in the list of desired meetings declined to meet with the team; such cases are noted.

Section 5 of the Task 3 report discusses the next steps and activities to be taken toward completion of this Technical Assistance.

The information in the Inception report served as input to the analysis in Task 4.

4. TASK 4: ASSESSMENT AND ANALYSIS OF BASELINE DATA AND DEVELOPMENT OF INITIAL FINDINGS

The Task 4 report builds on the work conducted in Tasks 1-3. It assesses and analyzes the baseline data and develops initial findings. It encompasses the three aspects of: economic, technical, and legal/ regulatory issues. The specialists in each area collaborated closely so that each team member could understand how the issues affect each other and the market as a whole.

During the consulting mission to Colombia, the ASTRO team interviewed over 20 companies, including telecommunications carriers, data center operators, Internet Service Providers, content providers, and ICT equipment/software vendors. The interviews included both objective, or measurable, information, as well as subjective questions asking interviewees for opinions or observations on a variety of ICT hosting, cloud computing, Internet/broadband, and other industry-related topics.

The analysis indicates that the main issues that hinder development of Colombia's data hosting market are economic and commercial, but technical conditions are not optimal, either. There is no law or regulation that directly hinders the development of data hosting in Colombia, but mis-interpretation of certain laws could discourage companies from entering the market.

- Economic and commercial factors include high costs, relatively small volume, lack of local content, lack of confidence in Colombian hosting providers, and in particular competitive barriers to entry.
- Technical deficiencies include inadequate infrastructure deployment, which appear to be either company policy or human decisions, rather than actual technical limitations. In addition, the NAP Colombia, while using a very simple switch for interconnecting participants, has very limited advanced functionality, such as the use of a route server or

advanced participant statistics and performance information. Performance issues also arise, e.g., reliability and security.

- One factor that could discourage companies is related to possible criminal liability for companies that operate. Apparently, the law on this is not clear.

Colombia should take a holistic view of the data center hosting industry. Having a domestic hosting industry will not only provide economic and performance incentives for all Colombian companies, but may also be considered a component of Colombia's critical national resources.

Economic

The Economic assessment begins with a discussion of the context of the global ICT market and trends in the U.S. hosting market, then analyzes the current market in Colombia and the potential, and finally considers financial aspects of the project.

Worldwide, fixed telephony is declining, while cellular telephony penetration continues to grow but is approaching saturation and the growth rate is slowing. On the other hand, Internet penetration and use is growing rapidly. About 3 billion people use the Internet, and international bandwidth is growing at about 45% annually. Again, fixed broadband penetration is beginning to flatten out, while mobile broadband penetration continues to grow.

Ever more people creating, uploading, and sharing content drive growth in broadband. Some of the uses of Internet that are growing unabated include information search, social media, e-shopping, e-business, e-government, education, and health. All these things create data that must be stored and made available for users; and this generates a demand for data hosting. In addition, several technological trends affect the market, including, among others:

- A shift is ongoing toward smarter mobile devices.
- Cellular networks are advancing.
- M2M (machine to machine) and wearable mobile devices are emerging and being adopted.
- Video usage is increasing in mobile applications.
- The proliferation of high-end handsets, tablets, and laptops on mobile networks is a major generator of traffic.

Two particular trends—the growth of mobile traffic and the growth of video, are accounting for a substantial part of the market.

- Smart phones currently account for more than half of all mobile data traffic and by 2019 will grow to account for 75%.
- Mobile video is already the largest category, accounting for almost 55% of the total in 14 and is expected to experience a 13-fold increase, rising to account for 72% of the world's mobile data traffic in 2019.

An overarching trend that affect the market is cloud computing. Virtualization and cloud computing are seen as a means to facilitate the sharing of IT resources, and cloud traffic is expected to dominate in a few years. Cloud computing is being adopted because it offers speed, flexibility, scale and access anywhere. It provides cost efficiencies and can help businesses improve their processes.

ICT has become an important economic sector, and governments around the world have raised the priority of ICT policies to foster innovation and diffusion of Internet technologies. Broadband infrastructure is seen as very important, and many countries have developed and implemented national broadband plans.

The U.S. Internet hosting services industry has experienced substantial growth over the past several years, and the U.S. has become the dominant player, with observers estimating a 70% market share. U.S. companies have achieved this market position through substantial investment, superior facilities that offer performance and security, attractive service offerings, and aggressive marketing.

A data hosting facility is capital intensive, and a world-class data center may require US\$50 million in initial investment, as well as continued investment to keep up with the technology and expand. The hosting companies invest in facilities and are then able to offer attractive services that reduce or eliminate capital expenditures for the customer.

Best practices for data hosting can refer to the data hosting facilities themselves, as well as the commercial environment in which they operate, and also the regulatory environment. To gain and maintain an important market position, data hosting facilities must offer complex solutions with high levels of reliability, scalability, security, and high performance. At the same time, to maintain its robustness, data hosting requires a competitive environment and the legal/regulatory framework.

The characteristics of U.S. data hosting providers that have enabled them to achieve a dominant position worldwide include:

- A competitive environment
- Numerous IXPs—currently over 80
- Substantial and continuing capital investment
- Multiple data centers throughout the world
- A broad portfolio of services
- Performance, reliability, and low cost
- Strong marketing

To improve its market position and increase data hosting in Colombia, data hosting facilities must offer complex solutions with high levels of reliability, scalability, security, and high performance, at a competitive price.

An example of a major player is Amazon Web Services (AWS). AWS has developed the architecture for its cloud offering to offer highly available and scalable Web hosting to provide reliable, scalable, secure, and highly performing infrastructure that accommodates customer traffic patterns in real time, in a cost-effective manner. Its model is based on the following elements:

- No more physical network appliances.
- Firewalls everywhere.
- Multiple data centers available.
- Hosts are treated as ephemeral and dynamic.

AWS is only nine years old, and it has at least 10 AWS regions around the world with 26 availability zones across regions and 51 edge locations for its content distribution network. Its efficiency has enabled it to reduce prices more than 40 times in the past eight years.

Cisco and Microsoft have jointly developed strategies for building a private cloud rooted in virtualized data centers and combining Cisco's infrastructure and Microsoft's private cloud technology. The concept stands on three pillars: compute, manageability, and networking; it offers the benefit of an intelligent infrastructure, a virtual networking solution, and a single unified way to manage it all. Cisco and Microsoft have found that the most important priorities for IT revolve around virtualization and cloud computing.

The trends of Colombia's ICT market are similar to those globally: Fixed telephony is declining, cellular telephony penetration continues to grow and is already more than 100%, and Internet penetration and use are seeing healthy growth. However, the data hosting market is relatively small and not well developed. Most Colombian data is hosted outside the country, primarily in the United States. Even government data, e.g., the *Gobierno en línea* site is hosted outside the country.

The obstacles to achieving a higher percentage of data being hosted in Colombia are primarily economic and commercial issues. Some of the main ones are:

- High costs
- Confidence factor in local hosting
- Competitive barriers to entry
- Lack of content

Colombia has only one IXP. A number of other countries with a similar population and a similar level of GDP per capita have more. For example, Kenya has 3, South Africa has 6, Ukraine has 6, and Argentina has 10. The OECD has recommended the establishment of additional IXPs in Colombia.

Of particular concern is that a number of Internet operators or content providers (e.g., google and Akamai) have sought entry into the Colombian market, but the NAP has rejected them. With this restriction, Colombia is losing out on the Network Effect, which is where the value of a network increases the more people that are on it.

Applying U.S. best practices to Colombia's data hosting market can help it effort to improve its position and enable it to increase data hosting in country.

Colombia has another compelling reason to adopt best practices: The country is seeking membership in the OECD, and in order to be accepted, it must demonstrate that it adheres to OECD policies, including ICT policies. The OECD has made a number of recommendations to improve Colombia's ICT sector:

- Strengthen the authority and independence of the regulator.
- Promote competition in the telecommunications market.
- Expand telecommunications infrastructure and services.
- Eliminate barriers to the deployment of infrastructure.
- Promote the interest of the consumer.

In particular, the OECD states that Colombia should promote the development of IXPs, particularly outside of Bogota, further, that barriers to the entrance of IXPs into the market should be minimized, not only for new IXPs, but for existing ones.

In order to improve its position and grow its data hosting market, Colombia must contend not only with major U.S. players, but competitors in other Latin American countries as well. For example, a significant volume of Colombia's data is being hosted in Brazil and Argentina.

Technical

Data center infrastructure in Colombia is limited by both available space and quality. Other factors include limited insufficient staff skilled or experienced in professional disciplines such as enterprise architecture, interoperability, service oriented architectures, and executive functions. Such deficiencies may delay a broader understanding of the need for more integrated or inter-connected national infrastructure.

A major element in the Colombian data hosting market is the NAP of Colombia. The 19 members of this organization, composed of the major telecommunications carriers serving the country, set policy for the NAP Colombia, including pricing, acceptance of new members, and other administrative functions. In the past, NAP Colombia has prevented other entities from joining, including large content providers such as Google and Akamai. This exclusion discourages domestic and international investment in local data center facilities. Further, the relatively small volume of data center inventory prevents economies of scale and increases the cost of hosting.

Not only is the amount of available data center space small, it is also frequently of lower quality than facilities in other countries, particularly those in the United States that offer an attractive and cost-effective service.

Further, while some operators claim to offer cloud computing, in reality they do not have a functional IaaS product but only offer some limited virtualization services to select customers.

With limited data center space and data volume, it is difficult for an operator to develop a large portfolio of services

A final consideration for developing a domestic data center industry is the cost of power, which is high in Colombia compared to the United States. In addition to the cost is the issue of reliability. When the ASTRO Team visited one data center, a power disruption occurred, and the center did not have adequate capacity to run both the central office communications equipment and cooling systems. Such problems could put a facility out of the running as a potential service provider. However, this problem could be mitigated in Colombia by taking advantage of Colombia's cool climate to reduce the need for air conditioning.

To summarize, the main technical challenges in developing Colombia's data hosting industry are:

- Power
- Location
- Human capacity
- NAP Colombia and IXPs

Of particular importance, the IXP is an essential component of a successful plan to increase data hosting in Colombia. NAP Colombia and/or new IXPs should be neutral with no barriers to participation among qualified members.

Legal/Regulatory

Data hosting services are subject to Colombian legislation regarding various matters such as personal data protection, copyright, Information and Telecommunications Technologies, Contractual Issues.

Thus, Colombia has a comprehensive legal framework on data protection and there are no legal obstacles or barriers to providing data hosting services. However, there are some specific issues that the Superintendence of Industry and Commerce needs to consider with a view to providing regulation or legal opinions in order to clarify the criteria relating to some expressions and concepts included in Law 1581/2012.

Colombia also has a Copyright legal framework that comprises domestic, international and supranational legislation. The National Copyright Directorate has provided guidelines on the application of these copyright rules when the content is available on the Internet, in the cloud, or other digital platforms.

In addition, Colombia has a modern and stable ICT legislation (Law 1341/2009) that involves the principles of investment promotion, Technology Neutrality and Net Neutrality, with a regulatory framework set out by CRC.

Finally, Contractual Legal framework allows data hosting providers to agree all the clauses commonly used in other countries.

Initial Findings

The factors that hinder greater data hosting in Colombia are primarily economic and commercial. The principle issues include:

- Competitive barriers to entry
- High costs in Colombia
- Lack of human resources with skills in architecture and analysis
- Lack of confidence in Colombian facilities/services
- Competition from prestigious data hosting companies in the U.S.
- Inadequate marketing efforts by Colombian data hosting providers
- Lack of local content
- Possible unfavorable misinterpretation of laws/regulations
- Lack of government support
- Lack of guidance from MinTIC

There are few technical limitations: Some data hosting facilities have inadequate security measures and problems with power outages, but such deficiencies could be remedied.

Perhaps the most important issue is embodied in the policy of NAP Colombia. Some major content providers and other operators that have sought entry into NAP Colombia have been denied. NAP has since opened up membership, but high fees are still a deterrent. This situation has hindered expansion of the market.

There is no law or regulation that inhibits data hosting operations. However, some provisions are worded in such a way that they may be open to misinterpretation and need to be clarified.

These issues will be addressed in Task 6, and remedies will be proposed.

5. TASK 5: PRESENTATION 1

Task 5 consisted of a presentation to present the initial findings obtained in Tasks 1-4. The agenda of the presentation covered:

- Introduction
- Activities so far
- Economic analysis
- Technical analysis
- Legal/regulatory analysis
- Initial findings
- Next Steps
- Question and Answer period

During the presentation, the ASTRO Team explained the issues, answered questions about the findings, and solicited input to guide the activities of the remaining tasks.

6. TASK 6: POLICY FRAMEWORK AND ACTION PLAN

In Task 6, the ASTRO Team looked at the growth of various services, such as video, online shopping, online banking, teleworking, education, healthcare, and public services. In particular, virtualization and cloud computing are seen as means to facilitate the sharing of IT resources and the offering of cost-effective services. They enable each user to run its applications and store its data on physically separated systems and access its IT resources and data in a secure and private manner. In this way, separate server racks or separate servers are not necessary.

The ASTRO Team formulates solutions that should enable the Colombian data hosting market to offer a wide range of lower-cost, yet more efficient and effective IT services that ensure a higher level of availability, higher internal and external connectivity, increased system capacity, better server utilization, larger data storage, higher bandwidth, improved performance, quality and support services, and a confirmed business continuity throughout operations.

The table below summarizes the conditions that are favorable for Colombia, as well as the conditions that are not favorable for Colombia to develop a data hosting industry.

Conditions Favorable to Colombia	Conditions not Favorable to Colombia
<ul style="list-style-type: none"> ➤ Location ➤ Good international connections with submarine cable landings from both Atlantic and Pacific ➤ Suitable land in Free Zone 	<ul style="list-style-type: none"> ➤ High energy costs ➤ Inequitable VAT tax treatment ➤ Lack of trained and skilled people in advanced IT topics

The Policy Framework and Action Plan is designed to remedy the deficiencies and enable Colombia to attract data center operators.

To understand the types of policies and actions needed, the Consultants first formulated the objectives that need to be achieved in order to attain the goal of increasing the portion of Colombian data hosted in the country to 20%. From these objectives emanated over a dozen policies. The policies are grouped under the objectives as see in the table below.

This report sets forth these policies with a discussion of what agency or agencies would be responsible for developing and implementing them, including steps and actions to be carried out to achieve the desired outcome.

Objective 1:
Improve local business conditions to attract investment and promote competitiveness
<ul style="list-style-type: none"> ✓ Policy 1: Encourage the establishment of new neutral IXPs ✓ Policy 2: Encourage ISPs to connect to at least one IXP ✓ Policy 3: Review VAT tax bracket for data hosting services ✓ Policy 4: Encourage trade missions to gain technical and business knowledge ✓ Policy 5: Review accounting policies related to IT equipment depreciation ✓ Policy 6: Develop and implement incentives to foster construction of data hosting centers ✓ Policy 7: Review policies that affect energy cost ✓ Policy 8: Incentives to create data center clusters in Colombia
Objective 2:
Increase local workforce technical capability
<ul style="list-style-type: none"> ✓ Policy 9: Promote executive actions to foster technical education and training ✓ Policy 10: Foster IT R&D+I through scholarships or R&D funds ✓ Policy 11: Develop and implement advanced IT curriculum ✓ Policy 12: Develop and implement advanced IT workforce development programs
Objective 3:
Incentivize content to be hosted in Colombia
<ul style="list-style-type: none"> ✓ Policy 13: Define rules for hosting of government data ✓ Policy 14: Foster the Development of Local Content and Applications

In addition, the involvement of CCIT is described. CCIT will be a key player in the process: it will collaborate with government agencies and other interested parties, work to improve entry conditions into the Colombian market, seek to attract content development networks to connect with existing and/or future IXPS, and establish partnerships with other related industry associations. CCIT can also participate in organizing trade missions and educational programs.

7. TASK 7: PRESENTATION 2

Task 7 consisted of a presentation to present the Policy Framework and Action Plan. The agenda covered:

- Introduction
- Conditions for data hosting
- Policy Framework and Action Plan
- CCIT's involvement
- Conclusions
- Question and Answer period

The presentation discussed conditions that are favorable for Colombia to foster a data hosting industry, as well as conditions that are not favorable and how such conditions might be remedied. Then the objectives and policies developed in Task 6 were discussed, covering the actors, the actions, how and why such policies would have a positive impact on the development of a data hosting industry in Colombia, as well as CCIT's involvement. Examples from the case studies in the Task 6 report that demonstrate that such policies have been effective elsewhere were also mentioned.

8. TASK 8: PRELIMINARY ENVIRONMENTAL ANALYSIS

In this task, the ASTRO Team conducted a preliminary review of the project's anticipated impact on the environment. Nevertheless, since this study was aimed at producing a list of policies and action recommendations, and there will be no immediate project, constructions or physical implementation, we will include in this task the recommended Guidelines about the potential environmental impact for a Data Center construction. We will discuss the environmental considerations that may be necessary in case such a project materialize in the future.

This review identifies potential negative and positive impacts, discuss the extent to which the negative impacts can be mitigated, and develop plans for a full environmental impact assessment when the project moves forward to the implementation stage. In this assessment, the Contractor analyzes the power requirement for the data center and its impact on the environment.

9. TASK 9: DEVELOPMENT IMPACT ASSESSMENT

The Task 9 report assesses the potential development impacts of the Project. It assesses the potential benefits of the project. Beyond the direct and immediate impact of the Project, other developmental benefits are included.

The goals and objectives are in line with Colombia's National Development Plan (NDP), since one of the NDP's major axes is the development and advancement of technology, as well as advancing the skills of human resources.

As background to assessing the impact of the present Project, we look at Colombia's socio-economic situation, the emphasis on technology—including ICT and the Internet—and the growth of the ICT market, which presents opportunities for data hosting in Colombia.

Three main types of developmental impact are considered:

- Infrastructure development and efficiency gains
- Human capacity building
- Promoting effective markets

The focus is on the direct impact of the Project, but where appropriate, other indirect developmental benefits are considered, such as spin-off and demonstration effects. The table below summarizes the estimated developmental impacts of the Project in the areas examined.

If the goals and objectives are achieved, the Project will have a significant positive impact on Colombia’s economic development.

Category	Indicator	Definition	Measure
Infrastructure Development and Efficiency Gains	Improved output through advanced technology	New technologies introduced to a host country resulting in an increase of efficiency, capacity, or output process improvement	Yes
	Improved data management and security	Capacity added, security/ redundancy gained or reliability improved through implementation of data centers, cloud computing systems, or other storage infrastructure	Yes
Human Capacity Building	Temporary jobs created	Temporary jobs created by project implementation	100
	Permanent jobs created	Permanent jobs created by project implementation	100
	Training and skill development	Training and skill development delivered during project implementation	500
Promoting Effective Markets and Governance	Supporting regulation that promotes effective government	Adoption of policy, regulations or laws that promote effective governance of a sector or market (including compliance with a bilateral or multilateral policy or trade agreement)	Yes
	Improved investment climate	Implementation/utilization of USTDA recommendations led to direct investment in host economy (including companies opening or expanding offices/operations)	Yes
	Promoting competition	Implementation utilization of USTDA recommendations led to opening of market to greater competition or introduction of standards (elimination or reduction of threat to foreign business interests and competitiveness)	Yes
Promoting Safety and Security	Improved safety and/or security	Improved human safety and/or security resulting from project implementation	Yes

These aspects of the impact are discussed in more detail in the main body of the report.

10. TASK 10: LIST OF POTENTIAL U.S.-BASED PROVIDERS OF RELEVANT GOODS AND SERVICES

Preliminary analysis indicates that U.S. providers have a very strong competitive advantage for the majority of hardware, software, and services required to develop the hosting market in Colombia.

The Task 10 report identifies possible U.S. sources of supply for the Project. In addition, it briefly describes relevant products, solutions and/or services, as well as contact information for the party or parties responsible for marketing/sales in Colombia. Business name, point of contact, address, telephone, e-mail, and fax numbers are included for each such party.

The information is presented in three sections:

- U.S. suppliers of data center equipment
- Profiles of suppliers established in Colombia
- Suppliers of other goods and services

The first list of U.S. suppliers of data center equipment covers hardware and software for the back one network, systems and solutions, equipment and systems for the data center, and implementation, conditioning, and support services for the data center.

Profiles of suppliers established in Colombia include Cisco Systems, IBM, INTEL Colombia, Microsoft Colombia, Oracle Colombia, Unisys Colombia, HP, and Dell.

The list of suppliers of other goods and services is a comprehensive list of major U.S. companies in the market, the type of technology solutions they offer, and/or their product and solution category.



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