



Enhancing Scientific Cooperation between the
European Union and Central America

Fortaleciendo la cooperación científica entre la
Unión Europea y América Central



Landscape of Research Technology and Development in Central America

Setting up the bi-regional dialogue



ENLACE (Enhancing Scientific Cooperation between the European Union and Central America) is a project co-funded by the European Commission in its 7th Framework Programme under the Grant Agreement no 244468 running from 1st Nov. 2009 to 30th Oct. 2013.



Abbreviations

ALCUE: America and Caribbean - European Union Summit.
CA: Central America.
CEPAL: Economic Commission for Latin America.
CERCAL: Centre of Studies for the Relations between the European Union and Latin America.
CORDIS: Community Research and Development Information Service.
CSUCA: Central American University Superior Council.
CTCAP: Commission for the Scientific and Technological Development in Central America and Panama.
EAP: Economically Active Population.
EC: European Commission.
ECOSUR: The Southern Border College.
ENLACE: Enhancing Scientific Cooperation between the European Union and Central America.
EPI: Environmental Performance Index.
EU: European Union.
EUROSTAT: Statistical Office of the European Communities.
FECAICA: Central America and Dominican Republic Chambers and Associations Federation.
FP7: Seventh Framework Programme.
GNP: Gross National Product.
HDI: Human Development Index.
INCO-Nets: International Cooperation Networks.
LA: Latin America.
LAC: Latin America and the Caribbean.
NR: National Report.
OAS: Organization of American States.
ODECA: Organization of Central American States.
R&D: Research and Development.
RICyT: Network for Science and Technology Indicators Ibero - American and Inter - American.
RR: Regional Report.
RTD: Research Technology and Development.
S&T: Science and Technology.
SCI: Science Citation Index.
SICA: Central American Integration System.
SIECA: Central American Secretariat for Economic Integration.
UCR: University of Costa Rica.
UNACHI: Autonomous University of Chiriqui.
UNDP: United Nations Development Program.
UNESCO: United Nations Educational, Scientific and Cultural Organization.
UPC: Universitat Politècnica de Catalunya.
UPNFM: National Pedagogical University Francisco Morazan.
USAC: University of San Carlos of Guatemala.
USD: United States Dollars.

Copyright notice:

Copyright © ENLACE.

ENLACE (Enhancing Scientific Cooperation between the European Union and Central America) is a project co-funded by the European Commission in its 7th Framework Programme under the Grant Agreement n° 244468 running from 1st Nov. 2009 to 30th Oct. 2013.

The information contained in this document reflects only the author's views and the Community is not liable for any use that may be made of the information contained therein.



EXECUTIVE SUMMARY

The present Regional Report (RR) represents a Common position paper of ENLACE-Central America's partners on Research Technology and Development (RTD) in Central America (CA). The report is based on the findings of a survey applied to a sample of researchers (circa 50 per country) and policymakers (5 per country), comprehended in National Reports from the following countries: Costa Rica, Guatemala, Honduras and Panama. An overview of the Central American region is given and information on environmental and economic aspects is presented. The information reveals that the region is rich in natural resources, but there are differences among countries in the way each country deals with their natural capital, as indicated by the Environmental Performance Index (EPI). According to the EPI Rank, in CA there is a country that scores 3 (best) and another 118 (worst). Despite CA's biological richness, in general the region poverty remains a key issue; average poverty rate for CA countries is approximately 46%. CA's cooperation with the European Union (EU) today and throughout history indicates a relatively historical cooperation between the two regions. According to the results of the surveys and statistics on RTD from CA, there is heterogeneity among the countries in terms of investments in science and technology. They range from 7 to 23 million dollars and from 0.06% to 0.40% of the Gross National Product. Those surveyed designated environment, health, agriculture and food, and energy as priority areas for scientific research and international cooperation. The most frequently named countries with which CA have the greatest international cooperation are Spain, Germany, United States, and Japan. Only 23% of total interviewed persons are aware of the Seventh Framework Programme. The building up of an INCO-Net in CA will contribute to promote regional integration and priority setting of common research areas of mutual interest and benefit, and identify research areas of international S&T cooperation under the specific programmes of FP 7.

Table of contents

EXECUTIVE SUMMARY.....	3
INTRODUCTION.....	5
1. DESCRIPTION OF THE CENTRAL AMERICAN REGION.....	6
1.1 Environmental aspects.....	6
1.2 Socioeconomic aspects.....	8
1.3 Human Development.....	11
1.4 Migration.....	13
1.5 An example of integration.....	13
2. European Union–Central America COOPERATION.....	14
2.1 political framework.....	14
2.2 CURRENT cooperation between European Union and Central America.....	14
3. ENHANCING SCIENTIFIC COOPERATION BETWEEN THE EUROPEAN UNION AND CENTRAL AMERICA (ENLACE).....	15
3.1 Science and Technology (S&T) priorities for Central America at macro level	16
3.2 Science and Technology priorities for Central America per country.....	17
3.3 Policy makers and Researchers surveys.....	19
3.4 Chambers of commerce surveys.....	23
4. CONCLUSIONS.....	25
5. REFERENCES.....	26

INTRODUCTION

Relations between the European Union and Central America (EU – CA), which include talks on political and commercial matters and address cooperation between both regions, formally began on September 28, 1984 with the San Jose Dialogue in Costa Rica (Karadjova *et al.* 2003, SICA 2001, European Commission 2007, Bonet 2007). Stressing the importance of political dialogue and economic cooperation built up by the EU and CA with the San Jose Dialogue, in 1993, a *Framework Cooperation Agreement* on regional development was signed in San Salvador (European Commission 2007, Caballeros 2008). In 1996, the San Jose Dialogue was ratified at the Ministerial Meeting held in Florence, Italy (European Commission 2007, Caballeros 2008, Bonet 2007). Shortly after, a natural disaster led to a turning point in bi-regional EU – CA relations: Hurricane Mitch hit vast regions of CA in October 1998. The urgent situation faced by the Central American countries spurred the international community to realize efforts and a broad range of meetings, forums, and initiatives were held, including the Stockholm Declaration in which Germany, Canada, Spain, United States, Sweden, and Japan called for discussions regarding the reconstruction of the region (SICA 2001). In 1999, the *1993 Framework for Cooperation Agreement* (European Commission 2007) took effect and the first Latin America and Caribbean - European Union Summit (ALCUE) took place in Brasilia, Brazil. Later on, in 2001, the European Commission (EC) and the Secretariat of Central American Integration (SICA) signed a *memorandum of understanding*, which governs cooperation initiatives between both regions, and thus new opportunities for scientific and technological cooperation were opened (Caballeros 2008, Bonet 2007, Mata and Cordero 2009). Furthermore, the establishment of the Regional Consultative Group was agreed upon in Madrid in 2001 (European Commission 2007). This outlined the Central American proposal for transformation and modernization of the region.

Currently, CA has an active and growing commercial relationship with the EU, with whom total trade was valued at almost 7 billion USD between 2007 and 2009 (SIECA 2009, EUROSTAT 2009). Latin America and the Caribbean (LAC) have benefited from the cooperation between the two regions. Almost 0% of development assistance dedicated to this region derives from Europe (Bonet 2007, Karadjova *et al.* 2003). Priority areas of cooperation have been set as mid-term challenges in the region, taking into account transversal themes such as equality, environmental sustainability, participation of civil society, migration, respect for human rights and vulnerable groups, and promotion of information technologies (European Commission 2007, Bonet 2007, Combescot 2003). Concerning cooperation in Science & Technology (S&T), the EU has a longstanding tradition of cooperation with non-European countries. European research organisations continuously opened new areas of cooperation and developed new international cooperation approaches. In order to facilitate cooperation with third countries, the EU has established International Cooperation Networks (INCO-Nets), which are coordination platforms that help to bring together the EU with policy makers and stakeholders of one target region. The main objectives of these platforms are to promote, organise and contribute to the participation of third countries in the activities of FP7. The purpose would be to promote regional integration and consequently would lead to the identification and prioritisation of common research areas of mutual interest and benefit. It would also facilitate the uptake and use of common identified research areas and the monitoring of performance and impacts of international S&T cooperation across the Specific Programmes of FP7. The Project *Enhancing Scientific Cooperation between the European Union and Central America (ENLACE)*, was conceived as an INCO-Net, and its specific objectives contribute to the broad INCO-Net projects goals.

The present report is an attempt to give an overview of Central America's state in Sciences and Technology. Environmental and socioeconomic aspects of the region are given as background information (section 1). A review of the historical cooperation and the political framework between EU and CA, and within CA is presented (section 2). The core component of the report is the survey conducted within the ENLACE Project to researchers and policy makers from CA's universities and research institutions, and governments concerning S&T (section 3). A survey to chambers of commerce from CA, assessing the economic performance of CA's industries is also included in section 3.

All the other information than the results of the surveys presented in this report was obtained from key literature on CA and international cooperation with CA: The Central America Regional Strategy Paper 2002 - 2006 and 2007 - 2013 by European Commission (EC); the National Science, Technology and Innovation Systems in Latin America and the Caribbean edited by United Nations Educational, Scientific and Cultural Organization (UNESCO) and additional texts, statistical data and several information provided by national and international internet pages (i.e. SIECA, RICYT, UNESCO, CORDIS).

1. DESCRIPTION OF THE CENTRAL AMERICAN REGION

1.1 Environmental aspects

Central America (CA), which has been independent from colonial empires for the past 200 years, is characterized by cultural, biological, and social diversity. The region is an isthmus that separates the Caribbean from the Pacific. Generally, it is considered to consist of the seven republics of Belize, Costa Rica, Guatemala, Honduras, El Salvador, Nicaragua, and Panama. CA has an approximate area of 500,000 km² and its population is estimated at more than 40 million inhabitants (CEPAL 2009, SIECA 2008). It measures 1,440 km from North to South, 500 km at its widest, and 64 km at its narrowest (the Panama Canal region) (Harvey *et al.* 2005, PNUMA 2005). The Atlantic Coast has a tropical humid climate with annual precipitation ranging from 2000 to 6000 mm. The Pacific Coast has a tropical dry climate with annual precipitation from 1000 to 1500 mm (Harvey *et al.* 2005). The precipitation and topography gradient - characterized by a high level of environmental heterogeneity - has led to the establishment of perennial, mixed, pine, and deciduous forests; wetlands; savannahs; thickets; coastal systems; mountain grasslands; deserts; arid scrub; and Atlantic and Pacific swamps (Harvey *et al.* 2005). CA's biological diversity includes Neo Arctic and Neo tropical floristic elements, and approximately 7% of the world's biodiversity is found in the region, which makes up less than 1% of the earth's surface (Barry 2003, CCAD 2003, CATHALAC 2008, PNUMA 2005). Central America possesses great biological richness (Table 1, Figure 1); environmental goods and services make up approximately 50% of the region's total income and 65% of its exports (SICA 2004).

CA's 23 watersheds, some of which are international, represent 40% of the region's territory (SICA 2004), and a quarter of CA's land area is under some type of protection status (Table 1, Figure 2). However, deforestation has caused the loss of more than 50% of the region's original habitat (CCAD 1998, Conservation International 2004, CATHALAC 2008, PNUMA 2005). The Central American governments have attempted to conserve the region's biological patrimony with initiatives such as the Central American Commission for Environment and Development (1989), the Central American Alliance for Sustainable Development (1994) and the Mesoamerican Biological Corridor (1997) (SIECA 2004).

In 2010, 163 countries were assessed according to the Environmental Performance Index (EPI), which measures how close governments are to fulfilling their environmental policy objectives that have been established according to international standards. Costa Rica rated first among the American continent, and third worldwide (Yale University and Columbia University 2010). The other Central American countries rated from 24th (Panama) to 118th (Honduras) (Table 1, Figure 3). The EPI consists of 25 indicators that include variables which evaluate ecosystemic vitality (EV) and environmental health (EH). EV indicators deal with climate change, agriculture, fishing, silviculture, biodiversity and habitat, water, and effects of air pollution on ecosystems. EH indicators address environmental burden of disease and include effects of air pollution on human populations and people's accessibility to clean water (Yale University and Columbia University 2010).

	Costa Rica	Guatemala	Honduras	Nicaragua	Panama
NPA (% of the country)	25.2 ^{1a}	29.4 ^{1a}	19.7 ^{1a}	17.0 ^{1a}	34.0 ^{1b}
Biodiversity BMA ²	624	571	579	577	680
EPI ³	86.4	54.8	49.9	57.1	71.4
EPI Rank ³	3	104	118	93	24

Table 1. Environmental indicators for ENLACE countries. NPA: National Protected Areas; BMA: Bird, Mammals and Amphibians species richness; EPI: Environmental Performance Index. Data: ^{1a} SICA 2004 ^{1b} National Authority of Environment of the Republic of Panama, 2004; ² CATHALAC 2008; ³ Yale University and Columbia University 2010.

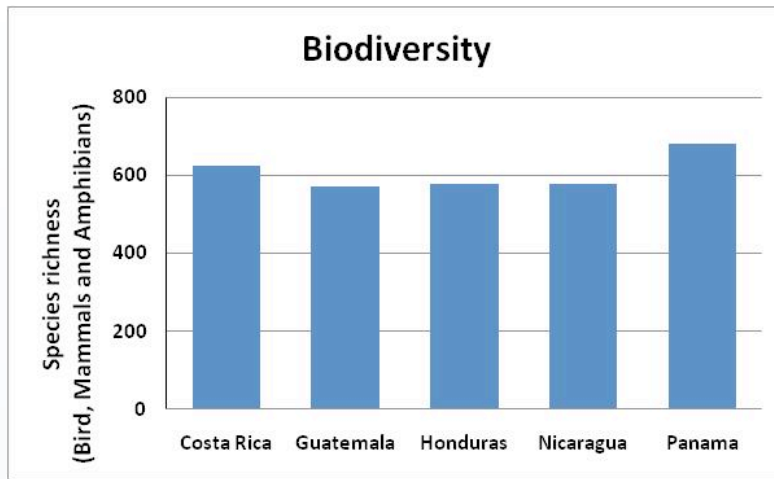


Figure 1. Species richness (Bird, Mammals and Amphibians) in CA.

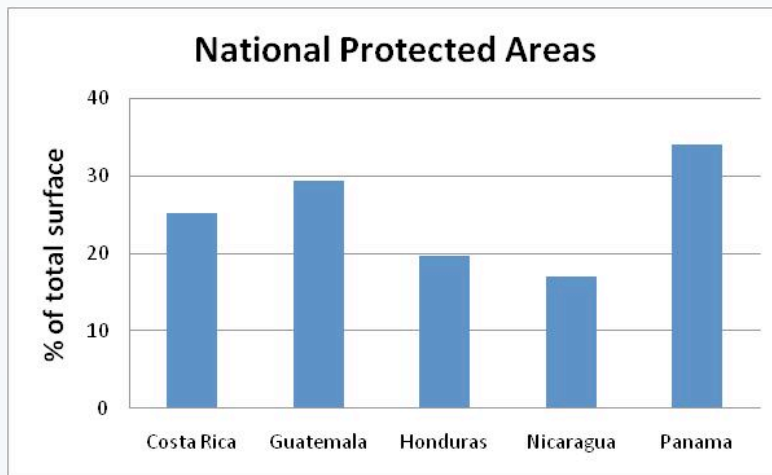


Figure 2. National protected areas in percentage of the total surface of the country.

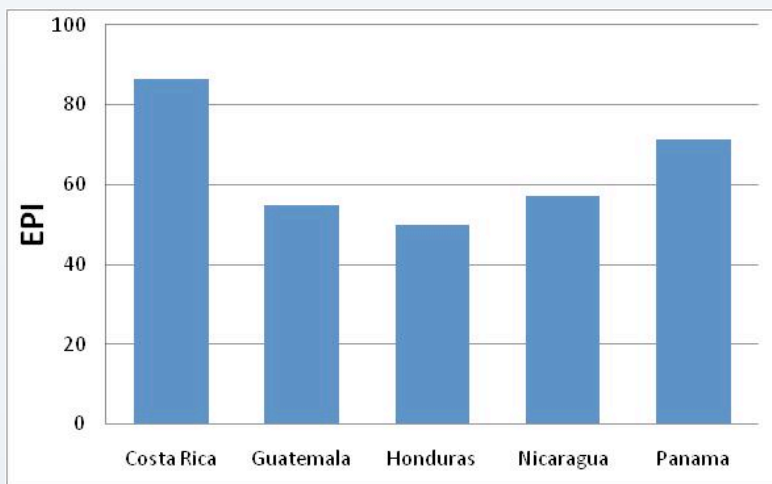


Figure 3. Environmental Performance Index (EPI).

1.2 Socioeconomic aspects

Central America's population (excluding Belize) stands at 42.5 million: 49.47% male and 50.53% female (SIECA 2008). The five countries of the ENLACE Project represent 83% of this population (UNESCO 2010), out of which 60% are younger than 25 (SIECA 2008). The average infant death rate (under 5 years of age) is high - 19%; Costa Rica has the lowest rate (10%), and Honduras the highest (29.6%) (SIECA 2008) (Figure 5). The region's average life expectancy is approximately 74 years; Guatemala has the lowest life expectancy (70.2), and Costa Rica the highest (78.8) (SIECA 2008) (Figure 6). In 2007, the region's economically active population (EAP) was close to 13 million, i.e. one third of the total population (RICyT 2007) (Table 2).

	Costa Rica	Guatemala	Honduras	Nicaragua	Panama
Population (millions of inhabitants) ¹	4.3	13.9	7.8	5.9	3.4
Infant death rate (% under 5 years of age) ²	10.0	25.3	29.6	15.4	14.7
Life expectancy (years) ²	78.8	70.2	72.1	72.9	75.6
EAP (millions of inhabitants) ³	2.0	4.2	2.9	2.2	1.5

Table 2. Social indicators for ENLACE countries. EAP: (Economically Active Population Data: ¹ UNESCO 2010; ² SIECA 2008; ³ RICyT 2007.

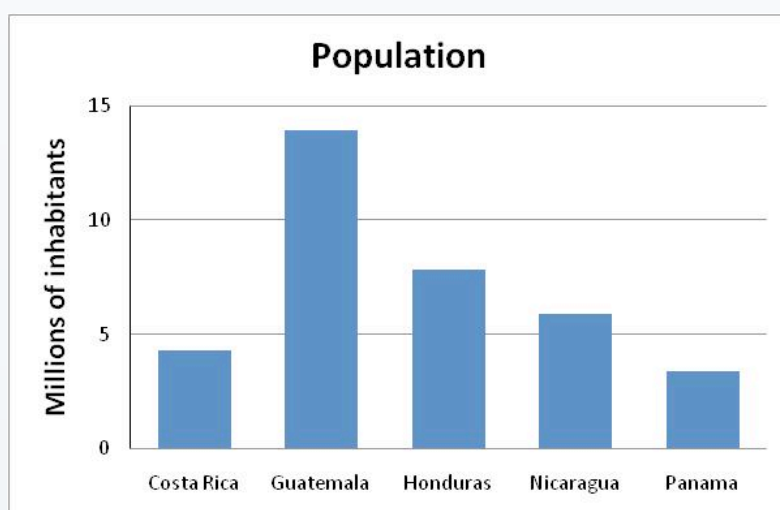


Figure 4. Population of ENLACE countries (2009).

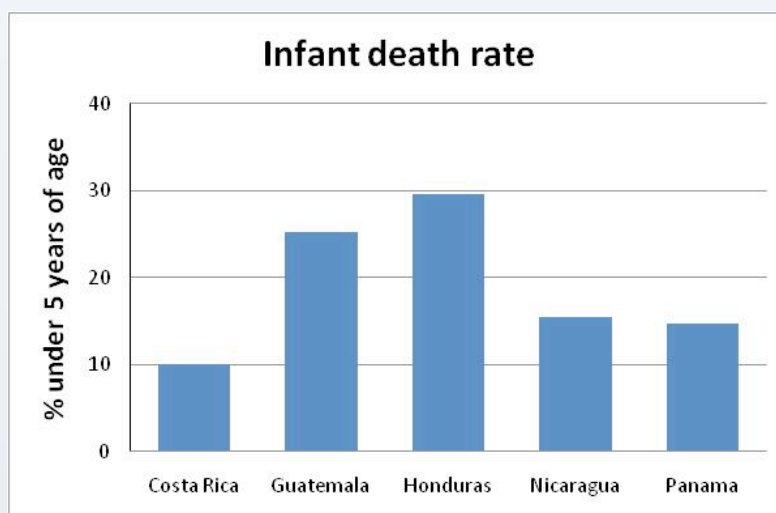


Figure 5. Infant death rate (under 5 years of age).

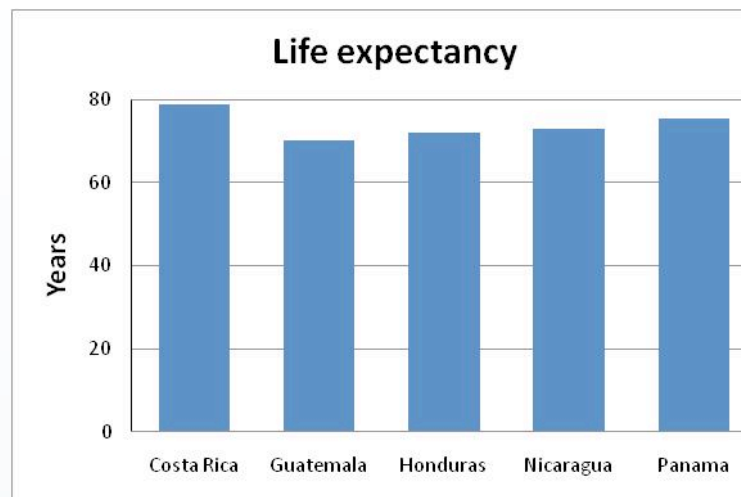


Figure 6. Life expectancy.

As it is the case for most of the Latin American countries, poverty is a long-standing problem (SICA 2004). In 2008, the average poverty rate for the CA countries was about 46%, with 16.4% of Costa Rica's population and 68.9% of that of Honduras living in poverty (CEPAL 2008). The economic growth reported for CA in recent years is not reflected in living conditions of the majority of the region's population. The total Gross National Product (GNP) of the Central American region increased from 14.5 billion dollars in 1970 to 34 billion in 1990. In 2007, the Central American GNPs ranged from 5.7 billion (Nicaragua) to 34.3 billion dollars (Guatemala) (RICyT 2007) (Figure 7). Average annual *per capita* income for CA remained almost static between 1970 and 1999, growing from 960 to 1080 USD (SICA 2001). In 2008, national averages ranged from 900 (Nicaragua) to 5500 USD (Panama) (CEPAL 2008) (Figure 8). Thus, income disparity has considerably increased during the past decade. Average industrial growth in CA in 2008 was 4.6%, with Panama experiencing the greatest increase at 9.2% (UNESCO 2010). Internal debt varies greatly among CA countries, ranging from 22% to 53 % of GNP (for Honduras and Nicaragua, respectively) (Table 3).

	Costa Rica	Guatemala	Honduras	Nicaragua	Panama
GNP (billion USD) ¹	25.2	34.3	16.1	5.7	19.7
GNP <i>per capita</i> (USD) ²	5188.5	1698.7	1452	896.7	5579.8
Industrial growth (%) ³	2.7	4.0	4.0	3.2	9.2
Unemployment (%) ²	4.8	2.7	3.9	5.9	6.5
Internal debt (% GNP) ³	42.2	23.6	21.6	53.2	45.3

Table 3. Economic indicators. GNP: Gross National Product. Data: ¹ RICyT 2007, ² CEPAL 2009, ³ UNESCO 2010.

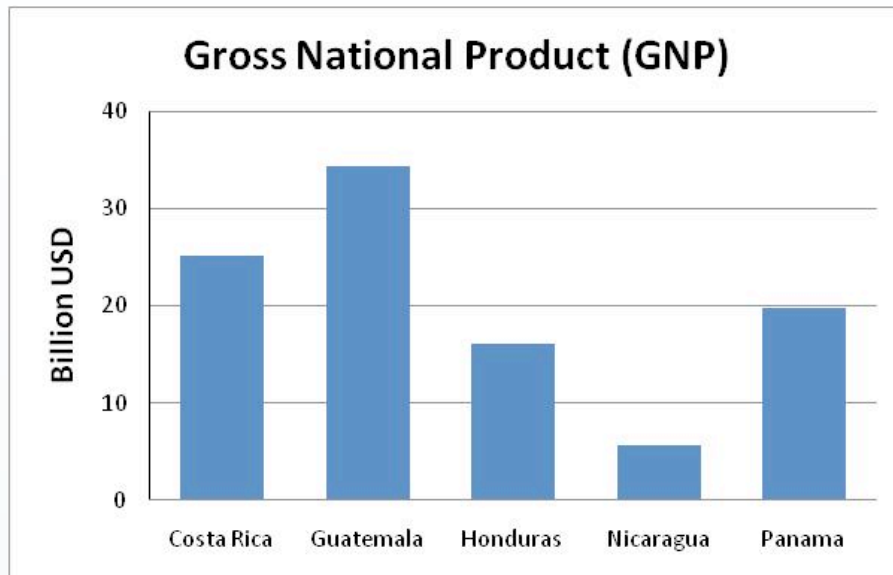


Figure 7. Gross National Product (billion USD) for ENLACE countries.

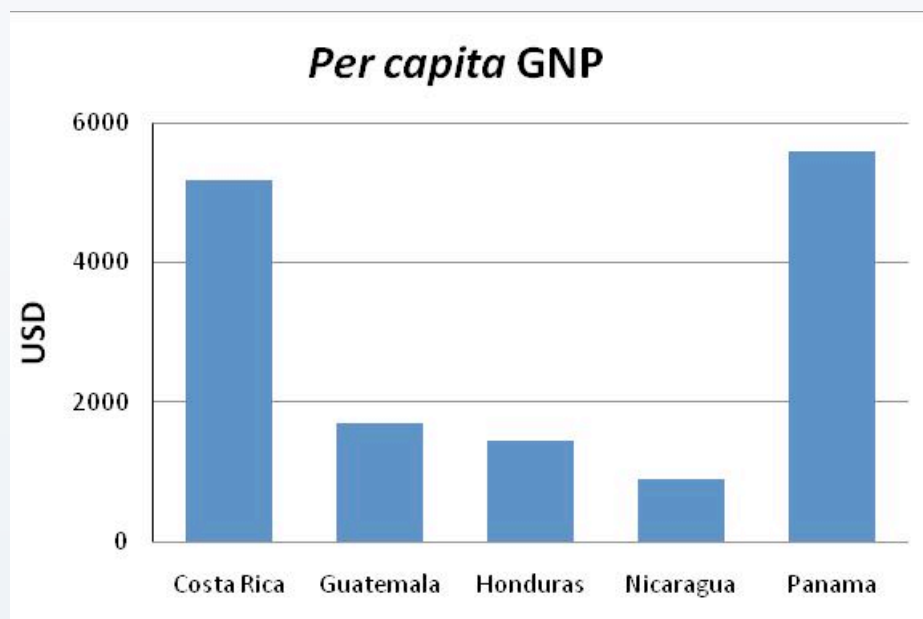


Figure 8. Gross National Product (*per capita* GNP, USD).

Within Central America, a sizeable proportion of the rural population has migrated toward urban areas in search of work and other opportunities (CEPAL 2009). This trend is buttressed by 2008 data showing that agriculture makes up on average just 11% of the region's economic activity, while industrial economy represents around 25%, and services 64% (UNESCO 2010) (Table 4, Figure 9). The average unemployment rate for the region in 2008 was 4.76% (CEPAL 2008).

	Costa Rica	Guatemala	Honduras	Nicaragua	Panama
Agriculture	6.5	13.1	13.1	16.9	6.4
Industry	25.9	25.0	30.0	25.8	17.2
Services	67.6	61.9	56.9	57.3	76.4

Table 4. Productive sectors as a percentage of the total. Data: UNESCO 2010.

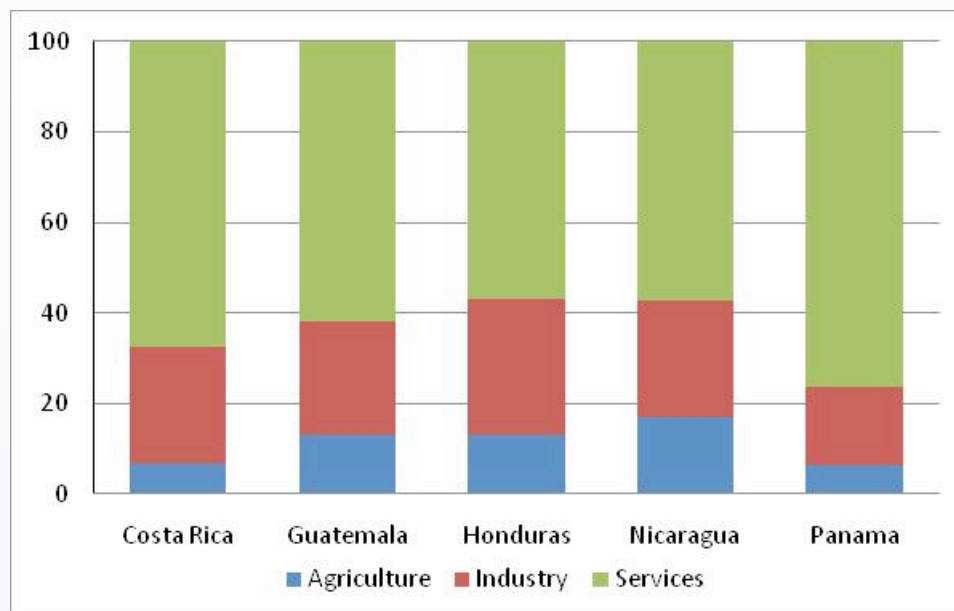


Figure 9. Productive sectors (%).

1.3 Human Development

With respect to education in CA, in 2000, almost 22% of the population was illiterate and nearly 25% only received primary school education (SICA 2001). However, statistics vary significantly among countries (Table 5, Figure 10). In 2006, Guatemala's literacy rate was 69%, while that of Costa Rica was 95%; the average regional rate was 82.6% (UNESCO 2010). Nevertheless, in the region in general (with the exception of Costa Rica) few students who finish primary school extend their education (SICA 2001). Investment in education as a percentage of GNP varies from 3% for Nicaragua to 5% for Costa Rica (UNESCO 2010). Percentage of GNP invested in research and development ranges from 0.1% to 0.4% (UNESCO 2010) among the region's countries. The numbers of researchers per 1000 economically active inhabitants in the region range from 0.1 (Guatemala and Panama) to 1.8 (Costa Rica). In 2007, 947 scientific works were published in CA. According to the Science Citation Index (SCI), a standard international parameter, scientific publications of each ENLACE country account for from 0.002% (Honduras) to 0.030% (Costa Rica) of the world's total publications (RICyT 2007) (Table 5, Figure 10).

	Costa Rica	Guatemala	Honduras	Nicaragua	Panama
Literacy (%) ¹	95	69	80	77	92
Education expenditure (% GNP) ¹	4.9	NA	NA	3.1	3.8
R&D expenditure (% GNP) ¹	0.4	0.1	0.1	0.1	0.2
Researchers / 1000 EAP ¹	1.8	0.1	0.2	0.2	0.1
Publications SCI ²	398	101	31	48	369

Table 5. Education indicators for ENLACE countries. R&D: Research and Development; EAP: Economically Active Population; SCI: Science Citation Index. NA: Not available. Data: ¹ UNESCO 2010; ² RICyT 2007.

The Human Development Index (HDI) - which encompasses life expectancy, literacy rate, educational enrolment, and per

capita income - ranges from 0 to 1. Average HDI for the ENLACE countries is 0.740. Costa Rica has the highest value (0.841) and Guatemala the lowest one (0.673); these countries rank the 48th and 118th, **respectively, among the 177 countries evaluated worldwide** (PNUD 2007) (Table 6, Figure 11).

Consistent with HDI data (PNUD 2007), the Gini Coefficient, in which 0 constitutes maximum equality and 1 represents maximum inequality, shows the highest value for Costa Rica (0.473) and the lowest for Guatemala (0.585), with a regional average of 0.538 (CEPAL 2008) (Table 6, Figure 11). In 2006 and 2007, public social spending - which comprehends education, health, nutrition, security, work, and social programmes, as well as infrastructure in water, housing, and sewage - was nearly 11% of GNP on average for the region, with Guatemala having the lowest percentage (7.5%) and Costa Rica the highest (17.2%) (CEPAL 2008).

	Costa Rica	Guatemala	Honduras	Nicaragua	Panama
Poverty (% population) ¹	16.4	54.8	68.9	61.9	27.7
Social expenditure (% GNP) ¹	17.2	7.5	11.4	11.4	9.2
HDI ²	0.841	0.673	0.683	0.698	0.809
HDI rank ²	48	118	117	112	58
Gini coefficient ¹	0.473	0.585	0.580	0.532	0.524

Table 6. Human development indicators. GNP: Gross National Product; HDI: Human Development Index. Data: ¹ CEPAL 2009; ² PNUD 2007.

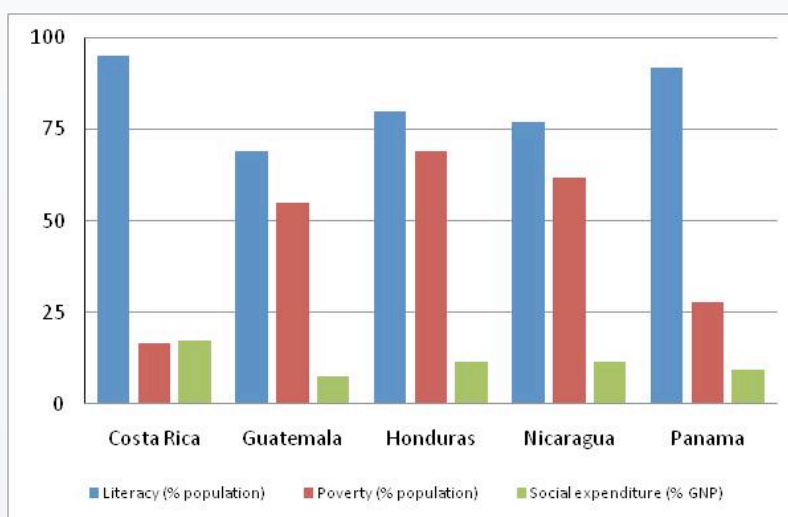


Figure 10. Literacy, poverty and social expenditure.

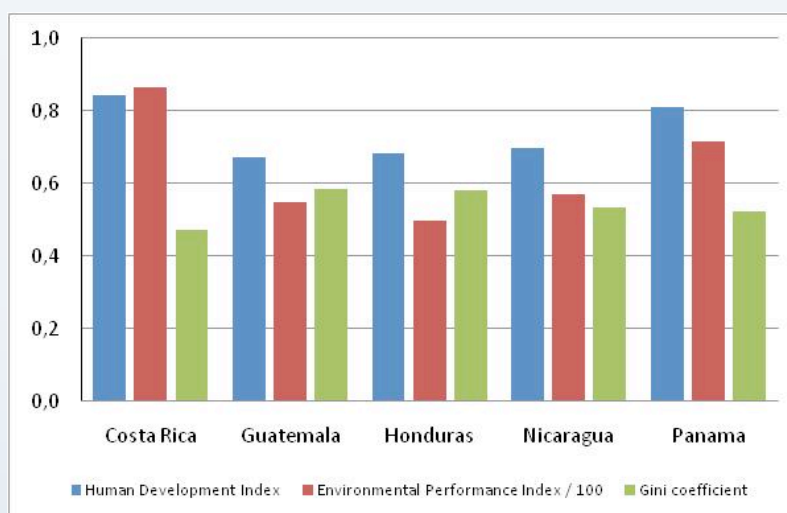


Figure 11. Human Development Index (HDI), Environmental Performance Index (EPI / 100) and Gini coefficient.

1.4 Migration

Migration is an on-going phenomenon in the Central American region. The United Nations Development Program (UNDP) in 2000 calculated roughly 350,000 migrants within the Central American region, principally in Costa Rica. Most Central Americans who leave the region migrate from El Salvador, Guatemala, and Honduras to Mexico and the United States. In 2004, an estimated 4 million Central Americans resided in the United States (SICA 2004). Remittances amount to a large percentage of the region's national economies - close to 5.3% of the region's total income in 2004 (SICA 2004). Causes of the complex migration phenomena include wage differences and varying capacities of the national economies to incorporate job seekers in the labour market (SICA 2004).

Natural disasters in CA have increased the migration phenomenon (SICA 2001). In 1998, Hurricane Mitch, CA's most devastating hurricane of recent years, accounted for around 6 billion US dollars in terms of damages i.e. 13% of the average GNP of the region (SICA 2004). Other phenomena inflicting heavy loss I include the El Niño phenomenon, earthquakes in El Salvador in 2001, and droughts in Honduras, Guatemala, Nicaragua, and El Salvador in the same year (SICA 2004). These phenomena have shed light on the varying levels of vulnerability related to income among the Central American countries. Honduras and Nicaragua have generally been the poorest of CA countries. In 2001, their per capita incomes were approximately 60% and 70%, respectively, of the regional median (SICA 2001).

1.5 An example of integration

Since the mid-twentieth century, the governments of the countries comprising the Central American region have been eager to join integration efforts. An example of this is the creation of the Organization of Central American States (ODECA) in 1951 and the Central American Common Market in 1962 (Combescot 2003, Santamaría 2003, and Vela 2003). The Central American Integration System (SICA) is the institutional framework of Regional Integration in Central America, created by the States of Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama. Also involved are the Dominican Republic as an Associated State; Mexico, Chile and Brazil as regional Observers; Taiwan, Spain, Chile and Germany, as extra regional Observers. The headquarters of the General Secretariat of SICA is in El Salvador. SICA was established by the Tegucigalpa Protocol in 1991, which amended the Charter of ODECA; SICA took formally effect in 1993.

The CA region's economy was the first target of integration (European Commission 2007). However, the signing of the General Treaty on Central American Economic Integration in the early 1960s (SIECA 2009) and the Tegucigalpa Protocol in 1991 legally outlined key principles for cooperation and understanding: lasting peace, freedom, democracy, and development (SICA 2001, European Commission 2007).

As a result of negotiations, the institutional framework for Central American integration has been strengthened. The executive bodies encouraging this integration are the Meeting of National Presidents, the Council of Ministers, the Executive Committee, and the General Secretariat of the System of Central American Integration (SG – SICA) (SICA 2009). This General Secretariat governs the sectorial integration of projects identified by the Sectorial Councils of Ministers (SICA 2001). Meanwhile, the Secretary of Central American Economic Integration (SIECA) is in charge of regional economic aspects of integration (SIECA 2009, European Commission 2007).

Toward the end of the 1990s regional institutions - General Secretariat of the SICA, the Central American Parliament, Central American Court of Justice, and the Central American Bank of Economic Integration (European Commission 2007, SICA 2001, Santamaría 2003) reinforced the integration process by reviewing and unifying common interest of governing criteria. Furthermore, mid-range plans have been designed, such as the Regional Proposal for Transformation and Modernization of Central America in the Twenty First Century, by the General Secretariat; and the Strategies and Lines of Action to 2010, elaborated by the General Secretariat and the Social Integration Branch of the SICA (SICA 2001, Santamaría 2003, Rodriguez and Versteeg 2003).

Alliances created in other regions of the world, such as the Asia Pacific group or the North American Free Trade Agreement (NAFTA), have been exclusively commercial, while the European and Central American visions value a common history and prioritize long-term social and environmental assets over commercial exchanges.

In Latin America, several regional blocs integrate a common vision, also focused on commercial exchange. These blocs are The Common Market of the South (Mercosur), The Bolivarian Alternative for the Peoples of Our America (ALBA), The Andean Community (CAN), The Caribbean Community (CARICOM), and The Union of South American Nations (UNASUR) (SELA 2008). In the context of these blocs and NAFTA, the System of Central American Integration (SICA) serves as a geographical and political bridge between the north and the south, and between the poles of development of America.

2. European Union – Central America COOPERATION

2.1 Political framework

The European Commission (EC) has a cooperation programme with CA for the period 2007–2013, which will focus primarily on regional integration. Analysis of EC policies and instruments and their possible impact on CA shows the most important issues to be tackled are trade, agriculture, environment, health and consumer safety, internal market, taxation, competition, justice, information society, research, and conflict prevention. This is consistent with the Regional Strategy for Central America, a continuous process of management of EC cooperation with CA, which fulfils one main objective: to support the process of political, economic, and social integration in the context of preparing the future Association Agreement between the European Union and Central America. The Central America Regional Strategy Paper 2007-2013 confirms that the EU is the leading donor of official development aid to Central America, with 840 million Euros set aside, and supports the process of political, economic and social integration in the context of the preparation of an Association Agreement with a financial contribution of 75 million Euros¹. These resources will be supplemented with projects funded from specific EC budget lines and programmes financed under the Central American and Latin American regional programmes (European Commission 2007).

2.2 Current cooperation between European Union and Central America

In 1984, the San Jose Dialogue, composed by chancellors from 21 countries – 12 from Europe and 9 from Latin America – including all the Central American countries except Belize (SICA 2001) - stimulated by the activities of the Contadora Group created in 1983 (European Commission 2007), an attempt to promote peace, democracy, security, and regional social and economic development in CA. The San Jose Dialogue took place in the context of other international organizations and negotiations such as the Rio Group and the Doha Round (Karadjova et al. 2003, Caldentey 2003).

Since the second ALCUE summit held in Madrid (2002), the process of strategic association was discussed (Caballeros 2008), the Regional Strategy and programmes for reduction of environmental vulnerability and degradation were defined (European Commission 2007), and support was expressed for economic integration and common policies (Bonet 2007). During the third ALCUE Summit held in Guadalajara, Mexico, in 2004, multilateralism, regional integration, and social cohesion were emphasized (European Commission 2007, Bonet 2007). In 2006, during the fourth summit in Vienna, Austria, the framework was set for an Agreement of Association between EU and CA (European Commission 2007). The most recent summit was held in Madrid in May 2010, which laid great emphasis on technology, innovation, and sustainable development in the Action Plan for the two regions (Nauen 2010).

In regard to cooperation in S&T, the Framework Programmes of European Research (FP) occupy a crucial role in EU-CA cooperation. During the first few years of FP7, participation of working groups from LAC has increased as compared to FP6, implemented from 2002 to 2006 (Nauen 2010, European Commission 2008). Furthermore, the EU R&D policy is complement to the Regional Strategy Paper for CA, by strengthening the links between both regions. The research policy is covered by the Framework Programmes through of international co-operation dimension for each research theme and for a specific international S&T co-operation programme. Additionally, specific programmes developed at the level of the Regional Strategy Paper complement the R&D policy in the area of high level education and cooperation between academic institutions². The Declaration of Vienna recognizes the importance of S&T for the sustainable, economic and social development of Central American countries, including poverty alleviation and social inclusion. It also acknowledges the strengthening of EU-LAC platforms for S&T, aimed at reinforcing the EU-LAC partnership promoting the EU-LAC Knowledge Area, conceived as a common area for science, technology and innovation. And look forward for S&T EU-LAC Senior Officials to promote the design, implementation and monitoring of joint research and development, mobility, innovation and public awareness of science activities in agreed areas of mutual interest for both regions, with a view to encourage mutual participation in research activities such as the Seventh Framework Programme and other bi- and multilateral programmes³.

The Sixth Framework Programme (2002-2006), consisted of 538 teams from Latin America (529) and the Caribbean (9) working on 221 projects. During the first three years of the Seventh Framework Programme (2007 – 2013), 515 teams from Latin America (500) and the Caribbean (15) participated in 226 projects (European Commission 2008, European Commission 2010).

1 ENLACE – project Funded by the European Commission's Directorate-General for Research - 7th Framework Programme (FP7) - Grant agreement n° 244468 – Annex I "Description of Work" 66 pages. 2009.

2 Ibid

3 ENLACE – project Funded by the European Commission's Directorate-General for Research - 7th Framework Programme (FP7) - Grant agreement n° 244468 – Annex I "Description of Work" 66 pages. 2009.

3. ENHANCING SCIENTIFIC COOPERATION BETWEEN THE EUROPEAN UNION AND CENTRAL AMERICA (ENLACE)

ENLACE is a project funded by the European Commission under the Seventh Framework Programme (FP7) for Research and Technological Development (RTD) -International Cooperation (INCO). The project was launched November 1, 2009 and will last 48 months. The ENLACE Project aims at supporting the bi-regional dialogue between the European Union and Central America. The project includes a set of activities to enhance the networking among EU and CA researchers through the organization of S&T dialogues, to identify research priorities of mutual interest and to raise awareness on FP7 in Central America mainly by setting up the network of FP7 National Contact Point in Central America. The consortium includes 15 partners, 8 from CA and 7 from the EU: Agency for the Promotion of European Research (Italy), Centre of Studies for the Relations between the European Union and Latin America (Belgium), Universitat Politècnica de Catalunya (Spain), Hellenic Project for Wider Application of R&D (Greece), The Austrian Latin America Institute (Austria), Research and Innovation Network (Belgium), The Hungarian Science and Technology Foundation (Hungary), University of Costa Rica (Costa Rica), Nicaraguan Council of Science and Technology (Nicaragua), University of San Carlos of Guatemala (Guatemala), National Pedagogical University Francisco Morazan (Honduras), Autonomous University of Chiriqui (Panama), The Southern Border College (Mexico), Central American University Superior Council (Guatemala), Central America and Dominican Republic Chambers and Associations Federation (Guatemala).

The consistency between the INCO-Net goals and ENLACE activities may be described as follows⁴:

- Promote regional integration by:

Supporting and facilitating bi-regional EU - Central America RTD policy dialogue involving stakeholders in policy making, from the scientific community and from industry (Figure 12). A solid base of knowledge is essential regarding the scientific landscape in Central America as well as opportunities and obstacles of cooperation needs to be built. This S&T Policy Dialogue Platform will be developed in a framework by which information and data will be constantly exchanged and disseminated in order to ensure maximum visibility and sustainability.

Enhancing on-going S&T dialogues and networks: Consolidated relationships in S&T already exist, but usually at the national level only. ENLACE intends to re-shape these one-on-one relationships into a comprehensive EU - CA dialogue by supporting a policy dialogue platform.

Strengthening the coordination of S&T cooperation and the complementarities with activities carried out by means of other Community s policy instruments.

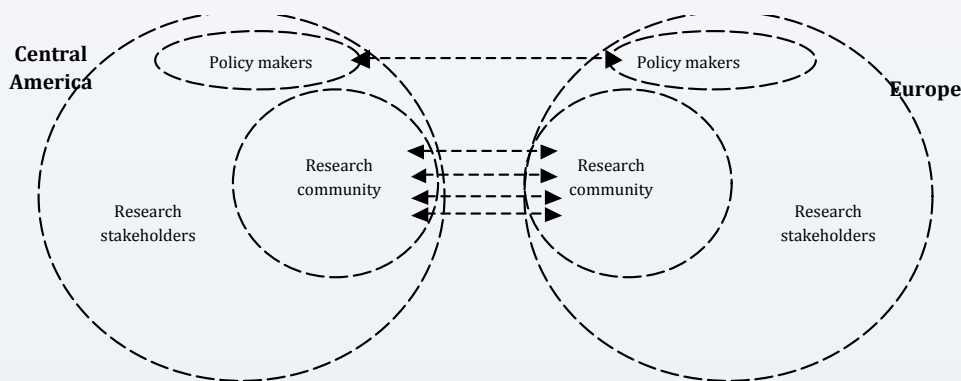


Figure 12 Promoting Participation

Facilitate the uptake and use of mutually identified research areas and the monitoring of performance and impacts of international S&T cooperation throughout the Specific Programmes of FP7 by:

Bringing together scientific priorities identified at the policy level (top-down approach) and at the scientific level (bottom-up approach) in Central America. This will lead to identifying and giving priority to research areas of mutual interest and benefit the uptake and use of commonly/mutually identified research areas.

Monitoring performance and impacts of international S&T cooperation throughout the Specific Programmes of FP7.

Performing in strategic analysis, monitoring and reviewing factors for S&T cooperation between both regions for providing a solid knowledge base and scientific evidence for the bi-regional policy dialogue platform. These analyses will investigate and monitor cooperation patterns between Europe and the CA countries.

4 Ibid

- Promote and structure participation of CA countries in the activities of FP7 by:

Strengthening and structuring the participation of CA Countries in the 7th EU Framework Programme. These efforts will cover all Specific Programmes (Cooperation, People, Ideas, and Capacities) and support participation through general information dissemination.

Enhancing capacities in CA countries by setting up trained National Contact Points (NCPs) for FP7 in order to increase awareness and dissemination of FP7 activities.

3.1 Science and Technology (S&T) priorities for Central America at macro level

Latin America and the Caribbean (LAC) cover 17.3% of the earth's land area, and represents approximately 4.7% of the world's economy. The population of the region equals 8.6% of the world's population, and produces 2.7% of the world's scientific publications from 1998 to 2007 (UNESCO 2010). Investment in R&D in LAC consisted of 2.4% in 2007. Inversely, 70% of the investments in R&D worldwide is allocated to the European Union, the United States, and Japan (UNESCO 2010). Moreover, the private sector spends more on R&D in more technologically developed regions of the world than in less technologically developed regions: 60% in North America (excluding Mexico), 50% in Europe, and only 30% in LAC (UNESCO 2010).

The numbers of university graduates show LAC's R&D needs and priorities (UNESCO 2010). Between 1990 and 2007, 64% of those who graduated from universities had majored in social sciences and humanities (SSH), 16% in engineering and technology (ET), 12% in medical sciences (MS) 15% in natural sciences (NS), and 2% in agricultural sciences (AS). At the Master's level, 64% graduated in SSH, 13% in ET, 9.7% in MS, and 8% in NS. At the Doctorate level, 37% graduated in SSH, 22% in NS, 16% in MS, 13% in ET, and 11% in AS (UNESCO 2010).

The Commission for the Scientific and Technological Development in Central America and Panama (CTCAP)

The CTCAP is a technical and high-level political executive, collegial decision-making capacity to manage activities of regional nature and impact in the field of scientific and technological development of Central America and Panama. This Commission was established in 1975 and hosted by the Organization of American States (OAS). The rules of operation and constitution are set out by the Secretariat of Central American Integration (SICA) who has been granted legal recognition as the agency responsible for coordinating the integration and promoting the development of science and technology in the production process of Central American integration.

CTCAP aims to foster the link between various National Science and Technology Bodies (ONCYTs), who are the executive authorities of each government in the region, responsible for science and technology, which in turn generate scientific policy and technological sub-region, consistent with socio-economic policies and programmes of each of the member countries. According to the Science, Technology and Innovation Strategic Regional Plan 2008-2018 for Central America, Panama and Dominican Republic (CTCAP 2007) some regional objectives are generally common: to strengthen regional capacity in knowledge management and innovation, to facilitate the integration of the region in the global knowledge society; to establish regional networks of centres of excellence in research, human resources development and strategic alliances in areas with future development in the region; **to promote culture of technological innovation in the productive sectors, aimed at increasing the quality and competitiveness in the global market;** to support processes of social appropriation of knowledge in local communities in order to solve problems of poverty and marginalization; to encourage the creation of technology companies in order to contribute to the transformation of the productive sectors and topromote entrepreneurship skills; to modernize funding of science, technology and innovation so that the coverage, level of resources and access to new sources of cooperation could be increased.

3.2 Science and Technology priorities for Central America per country

COSTA RICA

The National Science, Technology and Innovation System (NSTI) in Costa Rica, was established in 2005. It consists of institutions, organizations and public agencies, private research and higher education institutions. The Ministry of Science and Technology (MICIT) is the governing body. The aim of MICIT is to promote, encourage and stimulate the creation of conditions for research, innovation, and technological development of the country. The MICIT defines national policies and funds Science, Technology and Innovation (STI) activities. The National Council for Scientific and Technological Research (CONICIT) is responsible for policy implementation, evaluation of proposals and funding of Research and Development through the Technology Development Fund (FODETEC) and the Risk Fund for Innovation (FORINVES) (UNESCO 2010).

Other working institutions in Costa Rica are The National Innovation Committee that includes members from academic, public and private sectors and develops the Atlas for Innovation in Costa Rica to formulate the strategy, funding and future organization of the NSTI; the Committee for Incentive of Science and Technology which includes public and private representatives and selects people for public incentives and the Regional Councils that work with local bodies and whose purpose is to promote and manage STI development (UNESCO 2010).

At regional level Costa Rica attract attention as a key destination for multinational companies in a variety of companies (IBM, HP, Intel). The Organization for Tropical Studies (OTS) and the Volcanological and Seismological Observatory (OVSICORI) are among the most important scientific facilities in Latin America. At international level, Costa Rica takes part of the Project for Support to Technological Cooperation in Business in Ibero-America (IBEROEKA); The Multinational System of Specialized Information in Biotechnology and Food Technology for Latin America and the Caribbean (SIMBIOSIS) and the UNESCO Chair in Biodiversity Informatics have entered into agreements with the International Laboratory Accreditation Cooperation and with the International Accreditation Forum (IAF). In 2010, Costa Rica participates in 83 projects with the European Union under the Seventh Framework Programme (FP7) (CORDIS 2010).

GUATEMALA

In 1991, the Law for Promotion of Scientific and Technological Development in Guatemala established that the Federal Government recognizes science and technology as a fundamental basis for national development. In order to achieve that, the Government consider necessary to promote generation, dissemination, transfer and application of science. The law grants the National Council of Science and Technology (CONCYT) the power of approving national policy regarding scientific and technological development, and the National System of Science and Technology (SENACYT) the power to execute and provide follow-up to CONCYT's decisions. Since 1992, several institutions and programmes which support S&T have been created in Guatemala, all of them can be summarized in the National Plan for Science and Technology 2005-2014 (CONCYT 2005).

The mission of the National Plan is to develop basic sciences and its general objective is to contribute to sustainable economic and social development, which improves the population's quality of life. Along with putting the National Plan into effect, the Programme for Support for Technological Innovation (2004) aims to improve productivity and competitiveness of small and medium-size businesses by financing technological innovation, implementing extension and information services, and consolidating a framework of national policies, which stimulates and regulates scientific development and innovation.

Guatemala has two networks in Science, Technology and Innovation (STI): the National Registry of Researchers and the International Network for Science, Technology, and Innovation. Major initiatives, which promote growth of human capital resources in Guatemala, are the Community Information and Technology Centers, and the UNESCO Chair for Sustainable Use of Water Resources with the University of San Carlos of Guatemala (UNESCO 2010).

On a regional level, Guatemala participates in the following STI networks and organizations: The Institute of Nutrition of Central America and Panama, which is a member institution of the System of Central American Integration; The Pan-American Health Organization; the Inter-American Commission on Science and Technology funded by the Organization of American States; and The Commission for Scientific and Technological Development of Central America and Panama.

At the inter-regional level, Guatemala forms a part of: The Iberoamerican Program of Science and Technology for Development (CYTED), The Project for Support to Technological Cooperation in Business in Ibero-America (IBEROEKA), The Inter

American Institute for Global Change Research (IAI), The Forum for Cooperation for Latin America and East Asia (FOCOLAE), and The Multinational System of Specialized Information in Biotechnology and Food Technology for Latin America and the Caribbean (SIMBIOSIS) (UNESCO 2010). One of the achievements of the Plan 2005 - 2014 is a 230% increase in financing by FONACYT from 2006 to 2008 (UNESCO 2010).

Productivity in Guatemala for R&D is one of the highest in LAC, measured in terms of amount of financing per researcher per workday in 2007 (UNESCO 2010). From 1973 to 2008, Guatemala produced 0.38% of Latin American and Caribbean scientific publications (UNESCO 2010). In 2010, Guatemala contributes to 34 projects with the European Union under the Seventh Framework Programme (FP7) (CORDIS 2010).

HONDURAS

The Honduran Council of Science and Technology (COHCIT) is in charge of governing, coordinating and evaluating the Science, Technology and Innovation System (STI) in Honduras. The COHCIT is integrated by the academic, scientific, governmental and private sectors. In 2008, the COHCIT became a ministry and added innovation in their responsibilities. In the last ten years, the COHCIT enhanced relations between the productivity sector and the STI system. Nowadays, the following programmes compel attention in the country: programmes: Competitiveness for Small and Medium Enterprises (SMEs) through technical normalization in Central America and Dominican Republic; Innovation and Technology Promotion Program (Honduras Innova); Foreigner Investments Promotion Program (IED) (UNESCO 2010).

At the local level Honduras manages two academic networks: the Record of Honduran Researchers, and the National Knowledge and Communications Network with 122 community centres. Other initiatives are: the Center for Distance Learning, which is a member institution of Global Development Learning Network coordinated by the World Bank; the Chiminike Interactive Teaching Center that develops creativity for children; the @PRENDE Program; the Enhancing Technological Capacities in Poor Communities; the Excellence Center for Education and Information Technologies, which is an achievement of collaboration between the National University of Honduras and the Government of India; Honduras Capacita (UNESCO 2010). At the international level, Honduras participates in Quality Integrated System Project in Central America in collaboration with Taiwan government; the Iberoamerican Program of Science and Technology for Development (CYTED); the Multinational System of Specialized Information in Biotechnology and Food Technology for Latin America and the Caribbean (SIMBIOSIS); EUROSOLAR Project that promotes sustainable development in rural communities (UNESCO 2010). In 2010, Honduras makes a contribution to 22 projects with the European Union under the Seventh Framework Programme (FP7) (CORDIS 2010).

PANAMA

In 1997, the National Fund for Development of Science, Technology, and Innovation (FONACITI) was implemented in Panama. The National Ministry of Science and Technology (SENACYT) is the highest-ranking institution governing Science, Technology, and Innovation (STI). SENACYT is in charge of formulating STI policies, preparing, and evaluating the STI Development Plan; coordinating and supervising R&D activities; promoting human resources development; and coordinating international technical and financial cooperation. Consulting with the National Commission on Science, Technology, and Innovation (CONCYT), SENACYT is responsible for planning and executing mechanisms for financing, legislating, and evaluating proposed programmes of the Plan. The Inter-ministerial Council of Science, Technology, and Innovation (CICYT), created in 2004, is responsible for approving STI objectives and programmes with the assistance of SENACYT. Twelve National Sectorial Commissions formulate proposals and define lines of actions for operationalizing national sectorial programmes of technological development and scientific research (UNESCO 2010).

The Directorship of Business Innovation of SENACYT was created in order to foment innovation in Panama. Its objectives are to stimulate business innovation, to strengthen university-business relations, to increase the base line of invoicing of universities to businesses, **to increase the supply of exports through business innovation, to support the setting up of conglomerates,** and to strengthen innovation in small and medium sized businesses (UNESCO 2010).

The National Strategic Plan for Development of Science, Technology, and Innovation 2006 - 2010 is SENACYT's basic planning tool, which consists of a set of objectives, national programmes, and priority lines of action in concordance with national development policies. The plan will primarily focus on the following fields: transportation and logistics, information tech-

nology and communications technologies, life sciences, tourism, and agro-industries. Additional mechanisms which foment a greater relationship between the private sector and the system of science, technology, and innovation are the sectorial funds for business innovation which promote competitiveness of conglomerates by assigning non-reimbursable funds to co-finance (along with beneficiary businesses) projects of innovation which respond to the five priority areas of the National Strategic Plan for STI 2006 - 2010.

In Panama, the following programmes promote international cooperation which promotes technology transfer: Fomenting International Collaboration in R&D; Fomenting International R&D for the Natural Patrimony of Humanity Coiba National Park Site; The Scholarship Programme for Studies in Germany, conformed by the Institute for Training and Human Resource Development, SENACYT, and the German Academic Exchange Service. Panama also forms part of the Multinational System of Specialized Information in Biotechnology and Food Technology for Latin America and the Caribbean (SIMBIOSIS), and the Project for Support to Technological Cooperation in Business in Ibero-America (IBEROEKA). From 1973 to 2008, Panama produced 0.77% of Latin American and Caribbean scientific publications (UNESCO 2010). In 2010, Panama participates in 32 projects with the European Union under the Seventh Framework Programme (FP7) (CORDIS 2010).

3.3 Policy makers and Researchers surveys

In order to obtain information regarding the state of S&T in the Central American countries, and the acquaintance of Central America’s researchers with the Seventh Framework Programme (FP7), participants in the ENLACE Project (Central American academic and governmental institutions) surveyed 192 researchers and 20 policy makers. Each participating country presented a national report, which addressed the general state of education in their country, as well as priorities for research, science, and technology. Survey results show heterogeneity among the countries. For example, the number of universities in each country ranges from 12 to 101; that of research centres varies from 31 to 378 (Figures 13 and 14); investment in S&T ranges from 7 to 23 million dollars; and the percentage of Gross National Product (GNP) destined to S&T varies from 0.06% to 0.40% (Table 7, Figure 13, Figure 14).

	Costa Rica	Guatemala	Honduras	Nicaragua	Panama
Number of Universities	101	12	19	ND	29
Number of Research Centres	301	48	31	ND	378
S & T Investments (Million USD)	13.1	7.1	NA	ND	22.9
S & T Investments (% GNP)	0.40	0.06	NA	ND	0.26
<i>Web of Sciences</i> Reports (last 10 years)	3200	600	NA	ND	1724

Table 7. Science and technology indicators for ENLACE countries. NA: Not available. ND: No data. Data: ENLACE National Reports.

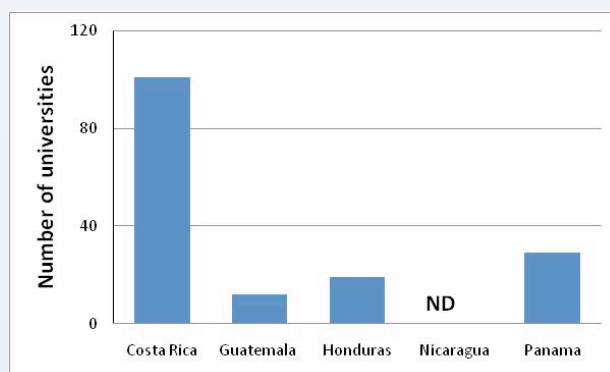


Figure 13. Number of universities. ND: No data. Data: ENLACE national reports.

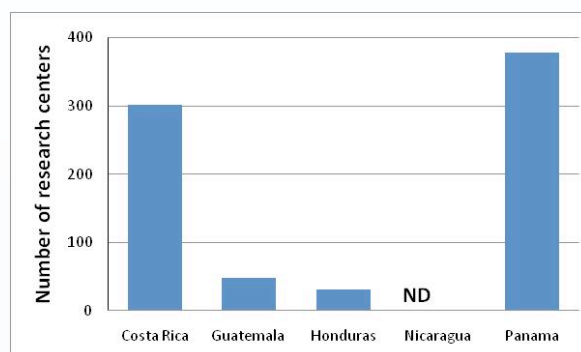


Figure 14. Number of research centres. ND: No data. Data: ENLACE national reports.

Those surveyed indicate that priority areas for scientific research and international cooperation are: environment, health, agriculture and food, and energy. They most frequently named Spain, Germany, United States, and Japan as the countries with which they have the greatest international cooperation (Table 8). Only 23% of total interviewed are aware of FP7.

	Costa Rica	Guatemala	Honduras	Nicaragua	Panama
Number of Surveys	50	57	51	ND	34
FP7 awareness (%)	46	21	0	ND	23
Principal cooperating country	USA	Spain	USA	ND	Spain
PRA ¹	Environment	Environment	Health	ND	Agriculture
SR ²	Agriculture	Environment	Environment	ND	Agriculture
MCP ³	Environment	Energy	Agriculture	ND	Energy

Table 8. Indicators for ENLACE countries from surveys. SD: No data. Data: ENLACE National Reports. ¹ Priority research areas; ² Strength in Research; ³ Main Cooperation Priorities.

The following sections show each country's tendencies in research and development policies, as indicated by the surveyed policy makers, researchers and the chambers of commerce.

COSTA RICA

The main development strategy formulated by Costa Rica is to allocate 1% of its GNP to these fields. The Costa Rican government has recently increased its funding to S&T by 200%. Nevertheless, these policies lack a long-term vision, and specified objectives have not been met yet. Scientific priorities for S&T development determined by researchers and policy makers are environment, health, and information and communication technology. With this information a consensus between the government and academics may be reached with respect to the country's scientific priorities. Costa Rica benefits from a large number of public and private universities. According to data from *Web of Sciences* (an international academic citation index), during the past 10 years, 3200 scientific documents have been published mainly in the biological and the ecological fields (UCR 2010).

Policy makers

According to the large majority of policy makers, the strategy actions agreed on in the National Development Plan (NDP) has demonstrated its usefulness and relevancy. The NDP seeks to raise science and technology investment up to 1% of the GNP and to reach the stages included in the Twenty Century Strategy. There has been a substantial increase in funding for incentives and organized structure to develop the NDP actions. However, some of government offices are not quite clear about how to achieve some of the established goals. Another important observation was that there is not a true articulation of a National Science and Technology System, an indispensable tool to develop the strategy. Regarding the fields of scientific and technological development strategy the NDP highlighted by, one can point out the following subjects by order of importance:

environment and climate; information and communication technologies and health. Policy makers indicates that the needs to boost science and technological development are: better articulation between institutions; an increase of funding; better association between the academy and the enterprises; promotion of entrepreneurship and human resources development.

Researchers

It is important to mention that environment and climate are emphasized as priorities for researchers surveyed in Costa Rica. The principal needs and priorities highlighted by the researchers as the ones that should receive a major support and cooperation are: **sustainable production in terrestrial and aquatic environments, biotechnology, medical technology and tools**; renewable energy resources; climate change, contamination, and environmental risks. The national research strengths highlighted are integration of production and materials new technologies; development of renewable energy resources; sustainable development; climate change, pollution and risks; sustainable production in terrestrial and aquatic environments; biotechnology, medical technology and tools; human health research.

The researchers consider agriculture, nutrition and biotechnology; environment and climate; and health as the main fields for which there are clear strengths in research centres. The researchers consider priority areas for cooperation between the European Union and Central America to be environment and climate. More than half (27) of the researchers do not know the FP7, only 9 researchers have presented research proposals and 5 describe their participation as successful. Some of the reasons that have made this participation difficult are the lack of information about the programme, **the lack of knowledge about the regulations to get funds and finally, the lack of contact with European research institutions.** One of the most frequent reasons for not applying to the FP7 is that researchers consider the process cumbersome and complicated and that there are time difficulties to fulfil the process. However, most of the participants are prone to do it as scientific partners in collaboration with other scientists.

GUATEMALA

The National Science, Technology, and Innovation Plan for the period 2005 - 2014 is being implemented by the National Science and Technology Council (CONCYT). This Plan contributes to Guatemala's innovation, technological improvement, and scientific development. The San Carlos University of Guatemala (USAC) is a leading actor in the S&T development strategy. Policy makers as well as researchers agree on the nation's S&T priorities: health, energy, food, agriculture, and biotechnology. Guatemala has 12 universities. Based on *Web of Sciences*, in the past 10 years approximately 600 scientific documents have been published, principally in medicine, agronomy, and social sciences (USAC 2010).

Policy makers

The policy makers consider that the national strategy on S&T is performing well, and they named its main commitments: Science and Technology should aim at solving national problems and encouraging the participation of national researchers in scientific nets. Moreover, Universities and research institutions should be autonomous and collaborate with the National Plan on Science, Technology and Innovation 2005 - 2014 from the National Science and Technology Council (CONACYT), research programmes should be consistent with the general policy on scientific research (2007 - 2009), to support coordination and collaboration between the 48 national scientific centres to promote projects related to the main research topics for the country, to spread the research results to universities and influence research national politics through concrete research proposals in order to solve national problems. Concerning the strategy for technological innovation, the policy makers deem important to follow the National Plan on Science, Technology and Innovation 2005 - 2014 so as to: strengthen the University research funds, promote a scientific research park, promote scientific cooperation in order to acquire skills to handle high technology instrumentations.

According to the policy makers, the priority research areas for the country are all those embraced in the University of San Carlos Research Programs which have a correspondence area in the FP7, i.e. Health; food, agriculture and biotechnology; information technologies and communication; nano sciences, nano technology, materials and new technologies production; energy; environment (climate change); transports; socioeconomics sciences and humanities; space; and security. And those for international cooperation are: transport and aeronautics; information technologies and communication; and nano-sciences, nano-technology and production's materials, and new technologies.

Policy makers state that in order to further strengthen S&T in the country, the following points should be reached: securing financial support (including international) to S&T; improving knowledge transfer; building of research nets; improving research infrastructure; and building human research capabilities. In addition, in order to improve scientific research quality, the policy makers suggest: To support scientific education from primary school to postgraduate level, to demand a Ph.D. degree to become responsible of research projects, to promote a link between universities and the private sector, and to promote research focusing to solve national problems according to the 174 article of the National Constitution.

Researchers

Guatemalan researchers indicate research strengths in their country to be: environment and climate (climate change, contamination and environmental risks), energy (biofuels), food, agriculture and biotechnology (sustainable production in terrestrial and aquatic environments), health (biotechnology, medical technology and tools), socioeconomic sciences and humanities (the interrelation between economic, social, and environmental paths to sustainable development), nano sciences (materials technology), information and communications technology (libraries and digital media). The researchers interviewed work in the following fields: health, agriculture, food and biotechnology, and environment and climate. Those interviewed were randomly chosen from a group of researchers selected according to their academic background and participation in committees of the CONACYT.

The researchers believe that priorities for cooperation between the European Union and Central America should be: environment and climate, energy, agriculture, food and biotechnology, information technology and communications, socioeconomic sciences and humanities, health, security, transportation and aeronautics, nano sciences, and space. 21% of researchers (12) say they were aware of the FP7. Only two of them have participated in respectively number of applications to the FP7, and only one of the two applications was approved. Participation is likely low due to the low level of knowledge and information regarding the FP7, especially about the legal aspects and procedures for presenting proposals and receiving funds, as well as the lack of contact with European researchers. Nevertheless, most researchers are very interested in participating as collaborators, partners, or in publicity of FP7.

HONDURAS

Honduras does not have an official S&T development strategy. Nevertheless, some initiatives - such as the National Competitiveness Program *Honduras Compite* and the Foundation for Investment and Export Development (FIDE) exist to improve the nation's business environment. Policy makers and researchers identify the same priorities. Nevertheless, those interviewed suggest that a protocol which would allow for determining S&T needs and priorities, with the goal of generating policies and funds to develop scientific research should be established. Honduras has 19 public and private universities as well as 31 public and private research centres (UPNFM 2010).

Policy makers

Even though Honduras makes many efforts, it has no clear strategy for the development of Science and Technology. However, the National Plan is being discussed right now and should give priority to this issue. No one can speak of the relevance and usefulness of the strategy because there are only isolated efforts to develop science and technology. Although, Honduras has offices and institutions that do research for the development of science, technology and innovation, there is a low percentage of GNP for research, development of science, technology and innovation and the budgets allocated to it are largely used for the payment of salaries of employees and officials.

A particular case is the National Autonomous University of Honduras because it is the only institution with a budget specifically dedicated to research and development of science. If a strategy for development of science, technology and innovation were implemented nationwide, it should vigorously give priority to at least three fields: health, agriculture, food and biotechnology and environment and climate. There is no strategy that could make budget allocation to the funding of research projects to promote the development of science, technology and also to enable innovation, but after the approval of the National Plan, a budget allocation should necessarily exist for this item. The Plan of nation should consider in its regulations, the private sector as an important actor for the development of science, technology and innovation.

Researchers

According to researchers in Honduras, fields that should be a priority of research are: health (biotechnology, generic tools and technologies for human health), education and inagriculture field (agriculture, food and biotechnology). In the area of economics, they should develop the theme of growth, employment and competitiveness in the society of knowledge. Sources of renewable energy should also be considered as a priority.

PANAMA

The National Strategic Plan for Science, Technology, and Innovation was approved in December 2005 for the 2005 - 2010 period, and is being updated for the 2010 - 2014 period. In the making of this plan, a variety of commissions representing the scientific, business, and governmental communities jointly drawn up a proposed plan which was submitted for approval by the National Commission on Science, Technology, and Innovation (CONCYT), the Interministerial Council for Science and Technology (CICYT), and the Senate. The objectives of the strategic plan are: technological innovation and modernization of

industry, agriculture increase in R&D activities, improvement in the academic and technical preparation of researchers, and strengthening of science education. These national policies coincide with the priorities expressed by researchers: health, energy, environment and climate, agriculture, food, and biotechnology. Panama has 29 public and private universities and 378 research centres. *Web of Sciences* reports that during the past 10 years, Panama has published 1724 scientific documents, principally regarding the environment and climate, as well as biology and ecology (UNACH 2010).

Policy makers

According to policy makers, priority research areas in Panama are: agriculture, food and biotechnology, health, environment, and climate. They consider priority areas for international cooperation to be: energy, agriculture, food and biotechnology, and health. Policy makers identify principal areas of investigation in Panama's R&D institutions to be: health, agriculture, food and biotechnology, environment and climate.

Furthermore, they assess Panama's needs in science, technology, and innovation to be: building research capabilities, supporting scientific education from elementary school to the postgraduate level, human resources development, and supporting PhD education to improve the quality of research projects, including publication in indexed scientific journals and obtaining patents.

Policy makers state that public universities play an important role in generating knowledge. In order to strengthen R&D, they say it is important to: promote technology transfer and access to technology, foment national talent, improve infrastructure and equipment in universities and research centres, improve university work environments, promote collaboration between government and the private sector, and acquire financial support from abroad.

Researchers

In Panama, researchers consider the following areas to be research strengths for the country: food, agriculture and biotechnology (sustainable production in terrestrial and aquatic environments), health (biotechnology, medical technology and tools), environment and climate (climate change, contamination, and environmental risks), and energy (biofuels). Current areas of research in Panama are: conservation and use of biodiversity, water conservation, bioprospecting, biofuels, tropical diseases, and agricultural production. Researchers interviewed belong to the following state universities: The University of Panama, The Autonomous University of Chiriquí, and The Technological University of Panama.

Researchers consider priority areas for cooperation between the European Union and Central America to be: energy, food, agriculture and biotechnology, health, environment and climate, socioeconomic sciences and humanities, information and communication technologies, security, nano sciences, transportation, and aeronautics. Border security was rarely mentioned in the surveys. 23.5% of researchers say they are aware of the Seventh Framework Programme (FP7), although none of them have participated. The lack of participation is principally due to the lack of information of the FP7, the lack of communication with European researchers, and lengthy legal procedures. Researchers say they are very interested in participating in FP7 projects as partners.

3.4 Chambers of commerce surveys

Aside from surveying researchers and policy makers, questionnaires were distributed to 44 different Central American chambers of commerce. Information obtained looked into the economic contribution of different industries and services, the barriers to industry, the industry's economic performance, and financing for innovation. The chambers of commerce indicated that the chemical industry, services, and trade make up 61% of the region's economic activity, while agriculture makes up just 9% (FECAICA 2010). These data are consistent with other evaluations, which indicate an average contribution of 64% for the service sector, 25% for industry, and 11% for agriculture on a regional level (UNESCO 2010). The surveys of the chambers of commerce also show that less than 10% of the region's current enterprises were founded prior to 1960. However, 77% were founded from 1980 to 2010. This suggests that industry and trade in CA has flourished during the past three decades (FECAICA 2010).

According to the chambers of commerce, 95% of current products have been introduced into the market during the past five years, and these new products make up half of the income of their producers; 82.5% of those surveyed have participated in innovation of products and/or services. Additionally, over 70% of those interviewed mentions research and development

to be increasingly important to their businesses. With respect to activities leading to innovation, training is considered to be the most important; approximately 65% considers training to be necessary, while less than 40% considers capital based technology to be important to innovation and less than 30% considers non-capital based technology to be important. Only 25% of enterprises has research and development departments. Furthermore, nearly 90% of financing for business investment comes from local capital, while just four countries account for 68% of the region's foreign investment: Switzerland, Mexico, El Salvador, and Ecuador (FECAICA 2010).

Survey responses reflect the positive impact of innovation on profitability, financial liquidity, participation in the market, competitively, productivity, quality of services, labour relations, and environment. Unfortunately, entrepreneurs are generally unaware of governmental policies and initiatives regarding innovation and only 5% of those surveyed expresses that they take advantage of these. Innovation has been limited by the lack of financial resources, qualified workforce, and governmental support. Another aspect, which indicates the lack of awareness of the existence of the programme, is the low level of coordination among businesses; research centres, universities and laboratories (FECAICA 2010).

4. CONCLUSIONS

At present, most states should recognise the crucial role of knowledge (Education and S&T), not only at macro level but as a human right; to procure access to education for most citizens. Only doing so, the countries will find solutions to the increasingly complex challenges for our societies. The world economies are deemed by the investment they make into education, science, technology and innovation, because this will be critical for turning challenges into opportunities for more sustainable development (European Commission 2008).

The UNESCO 2010 statistics show that investment in Research and Development (R&D) in LAC countries reached only 2.4% in 2007, while 70% of investment in R&D worldwide is spent in the European Union, the United States, and Japan. That's in part why the UE-LAC summit carried out in Madrid in May 2010 put emphasis on technology, innovation, and sustainable development in the Action Plan for the two regions. Reinforcing as such the EU-LAC partnership and promoting the EU-LAC Knowledge Area, as conceived in the Framework Programmes of the European Commission RTD General Direction. The good news is that during the first years of the FP7 programme, participation of working groups from LAC has already increased as compared to FP6.

In general, Central American countries have low indicators on S&T and budget allocated to R&D in terms of GNP percentage and a few researchers in relation to the number of inhabitants. Moreover, the countries in the region, as in most LAC countries, concentrate efforts in creating a strong public sector research system and have a small fraction of R&D financed by the private sector. These low indicators on S&T are in accordance with the region's low income levels (Rodriguez - Clare 2005).

As its objectives point out, the building up of an INCO-Net in CA will contribute to promote regional integration and prioritisation of common research areas of mutual interest and benefit, and identify research areas of international S&T cooperation across the specific programmes of FP7. It will also help to overcome the current differences among the Central American countries on S&T. However, the success of this quest will heavily depend on the coordination and understanding between policy makers and researchers within each CA country and on the good will between partners, because the areas of interest and priorities of research between both communities are often different. Multinational organisations such as CSUCA and FECAICA will occupy a crucial role in the integration process. Last but not least, the National Contact Points will be important for disseminating FP7 calls and other bi-and multilateral programmes.

The new Europe 2020 strategy is expected to demand more coordinated activities among actors and this circumstance ought to be used to promote high-level research cooperation between the regions.

5. REFERENCES

- Barry, P. 2003. Mesoamerica Burning. National Aeronautics and Space Administration. Washington. In: science.nasa.gov
- Bonet, A. 2007. La cooperación al desarrollo como instrumento de la Política Comercial de la Unión Europea. Aplicaciones al caso de América Latina. Banco Interamericano de Desarrollo. Instituto para la Integración de América Latina y el Caribe. 74 pages.
- Caballeros, R. 2008. Centroamérica: los retos del Acuerdo de Asociación con la Unión Europea. Comisión Económica para América Latina (CEPAL). 68 pages.
- Caldentey, P. 2003. Organización y Funcionamiento Institucional del SICA. La Integración Centroamericana Frente al Reto Institucional. Informe de Consultoría, Proyecto SG-SICA/CEPAL. 78 pages.
- Centro del Agua del Trópico Húmedo para América Latina y El Caribe (CATHALAC). 2008. Potential Impacts of Climate Change on Biodiversity in Central America, Mexico and the Dominican Republic. Panama. 105 pages.
- Cimoli, M., J.C. Ferraz, and A. Primi. 2005. Science and Technology policies: The case of Latin America and the Caribbean. CEPAL 59 pages.
- Combescot, P. 2003. La estrategia de cooperación regional de la Unión Europea en Centroamérica. In: El proceso de integración Centroamericana y el papel de la Unión Europea. Pages: 21 – 24.
- Comisión Centroamericana de Ambiente y Desarrollo (CCAD). 1998. Estado del ambiente y los recursos naturales en Centroamérica. San José, Costa Rica. 179 pages.
- Comisión Centroamericana de Ambiente y Desarrollo (CCAD). 2003. Estado del Sistema Centroamericano de Áreas Protegidas: informe de síntesis regional. Costa Rica. 33 pages.
- Comisión Económica para América Latina (CEPAL). 2009. Panorama social de América Latina 2009. Anexo Estadístico. 35 pages.
- Comisión Europea, 2006. Documento de Estrategia Regional para América Central 2002 - 2006. 54 pages.
- Comisión Europea, 2007. Documento de Estrategia Regional 2007 – 2013. 37 pages.
- Comisión Europea, 2008. La cooperación científica en los retos socioeconómicos medioambientales entre América Latina, el Caribe y la Unión Europea. 20 pages.
- Community Research and Development Information Service for Science, Research and Development (CORDIS). European Union, 2010. In: <http://cordis.europa.eu>
- Consejo Nacional de Ciencia y Tecnología (CONCYT). 2005. Plan Nacional de Ciencia, Tecnología e Innovación 2005-2014. 62 pages.
- Conservation International, 2004. Biodiversity Hotspots Revisited. In: <http://www.biodiversityhotspots.org>
- ENLACE – project Funded by the European Commission’s Directorate-General for Research - 7th Framework Programme (FP7) - Grant agreement n° 244468 – Annex I “Description of Work” 66 pages. 2009.
- Europe 2020: a strategy for smart, sustainable and inclusive growth, COM (2010) 2020 final. Conclusions of the European Council of 25/26 March 2010, doc. EUCO 7/10.
- European Commission, 2007. Central America Regional Strategy Paper 2007 -2013. 83 pages.
- European Commission, 2008. Scientific and Technological Cooperation on socio -economic and environmental challenges between Latin America, the Caribbean and the European Union. 20 pages.
- European Commission, 2010. Towards the EU-LAC Knowledge Area. Scientific and Technological Cooperation between Latin America, the Caribbean and the European Union for Sustainable Development and Social Inclusion. 40 pages.
- Federación de Cámaras y Asociaciones Industriales Centroamericanas (FECAICA). 2010. Estado Actual de la Ciencia, Tecnología e Innovación, según Cámaras de Industria en Centroamérica. 19 pages.
- Harvey, C., F. Alpizar, M. Chacón, and R. Madrigal, 2005. Assessing Linkages between agriculture and biodiversity in Central America: Historical Overview and Future Perspectives. The Nature Conservancy (TNC), Costa Rica. 162 pages.
- Karadjova, E., P. Versteeg y F. Zorzan. 2003. Comisión Europea. UE - América Central – Relaciones políticas, económicas y de cooperación. In: El proceso de integración Centroamericana y el papel de la Unión Europea. Pages: 16 - 21.
- Mata, H. y M. Cordero. 2009. El Acuerdo de Asociación Económica entre Centroamérica y la Unión Europea: viabilidad, avances y perspectivas. Comisión Económica para América Latina (CEPAL). 68 pages. Comisión Económica para América Latina (CEPAL). 46 pages.
- Nauen, C. 2010. Estrategia actual de cooperación internacional de la UE con América Latina y el Caribe en Ciencia y Tecnología y algunos aspectos prácticos de realización en el VII PM. DG Investigación. Comisión Europea. 30 pages.
- Organización de las Naciones Unidas para la Educación la Ciencia y la Cultura (UNESCO). 2010. Sistemas Nacionales de Ciencia, Tecnología e innovación en América Latina y el Caribe. Montevideo. 324 pages.
- Comisión para el desarrollo científico y tecnológico de Centroamérica, Panamá y República Dominicana (CTCAP). 2007. Plan Estratégico Regional de Ciencia, Tecnología e Innovación 2008-2018. 10 pages.
- Programa de las Naciones Unidas para el Desarrollo (PNUD). 2007. Informe Sobre Desarrollo Humano. México 2006 – 2007. Migración y Desarrollo Humano. México. 216 pages.
- Programa de las Naciones Unidas para el Medio Ambiente (PNUMA) y Comisión Centroamericana de Ambiente y Desarrollo (CCAD). 2005. GEO Centroamérica. Perspectivas del medio ambiente 2004. México. 194 pages.

Red de Indicadores de Ciencia y Tecnología Iberoamericana e Interamericana (RICyT) 2007. In: <http://www.ricyt.org>

Rodríguez, E. y P. Versteeg, 2003. Integración regional centroamericana: avances recientes y retos futuros. In: El proceso de integración Centroamericana y el papel de la Unión Europea. Pages: 91 – 96.

Rodríguez - Clare, A. 2005. Innovation and Technology Adoption in Central America. Research Department working paper series. 525 pages.

Rouquayro, L. y S. Herrero. 2005. Guide to Cooperation between The European Union and Latin America. Centre for Studies, Training and Information on Cooperation between Latin America and Europe. 93 pages.

Santamaría, O. 2003. La reforma del marco institucional: lecciones y desafíos. In: El proceso de integración Centroamericana y el papel de la Unión Europea. Pages: 26 - 38.

Secretaría de Integración Económica Centroamericana (SIECA). 2008. Estadísticas Demográficas. In: <http://www.sieca.int>

Secretaría de Integración Económica Centroamericana (SIECA). 2009. Relaciones Comerciales entre Centroamérica y la Unión Europea. 34 pages.

Sistema de la Integración Centroamericana (SICA). 2001. Transformación y Modernización de Centroamérica en el Siglo XXI. 55 pages.

Sistema de la Integración Centroamericana (SICA) y Comisión Económica para América Latina (CEPAL) 2004. La integración Latinoamericana: beneficios y costos. Documento Síntesis. México. 336 pages.

Sistema Económico Latinoamericano y del Caribe (SELA). 2008. Dimensión social de la integración: Lineamientos para un Plan de Acción en salud, educación, vivienda y empleo. 81 pages.

Statistical Office of the European Communities (EUROSTAT). 2010. Central America. EU bilateral trade and trade with the world. 11 pages.

Universidad Autónoma de Chiriquí (UACH). 2010. Estado actual de la Ciencia, Tecnología e Innovación en Panamá. Proyecto ENLACE. 13 pages.

Universidad de Costa Rica (UCR). 2010. Estado actual de la Ciencia, Tecnología e Innovación en Costa Rica. Proyecto ENLACE. 13 pages.

Universidad Pedagógica Nacional Francisco Morazán (UPNFM). 2010. Estado actual de la Ciencia, Tecnología e Innovación en Honduras. Proyecto ENLACE. 12 pages.

Universidad de San Carlos (USAC). 2010. Estado actual de la Ciencia, Tecnología e Innovación en Guatemala. Proyecto ENLACE. 11 pages.

Vela, A. 2003. Hacia la comunidad centroamericana. In: El proceso de integración Centroamericana y el papel de la Unión Europea. Pages: 39 - 45.

Web of Sciences. Thomson Reuters.

Yale University and Columbia University, 2010. Environmental Performance Index (EPI). In: <http://epi.yale.edu>

Authors: ECOSUR, UPC and CERCAL

Design and Concept of editing: APRE

Picture on cover by Buidling a net, strengthening links, Mlomp, Dept. Oussouye, Senegal. Activities funded by the Cooperation for Development Centre of UPC

Copyright notice:

Copyright © Enlace Consortium

ENLACE (Enhancing Scientific Cooperation between the European Union and Central America) is a project co-funded by the European Commission in its 7th Framework Programme under the Grant Agreement no 244468 running from 1st Nov. 2009 to 30th Oct. 2013.

The information contained in this document reflects only the author's views and the Community is not liable for any use that may be made of the information contained therein.

<http://www.enlace-project.eu/>