



**ICTs and environmental sustainability:
Mapping national policy contexts –
Costa Rica baseline study**

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1. Introduction

This investigation has the objective of establishing the main stakeholders, initiatives, policies and regulations that have been developed in Costa Rica regarding ICTs and environment sustainability, placing an emphasis on ICTs and climate change, as well as on the management of electronic waste (e-waste).

When it comes to ICTs the political context in the country is characterized by two special circumstances. Firstly, the social, education and political conditions in Costa Rica make it an attractive base for the operational centres for multi-national companies working in the services and technology sectors. A stable political environment, bilingual human resources with high educational levels and technical computer skills are some of the characteristics that make enterprises such as INTEL, IBM and Hewlett Packard settle in the country. Secondly, an important event was the approval of the Central American Free Trade Agreement (CAFTA) in 2008, and with it, the commercial opening of the telecommunications sector that had been a monopoly of the Costa Rican State since 1963.

It is within this context that this study occurs – it poses the critical questions: given the crises of climate change, to what extent are ICTs been used to help meet this challenge? Is there a need to raise awareness around this issue? And, the counter-question, to what extent are ICTs contributors to environmental problems in Costa Rica, in their production and use, and in their disposal?

The part of the report is a brief review about ICTs and sustainable environment in Costa Rica. The second presents the main stakeholders and initiatives that have been developed in the country in the research area (a summary table of the participation of those stakeholders at a national level is included in the Appendices).

The third part of the report discusses the political context that has developed in the past years when it comes to ICTs, the topic of climate change and e-waste. Finally, this report presents the main policies and regulations on the topics cited above. The report ends with a brief indication of potential advocacy opportunities for civil society in the area of ICTs and environmental sustainability.

2. Summary of key findings

In Costa Rica there have been several initiatives in the field of ICTs and climate change. Some government stakeholders stand out, such as the Meteorological Institute of Costa Rica, the Vulcanology and Seismologic Observatory and the National Emergency Commission on the use of ICTs. Besides the use of other technologies to monitor climate events, these initiatives involve mobiles, text messaging and social networks and to prevent and mitigate climate change and for integral disaster management.

Over the past decade, the country has made important advances regarding the management of e-waste. In 2010 legislation to regulate e-waste was approved, identifying the main government stakeholders involved: the Ministry of Environment, Energy and Telecommunications, the Ministry of Health and the municipalities. It is important to point out that the issue of e-waste gained importance due to the participation of social and academic organisations and institutions that, with the support of international co-operation (especially the International Development Research Centre (IDRC)), assessments and studies have been carried out, and plans developed since 2003. This is an indication of the importance of regulating and managing e-waste in Costa Rica.

There remain no regulations for the management of energy resources of technology enterprises. Most initiatives are developed in the private sector, led by individual enterprises that take actions and internal level policies to control their energy use and reduce to their carbon footprint. Other stakeholders, for instance in the civil society sector, are also active in the field of environmental sustainability, raising awareness, promoting and disseminating 'green' initiatives. The REDDES project is an example of this – it promotes sustainable production and sustainable energy in the Central American region by using ICTs strategically.

Despite this, Costa Rica has made several commitments in line with the international community, such as Law 7414 ratifying the United Nations Framework Convention on Climate Change in 1994, the Regional Convention in 1995 and Law 8219 approving the Kyoto Protocol of the United Nations Framework Convention on Climate Change in 2002.

In 2009 the National Strategy for Climate Change was formulated, establishing the action lines for the following years. The strategy also describes the climate change programme of the National Meteorological Institute and the competitiveness strategy Carbon Neutral Brand, which has the goal of Costa Rica being a carbon neutral country by 2021. To complement this strategy, in 2010 a climate change regional strategy was formulated, involving the countries of the Central American Integration System (SICA). During the second presidency of Oscar Arias Sánchez (2006–2010), the government initiative Peace with Nature was established. It is a programme that combats environmental degradation, with a focus on

climate change as a strategic area. The programme is the government entity in charge of assuring compliance with the commitment acquired to be carbon neutral by 2021.

In the case of ICTs, the policy framework is oriented towards the strategies drawn out by the National Telecommunication Development Plan formulated in 2011, which was established by Law 8660 Strengthening and Modernising the Public Entities of the Telecommunication Sector and the strategic actions that are defined in the National Development Plan 2001-2014, by the Chinchilla Miranda administration, on competitiveness and innovation.

There are some efforts in the National Development Plan 2011-2014 and the Telecommunications Plan 2009, that formulate policies and strategic lines about using ICTs for environmental issues, among them, mitigation and adaptation to climate change.

The country started to regulate e-waste in 1991 when the first Costa Rican National Waste Plan was created. This plan did not achieve its goals and was not effective. After 1991, the country ratified several international conventions and environmental laws, but still did not regulate e-waste. It was only in 2003 that an e-waste assessment was carried out, with the purpose of formulating the National Strategy in 2004, which was the base for creating the National Solid Waste Plan (PRESOL) in 2006. In 2010 the General Law for Integral Management of Waste was approved, and the Regulation for Integral Management of Electronic Waste was ratified, marking the beginning of state regulation.

There are no regulations for enterprises producing ICTs in the country. Some of them have started individual initiatives, especially related to paper consumption. The laws and the regulations for e-waste are relatively new, and there are few substantial e-waste collection programmes. The few re-use and recycling initiatives that exist are also very small.

The government has to raise awareness and educate the public about the relationship between ICTs and environment sustainability and the integrated management of e-waste. Until now, civil society organisations have been the ones that had taken a lead role in the dissemination and promotion of these topics. There has been a significant advancement with the approval of laws and regulations for e-waste in 2010. One would expect that with a new regulatory framework entrepreneurial initiatives, local governments and civil society could work together to achieve a greater impact.

3. Objectives of study

This study had several key objectives:

- Determine the key stakeholders and initiatives related to ICTs and environmental sustainability (climate change and electronic waste) in Costa Rica.
- Identify the national policies and regulations regarding ICTs, climate change and electronic waste.
- Investigate the use of ICTs for climate change in the country.
- Analyse the impact of national policies and regulations regarding ICTs for climate change and management of e-waste.

The report is part of the newly-created programme by the Association for Progressive Communications (APC) in the field of ICTs and environmental sustainability. It accompanies an inventory of sustainable tools and practices, and policy research into ICTs and environmental sustainability in four other countries: India, Bangladesh, Egypt, and Mexico. The survey, inventory and research have been made possible through funding from the International Development Research Centre (IDRC). This research and other activities in the APC programme area can be accessed on the organisation's website: www.apc.org

4. Methodology

The methodology for this study included document review, interviews and focus group discussions. Desk research aimed at determining the main policies and standards that are relevant to the field of ICTs and environmental sustainability, and to identify stakeholders and important initiatives that have been developed in Costa Rica.

Interviewees were selected from a stakeholder mapping exercise, where key institutions and initiatives were selected. Interviews were carried out both telephonically and face-to-face with key stakeholders that work within the sectors of ICTs, climate change and e-waste. A number of interviewees were invited to focus group discussions on the subject of ICTs and environmental sustainability.

For research purposes, APC's definition of ICT and environmental sustainability was used:

In this report, ICTs and environmental sustainability is a broad and inclusive definition. It involves the environmentally sound and sustainable management of ICTs, including their production, use, re-use and disposal. Importantly, it also involves using ICTs to mitigate, and adapt to climate change. Finally, ICTs can be used more generally in support of environmental causes, or as tools to assist in protecting and preserving the environment. The particular focus of this report is on e-waste and climate change, but is not limited to these issues.

5. Background to Costa Rica

5.1. Politics, geography and demographics

Political structure: Costa Rica is a democratic country; it consists of seven provinces, 81 cantons and 472 districts. It is ruled by the Political Constitution of 1949; the last modification was carried out in 1999.



Map 1: Costa Rica political division

Geography: Costa Rica is located at the centre of the American continent. It has a land extension of 51.100 square kilometers (km²) and 589.000 square kilometers of ocean territory.

Socio-economic structure: Since 1990 the service sector is predominant in terms of income generation for the country, especially in the area of tourism and high-end technological goods. Currently, services represent approximately 63% of the Gross Domestic Product (GDP)

Table 1

Productive structure of Costa Rica		
Sector	Components	Percentage
Primary Sector	Agriculture	10%
Secondary Sector	Industry and construction	27,8%
Tertiary Sector	Basic services, commerce and other services.	62,2%

Source: Based in MIDEPLAN information¹

Costa Rica hosts the highest number of multi-national companies in the Caribbean region. Among its most important exportation products are: micro-electronic components, banana, pineapple and textiles.

Demographic structure: According to the Ministry of National Planning and Economic Policy (MIDEPLAN), the country has a total population of 4.533.162, with 58.9% of the population living in the urban area and 41.1% in the rural area.

5.2. ICTs in Costa Rica

Access to telecommunications is seen as a civil right of the country's inhabitants. The Ministry of Public Education (MEP) has been running an initiative for 20 years called Education Programme on Computer Science. It has the objective of opening up computer labs in elementary and secondary schools in the whole country and also trains teachers to use these computers. Costa Rica had been a leader in these type of initiatives.²

The public libraries and the internet cafés are the most important public ICT access points (several telecentre initiatives met without success). There are over one thousand internet cafés in Costa Rica. The broad network coverage and the high tourist-driven demand for connectivity are both enabling conditions that explain the existence of internet cafés in

¹ MIDEPLAN. (2009a)

² Sulá Batsú Cooperativa (2010a). p 82.

almost every part of the country. This service is not free, but it can be found at accessible prices.³

In general terms, Costa Rica is evolving towards high-speed broadband access, with a concentration of connectivity in urban areas. Even though there is a digital gap, the telecommunication indices have been increasing as have the number of ICT initiatives in different sectors (government, private enterprises and civil society).⁴

Below is a summary of some important data regarding ICTs in Costa Rica:

- Until 2008 Costa Rica had a state monopoly in the field of telecommunications, handled by the Costa Rican Institute of Electricity (ICE). This entity currently provides the services of land-line telephony, mobile telephony, internet and electricity to the whole country.
- There is an important digital gap between the urban and rural areas of the country, where accessibility and coverage of ICTs (mobiles and internet) is still limited.⁵
- According to an online report, Costa Rica [has] held the number one position in land-line telephony in Latin America, number 19 in mobile telephony, number seven in internet access and number nine in broad-band internet access. The subscriber density is of 32.16%, 33.76%, 3.79% and 2.63%, respectively.⁶
- The National Telecommunications Development Plan for 2009 states that color television and radio are found in most households, while the majority of homes have no computer, cable or internet.

³ Ídem, p 85.

⁴ MIDEPLAN (October, 2008). (3)2.

⁵ Retrieved from http://www.minae.go.cr/ejes_estrategicos/telecomunicaciones/PNDT/Metodologia_PNDT.pdf

⁶ Ídem.

Table 2

Percentage of households with ICTs			
	Total households	Area	
		Urban	Rural
With radio	77,7	48,2	29,5
With computer	38,0	28,2	9,8
With internet in the household	18,7	15,6	3,0
With land line telephony	65,9	42,9	22,0
With mobile telephony	69,5	45,4	24,0
With color television	95,9	58,2	37,7
With cable television	37,6	30,6	7,0
Total households in Costa Rica	1 256 701 (100%)	749 198 (100%)	507 503 (100%)

Source: Drawn from INEC – Costa Rica⁷

Regarding internet access, ICE has implemented two initiatives:

- The Advanced Internet Network project (RAI): Its purpose was to guarantee meeting the demand for broadband solutions and enable the development of innovative services in applications and content.
- Border to Border project: It seeks to establish a network of fibre optics connected from border to border and ocean to ocean to provide broadband services for both basic communication and mobile, global and IP communications.

Both services are targeted at large enterprises such as call centres and others that have headquarters in our country.⁸

According to the basic indicators of Costa Rica developed by MIDEPLAN, since 2004 there is an increase in the number of active accounts per hundred inhabitants.

⁷ Retrieved from www.inec.go.cr

⁸ Retrieved from http://www.minae.go.cr/ejes_estrategicos/telecomunicaciones/PNDT/Metodologia_PNDT.pdf

Table 3

Internet density per year. (Per 100 inhabitants)						
Indicator	2004	2005	2006	2007	2008	2009
Internet density	0,2	1,5	2,3	2,5	3,2	6,5

Bibliographic source: basic indicators of Costa Rica⁹

As we can see in table 4, internet cafés, workplaces and education centres are the most important venues where the Costa Rican population accesses ICTs.

Table 4

Percentage of internet use in the different venues for access	
Place	Percentage
Home	29%
Workplace	20%
Education centre	5%
Internet cafés	41%
Neighbor, family or friend's home.	4%
Others	1%

Source: Based in MINAET – Costa Rica¹⁰

From 2007 the country started to open up the telecommunication sector commercially, with the implementation of Central American Free Trade Agreement (CAFTA), approved in Costa Rica after an intense struggle by social movements that declared their opposition to the Treaty.

With the liberalization of the market, Costa Rica will be forced to re-structure the telecommunication system and open the market to foreign investment. That is, the regulatory framework will be reformed to allow private competition in areas such as telecommunications, mobile telephony and internet (previously regulated by ICE). Liberalisation will allow greater freedom to choose one's service provider; however, this does not guarantee the universal service that the country has sustained, because foreign enterprises do not necessarily have a social vision.¹¹

⁹ MIDEPLAN. (2010b).

¹⁰ Retrieved from http://www.minae.go.cr/ejes_estrategicos/telecomunicaciones/PNDT/Metodologia_PNDT.pdf

¹¹ Sulá Batsú Cooperativa (2010a). p 82.

5.3. Environment sustainability

Costa Rica is famous for its nature conservation. There have been initiatives to strengthen the environmental sector, such as the creation of Neotrópica Foundation, diverse ecologist associations and federations as well as a television programme called Green Era (Era verde). Currently, and in the context of the recently approved CAFTA, one of the most important points of protest was the Treaty's environmental consequences.

Another recent flashpoint of environmental struggle has been the Crucitas mine, an open-pit mining project led by the Canadian enterprise Industrias Infinito S.A. The company offers the rural community many economic benefits, but behind this promising discourse there are also important health hazards for the population, especially women and children (infertility and respiratory problems, potential learning disabilities), as well as an environmental problem regarding vegetation (protected areas are involved) and fauna (endangered bird species). Between 2001 and 2010, the environmental sector and part of the population from Crucitas launched a campaign against the mining project. In 2010, the company was forced to cease operations.

There has also been resistance in Sardinal where the communities have battled big tourist companies (especially big resorts in Guanacaste) for water rights.

In the last three examples, ICTs – particularly social networks – have played a key role for advocacy and information-sharing, to organise citizen collaboration and mobilisation, to develop support networks, and to link rural and urban areas, amongst others.

5.4. Climate change

Costa Rica has not remained isolated when it comes to climate change; the country has developed different initiatives with the purpose of positioning itself within an environmentally friendly economy, although the results are not that representative yet.

The country has taken public policy measures such as the consolidation of the Protected Areas System (40% of the territory is protected), the promotion of reforestation and forest conservation, a route for clean energy development and the increase of the country's capacity to improve carbon stocks.¹²

¹² MINAET. (2009a). p 4

The following table presents a summary of the main action lines of the National Strategy for climate change, with the aim of becoming a carbon-neutral country, able to develop diverse actions for natural disaster prevention.

Table 5

Priority action lines for climate change in Costa Rica	
Action lines	Description
Risk management	<ul style="list-style-type: none"> • Detection of vulnerable areas (vulnerability). • Mitigation and adaptability to climate change. Strategies of training and intervention in risk areas. • Implementation of ICT for climate change strategies.
Emissions	<ul style="list-style-type: none"> • Reduction of carbon emissions. Costa Rica seeks to be a carbon neutral country by 2021. • Carbon capture and storage. Based on stimulating reforestation, agroforestry systems, natural antropogenic regeneration and avoiding deforestation. • Development of carbon markets with the C-neutral brand initiative that is meant as an incentive for the national economy. Also, the Forest Finance Fund.

Source: Based on MINAET (2009a)¹³

5.5. Environment and energy

According to the Millennium Development Goals report (2010), the country's energy demand is increasing between 5% and 6% per year. If this level of growth continues, in the next 20 years the country will have to duplicate the current installed capacity to meet this demand. However there are not enough renewable resources to satisfy this demand curve, because those resources are in environmental areas that are protected by law.

Lagging investment in renewable energy projects has forced ICE to decrease the percentage of electricity generated using renewable sources. On the other hand, rates have risen in hydrocarbons; in the past two decades there has been an annual growth of 4.8%. If the demand continues, this pattern of growth it will duplicate in 15 years. The transportation sector is the largest hydrocarbon consumer, generating large amounts of contaminating gases.

Carbon emissions are the most important contributors to green house gases (GHG). The sector that generates the most contamination is the energy sector, without outputs increasing from 2381.4 Gg. in 1990 to 5377.1 Gg. in 2005.¹⁴

¹³ Ídem.

¹⁴ Ídem.

Water resources are also of great importance in Costa Rica. According to the National Development Plan 2011-2014, the degradation of water resources has been constant in the past decades. Regulations to manage water resources were passed in 1942. The management and administration of the resource has not been coordinated and frequently there has been a duplication of functions in several government institutions. This resource is mainly used for hydroelectricity, irrigation and agriculture and farming. The country produces between 90% and 95% of its energy using renewable sources – the remainder is generated with fossil fuels.¹⁵

Table 6

Percentage of water resources used in the different sectors in Costa Rica	
Sector	Percentage
Agriculture, farming, agro-industrial, human and industrial.	31%
Pisciculture and hydraulic energy for mills & breakers, among others	6%
Electricity (95% consumed within the country)	63%

Source: Based on MINAET¹⁶

5.6. E-waste

Waste management has not been a strong area in the environmental sustainability of the country; before 2009 there was no regulation in this area. The generation of non-regulated waste has impacted the environmental quality of the country, affecting public health as well as the quality of water and aquifers. At the same time, the population has not been properly educated on the topic, and the country does not have a culture of recycling. In the last 15 years the generation of household waste has reached 3,780 tons per day, of which 64% is disposed of without any treatment, in open dumps that often have no controls.¹⁷

The absence of registered data on the topic makes it impossible to take concrete action. There is also no information about hazardous waste, such as e-waste. Given this context, in 2003 the first data gathering initiatives were carried out. There was an assessment of the situation of integral and sustainable management of e-waste that in 2004 generated the National Strategy for Integral and Sustainable Management of Electronic and Electric Devices Waste. In 2007 the Solid Waste Plan (PRESOL) was developed.

¹⁵ Retrieved from www.una.ac.cr/ambi/ambien-Tico/92/jimenez.htm

¹⁶ MINAET. (2009a).

¹⁷ Ídem.

The study carried out in 2003 found that due to the lack of internal controls and often since information is considered confidential, it was difficult to access quantitative data about the amount of equipment that enterprises and institutions have and the amount of e-waste they generate.

In 2007 a report from National Congress¹⁸ stated that most of the country's municipalities do not have a waste collection service whose efficiency can be analysed. 26% of local governments do not have solid waste collectors: they use vehicles that are not suited for the task, and although 74% of them use special trucks, only 21% of these vehicles are in a good state. In 46 municipalities there is not adequate disposal of solid waste.¹⁹

Costa Rica has four landfills: Río Azul (that is currently closed), La Uruca, Los Mangos and Navarro. In 2007 these landfills served 60% of the country's population. These projects have no recycling initiatives.

In 2004 it was estimated that 12,000 tons of e-waste were generated.²⁰ Between 1996 and 2007 it was projected that the country has accumulated 24,000 tons of e-waste, due to the growth of the technology sector in the country. There is a projected increase of 4000 tons per year.²¹

¹⁸ National Congress of Costa Rica (2007)

¹⁹ Ídem, p 21.

²⁰ CYMA Program. PRESOL. (2006)

²¹ Retrieved from <http://www.giswatch.org/es/node/289#attachments>

6. Key stakeholders and initiatives

Several stakeholders from the government, the private sector, academia and civil society are involved in issues related to ICTs and environmental sustainability. All of them propose actions and initiatives to face the environmental challenges, especially those related to climate change.

On the topic of ICTs and climate change there are several lines of action:

- ICTs to mitigate and prevent climate change
- ICTs to raise awareness and to promote and strengthen green initiatives
- Environment responsibility for ICT companies (especially multinational companies).

Due to the growing importance of climate change at a national and international level, the government has developed several initiatives and has strengthened state institutions. The Ministry of Environment, Energy and Telecommunications (MINAET) is the State entity that works on climate change and co-ordinates research. In 2009 it created a special department for climate change management. MINAET is in charge of the National Climate Change Strategy and it also manages the Telecommunications Sector, which develops the National Telecommunications Development Plan.

Regarding ICTs for climate change prevention and mitigation, three institutions fulfill important roles in the country. The Volcanology and Seismologic Observatory has a very interactive website and uses ICTs strategically, such as mobile text messaging to send information to several entities in the case of an event, and social networks like Facebook. The Meteorological Institute also uses technologies to monitor and follow-up climate events, develop projections on climate change and carry out studies to determine the vulnerability of the water resources in the country. Using ICTs, the institute establishes communication with the weather stations in the country; this information is then available on the institution's website. It is important to point out that all of the programmes developed by the Meteorological Institute disseminate the data, especially the Geographic Information Systems (GIS), which are available for local governments to use.

The National Emergency Commission (CNE – Comisión Nacional de Emergencias) uses ICTs for preventing and managing natural disasters related to climate change; for example, by creating a communication system for disaster prevention using an early- alert system based on community observers. To implement this system the commission develops alliances with

community organisations that use a combination of community radio, internet and satellite communication to keep the community and the CNE informed of possible threats.²²

The academic sector is an important stakeholder in the country: public universities are continuously developing research and projects related to the issue of ICTs for environmental sustainability. In our research we identified that both the National Distance University (UNED) and National University (UNA) use ICTs to raise awareness, promote and strengthen green initiatives and e-waste management through environmental education centres. Public universities and the National Centre for Technology (CENAT) promote research on digital green technologies to develop improved energy efficiency sensors and electronic components that use less energy, among other areas.

In the private sector there are some initiatives in the ICT sector that help to better manage their physical and energy resources and protect the environment. These initiatives are part of internal policies adopted by these companies and are also seen as competitive strategies in the global market.

Social organisations that promote the use of ICTs to mitigate and prevent climate change include the CO2 Neutral 2021 group, which is a group of young professionals that have organized themselves with the purpose of achieving the goal of a carbon neutral country by 2021.

The Costa Rican Chamber of Information and Communication Technologies (CAMTIC) has developed very early action lines on the subject. Together with the Centre of Informatics and Industrial Technological Management (CEGESTI) the chamber developed an online training programme for the ICT sector on the topic of energy efficiency. CAMTIC, together with the Organization of Tropical Studies (OET), promotes the development of green technologies. The OET has several achievements in the use of ICTs. For example, its three meteorological stations report climate conditions every 30 minutes, and there are geographic information systems and online databases with relevant information about tropical biology. Another ICT contribution has been the incorporation of a network of installed sensors that capture climate data, audio, video and fixed images live. This information is then transmitted to researchers in different parts of the world.

Civil society also promotes other initiatives for the use of ICTs in the areas of awareness and advocacy in diverse topics such as climate change, energy consumption, and sustainable energy use. An example of this is the programme called Digital Resources for the Sustainable Economic Development at the Central American Region (REDDES). This programme promotes the sustainable production and sustainable energies in the region through the strategic use of ICTs.

²² Retrieved from <http://www.giswatch.org/es/node/289#attachments>

Another important initiative is the Regional Information Centre for Disasters (CRID), an NGO supported by six organisations that decided to join efforts to collect and disseminate all the available information about natural disasters and climate change in Latin American and the Caribbean. They have a web page and a digital library and also develop web sites about specific issues in risk management for agencies of the United Nations and organisations such as the Red Cross. On demand, they produce CDs with the information requested by the institutions and they are currently developing a web page dedicated exclusively to the issue of climate change and risk management, including relevant information on adaptation and mitigation to climate change in the region.

In 2010 legislation for the integrated management of e-waste was passed. This breakthrough was achieved through the active participation of several institutions. Both national and international organisations have conducted research and analysis and formulated strategies for the integrated management of e-waste in the country since 2003, placing the issue in the Costa Rican political agenda. These key actors were the Ministry of Environment, Energy and Telecommunications, the Ministry of Health, the American Association for Economy, Health and the Environment (ACEPESA), and the Chamber of Industries of Costa Rica and the Technological Institute of Costa Rica, in collaboration with the government of the Netherlands. In recent years the number of public and private enterprises has increased. It is expected that with the new regulations this sector will be formalised, regulating the activity and promoting the inter-agency integrated management of waste.

The government has also played a key role in terms of the e-waste regulation. With the approval of the Law for the Integrated Management of Solid Waste the National System for the Management of Electronic Waste (SINAGIRE) was established. This body is responsible for ensuring compliance with waste regulations in the country. The law also stipulates that the Ministry of Environment and Telecommunications would be the governing body of the subject, and the Ministry of Health would be in charge of control and monitoring.

The government is also responsible for the promotion of and training in integrated solid waste management, including e-waste. However the government has not played a key role in awareness-raising over the last years. Initiatives in this area have mostly come from civil society organisations.

Municipalities, in line with the new legislation, have a leading role regarding the implementation of the integrated waste system in the country. They are responsible for establishing and implementing municipal waste planning, designing and implementing the regulations on collection and have an Environmental Management Unit in each local government.

Currently, municipalities are in the process of formulating their waste plans. At this stage they are receiving the assistance of funding from German Technical Co-operation GTZ and technical assistance from Terra Nostra Association, which is working with several cantons of the country in the development of the cantonal plans for e-waste.

The academic sector has had an important role in promoting and implementing campaigns to collect e-waste, as in the case of the Technological Institute of Costa Rica. Public universities have also done outstanding work in developing internal policies for solid and e-waste management. A Sustainable Campus Programme of the National University (UNA) is one such example. Since 2010, through this programme, e-waste such as scanners, printers and computers, which are collected from various campus units as obsolete inventory, are sold. The UNA has a protocol for removing institutional assets, and all discarded materials are deposited in a warehouse, and then classified by weight before sale. The company that buys the material, Villager Export, was selected through a tender process. It exports the e-waste so that it is treated appropriately. For its part, the University of Costa Rica promoted the collection of e-waste from computers to copiers on their campus during their environmental week.

According to Silvia Mora from Terra Nostra Association, the number of enterprises that collect waste as well as the demand by organisations, individuals and institutions that want to manage their e-waste responsibly has increased significantly. The private sector has established many initiatives that in one way or another promote e-waste management.

There are some business initiatives (although involving very few Costa Rican companies) that buy e-waste from institutions. It is collected, selected and arranged for export to foreign countries for appropriate recycling, either for components to be reused (reuse is not very important in Costa Rica) or to be disposed of correctly. This is the case with companies such as Central America and Caribbean GEEP and La Bodeguita exporting to countries like Indonesia, Vietnam and Hong Kong, Ecological Services, FORTECH, Environmental Projects and Village HOPE Export.

With the new regulations governing e-waste collection, these companies must write an annual report and develop a strategic plan that must be presented to the Ministry of Health. This assists the ministry with control and monitoring of the sector, promoting its formalisation.

Technology companies such as Epson, IBM, Hewlett Packard, Walmart, Office Depot and the Television of Costa Rica have all in one way or another developed e-waste campaigns in Costa Rica.

In the civil society sector, e-waste collection campaigns have been carried out by associations such as Terra Nostra, the Rotaract Club of San Pedro and Curridabat and others. Many of these campaigns are conducted jointly with business or universities.

Key associations working in the sector are: The Terra Nostra Association, American Association for the Economy, Health and Environment (ACEPESA), the Association of Integrated Management of Electronic Waste (ASEGIRE), the Center for Information Technology and Industrial Management (CEGESTI) and the Chamber of Industries of Costa Rica and its initiative, the National Center for Cleaner Production.

Terra Nostra considers it is essential to develop local plans with communities and the leaders in municipalities, raising awareness of e-waste legislation in schools, colleges, and universities, and promoting reflection and awareness on the issue.

For its part, ACEPESA, launched in 2003, are pioneers in the field of e-waste management. In partnership with other organisations, like the Chamber of Industry and the Technological Institute raised the discussion about e-waste by promoting collection campaigns, conducting assessments, and promoting the development of legislation. ACEPESA was the IDRC project leader dealing with e-waste.

With the development of e-waste legislation and regulation, ACEPESA has been working on raising the issue at a regional level, supporting a number of baseline assessments in Central America. They are part of the Monitoring, Evaluation and Systematization Network in Latin America and the Caribbean (RELAC), working together with other Latin American countries on a common conceptual framework to homogenize the use of same concepts throughout the region, and simplifying some procedures, activities and actions taken in countries such as movement of e-waste outside the region. ²³

For ACEPESA, a major challenge in the law is its effective implementation in the business sector. ASEGIRE is the body responsible for ensuring compliance with the regulation in all its member companies. The association has as its members 13 prominent businessmen who have been working on the issue, but the challenge is to include the entire electronics sector, as a duty regulated by a law. They believe that for the country this is a learning process that is quite complex. It is not a simple issue, and alliances and organised advocacy should be done by the different actors in order to implement the e-waste law assertively. ²⁴

For CEGESTI the topic of e-waste is a major issue for the promotion of sustainable development in Latin America. The National Chamber of Industries is a key actor that has supported the e-waste assessment in the country and also contributed to the formulation of the National Waste Strategy and the Electronic National Solid Waste Plan (PRESOL). It

²³ Victoria Rudin, personal interview, January 17, 2011.

²⁴ Idem

currently has a National Centre of Cleaner Production, promoting and advising the industrial sector on the integrated management of waste.

As can be seen, in the fields of ICTs and climate change as well as e-waste there are major initiatives by various actors in the government and the private sectors, academia and civil society. When it comes to e-waste many of these initiatives are isolated, and it is expected that the new regulation promotes a more organised sector and new national actors to strengthen its management.

The growing importance that climate change has at the international level means that countries have developed strategies to meet the challenges that it represents. Costa Rica has not been the exception: diverse actors are researching and taking concrete actions to mitigate and adapt to the effects of this phenomenon. The use of ICTs for this purpose is certainly very important, but the initiatives in the country on the use of ICTs for climate change are few. We believe that as it progresses in the strengthening of institutions and public and private programmes, the pairing of ICTs and climate change will develop.

Annex 2 lists the key stakeholders and their roles, while Annex 3 describes the key initiatives that have taken place in Costa Rica in recent years in terms of e-waste, ICTs and climate change.

7. Background to policy context

7.1. ICT policy

In Costa Rica, foreign direct investment (FDI) has increased considerably in recent years, as a result of a deliberate policy of attracting investment to the services, technology and industry sectors. Taking advantage of resources that the country has, including a stable political environment and highly educated and bilingual human resources, different technology sector multinationals have moved operations into the country.

According to data presented by the Costa Rican Coalition for Development Initiatives (CINDE), Costa Rica was ranked among the top five destinations to establish service operations. According to CINDE, the services sector has been growing steadily over the past decade, characterised by service industry-focused companies such as call centres, and office systems and software developers, among others. Major investments are made by the state in the area of information technology education and English. Costa Rica has approximately 27 call centres, 200 small and medium companies in the area of software development and 19 multinational companies that have their back office in the country, as the case of IBM.²⁵

All these features make the country an ideal place for steady growth in the technology sector – a situation that makes the development of policies and guidelines governing an environmental approach to sector activity urgent. This should encompass energy use, environmental management policies, and recycling of e-waste.

Another special situation of Costa Rica in the area of ICTs is the development of telecommunications. The telecommunications sector has grown at a rapid pace in recent years in every sense: technology, market, demand and consumption, and also the regulations that have been created. In Costa Rica this sector has historically been in the domain of state power, as a public monopoly. However, after CAFTA, the 2008 Telecommunications Law opened up the telecommunications market in the country.

Since then Costa Rica has followed a model of openness regulated and guided by the State under the National Development Plan of Telecommunication (2009). This phase has been characterised by “openness in terms of competition with effective regulation, with clear policies ... designed approach from the perspective of competitiveness and human development of the population.”²⁶ That is, according to the Plan, the liberalisation of telecommunications is based primarily on strengthening public institutions in charge of the sector, and modernising and developing their functions. These institutions are the Ministry of

²⁵ Retrieved from <http://www.cinde.org/es/services-sector->

²⁶ Retrieved from http://www.minae.go.cr/ejes_estrategicos/telecomunicaciones/PNDT/Metodologia_PNDT.pdf

Environment, Energy and Telecommunications, the Regulatory Authority of Public Services (ARESEP), ICE and their public companies as operators of telecommunications.

In terms of international standards, the country is currently governed by the principles agreed at the World Summit on the Information Society in Geneva, held in 2003, and the second phase of it held in Tunis in 2005. At these summits agreements that aim to manage ICTs to achieve the Millennium Development Goals were signed.

7.2. Environment sustainability

Costa Rica, as well as the rest of the world, has been taking actions to mitigate climate change since the mid-nineties, when the Earth Summit was held in 1992 and the UN Framework Convention on Climate Change was approved.

Initiatives have been different sectors, generating commitments to the international community and taking action public policies. These include the consolidation of a National Protected Areas System, various actions to achieve clean energy development, and the creation of initiatives to achieve a carbon-neutral economy by 2021.

In 1994 the country adopted the United Nations Framework Convention on Climate Change, by means of Law 7414. A year later, in 1995, it ratified the 7513 Law approving the Regional Convention on Climate Change, which promotes regional-level measures, policies and actions for mitigation. In 2002, the country confirmed the approval of the Kyoto Protocol, through the 8219 Law. Once the international commitments have been ratified, Costa Rica has the duty to formulate national programmes to reduce the emissions of greenhouse gases, as well as actions to mitigate and adapt to climate change and joint actions by different sectors in the country.

Today climate change is an issue that is very much on the political agenda, and included in the National Development Plans as a key environmental concern. A National Climate Change Strategy was formulated in 2009, as well as specific programmes on the subject in various state institutions, such as the Climate Change Programme at the National Meteorological Institute and the Office of Peace with Nature, a presidential initiative created in 2006 during the administration of Oscar Arias Sánchez. Similarly, in 2007, under the UN Convention, Costa Rica committed to be a carbon-neutral country by 2021, a goal we share with New Zealand and Iceland.

The government body responsible for conducting national studies and co-ordinating the necessary actions in this area is MINAET, which receives assistance from the National Meteorological Institute and the Costa Rican Joint Implementation Office.

As part of the Millennium Development Goals, Costa Rica made a commitment to environmental sustainability to the international community at the Millennium Summit in 2000. To meet this objective, the Peace with Nature initiative IPN was established in July 2007, assuming environmental sustainability as a state policy that goes beyond governments. The initiative also ensures that Costa Rica participates in an international campaign against climate change, leading an international network of carbon-neutral countries and supporting an international levy on carbon emissions.

The initiative, proposed in the 2006-2010 Arias administration, seeks among other things to position itself as a competitive strategy that places the country in the international arena, creating business opportunities for investors and companies.

In the National Development Plan 2011-2014, the current government of Laura Chinchilla Miranda has as a national goal: "To consolidate the country's environmental position with a sustainable energy mix and optimum environmental performance." This target reflects an environmental tradition that has existed in the country and the challenge of continuing with a development model committed to sustainability. To achieve this goal, the National Development Plan deals with the issue of climate change and carbon neutrality

The Plan refers to various aspects that make it difficult taking action on these issues, including the dispersal of public policies and limited financial resources, lack of monitoring of actions on climate change at both the legal and infrastructural levels, and barriers in the coordination between ministries, public and private companies, NGOs and local governments. This hampers the implementation of plans, programmes and projects in terms of adaptation and mitigation of climate change.²⁷

According to the Second Communication on Climate Change, Costa Rica has many programmes and studies on the subject of climate change. This includes some 44 studies by NGOs and public universities. 45% of them deal with forests and 18% agriculture. It is also estimated that there are 61 studies on the topic conducted by international researchers.

In early 2010 the first study on the perceptions and attitudes of the population on the issue of climate change was released, undertaken by the Tropical Agricultural Research and Education (CATIE),²⁸ an initiative of the Office of Peace with Nature. The study queried what the most important topics for discussion in the country were generally. The first three issues mentioned were education, health and safety; climate change was mentioned as the fourth item, showing a growing concern amongst citizens about it.

²⁷ Idem. p 76.

²⁸ The study was developed during September and October 2009. 1.473 people were interviewed, 62% from urban areas and 38% from rural areas.

Information sources where interviewees got to know about global warming or climate change are:

Table 7

Information sources for information on climate change	
TV	96%
Radio	96%
Newspaper	43%
Family	14%
Friends	14%
Neighbors	10%
Coworkers	8%
School	4%
Others	4%
Internet	3%

Source: CATIE²⁹

One can see that the internet was mentioned by only 3% of the interviewees. According to the research, internet was mentioned by people over 30-years-old mostly, while educational and informative talks were sources of information to be found more in the rural area and within people under 30.³⁰

According to the study, 49% of the interviewees believe that the government is primarily responsible for the actions that should be taken on climate change, while 21% believe that is a task of citizens. One of the main findings indicates that Costa Ricans need much more information to understand the issue of climate change better.³¹

7.3. E-waste

The first state-wide effort to regulate the issue of waste in the country occurred in 1991 with the National Plan of Waste Management of Costa Rica. This plan was not adequately monitored by the responsible authorities and did not mean a breakthrough in integral management of waste. Since 1991 Costa Rica has ratified several important international conventions on the subject and adopted environmental laws like the Organic Environmental Law in 1996. However, this law dealt with the issue of waste in a very general way and did

²⁹ Retrieved from <http://www.pazconlanaturaleza.org/admin/descargas/upload/Informe-digital.pdf>

³⁰ Ídem.

³¹ Retrieved from <http://www.pazconlanaturaleza.org/noticias.php?id=47>

not define the responsibilities of each actor in society to provide adequate provision for waste. Other laws that were ratified were the Wildlife Law and Biodiversity Law.

Some of the international conventions on solid waste that Costa Rica has ratified are³²:

- Regional Agreement on the Transboundary Movement of Hazardous Waste, in 1992.
- Basel Convention on the Control of Transboundary Movement of Hazardous Waste and their Disposal, 1994.
- Stockholm Convention on Persistent Organic Pollutants, ratified in 2007. This agreement eliminates the use of certain pesticides that produce emissions.
- Decree for the creation of the Technical Secretariat for coordinating the management of chemicals, in 2006.

Despite these initiatives, regulations and agreements the country did not have a plan to address the waste issue in a comprehensive, co-ordinated and efficient way. There was no specific legislation on the subject, and the plan formulated in 1991 did not achieve the expected goals due to the dispersion of product standards and the overlapping of responsibilities between ministries. That plan did not include the analysis of e-waste, according to a study conducted after³³ the recommendations of this Plan were not executed.

An evaluation by the Legislative Assembly, conducted in 2007, reviews the situation: "The revised reports and research have identified the absence of a comprehensive approach to the problem that allows the conception and implementation of a national plan or strategy, a situation that has led the efforts of recent governments to primarily focus on the construction of landfill." ³⁴

Because of this lack of integrated and co-ordinated actions in the area, as well as real problems in waste that existed at the national level, since 2000 various organisations and institutions intend to start working on the issue of waste management. Various efforts to regulate the issue in a comprehensive manner, including e-waste, have been made.

In 2003, with support from the International Development Research Centre (IDRC), the national institutions the American Association for the Economy, Health and Environment (ACEPESA), the Chamber of Industries of Costa Rica, the Technological Institute of Costa Rica, and the technical support of several ministries, academia and the private sector, an evaluation of the status of integrated and sustainable management of e-waste in Costa Rica

³² Retrieved from <http://www.programacyma.com/seleccion-documentos/presol-plan-de-accion/>

³³ Idem.

³⁴ Legislative Assembly of Costa Rica (2007).

was conducted. This effort resulted in the formulation of 2004 National Strategy for Integrated Sustainable Management of Electrical and Electronic Appliances Waste.

Both raised key issues about the mismanagement practiced in the country regarding waste in general and e-waste in particular, and proposed new strategies and appropriate and comprehensive management plans for waste. Finally, the Comprehensive Plan of Solid Waste (PRESOL) was formulated in 2007, and in 2008 the Regulations for Waste Recovery Centres was created.

By 2010, due to the partnership of different sectors, the Law for the Integrated Waste Management was approved, and months later the Regulations for the Integrated Management of Electronic Waste was created.

As mentioned, the Law for the Integrated Waste Management states that the governing body on the matter is the Ministry of Environment, Energy and Telecommunications, while the Ministry of Health is in charge of control and monitoring of legislation, programmes and policies.

For their part, municipalities have the responsibility to establish and implement a municipal plan of comprehensive waste management, which must be submitted to the Ministry of Health for approval. Municipalities are currently working in the construction of this plan with the collaboration of several agencies such as the Terra Nostra Association and the German Technical Co-operation GTZ, guided by the National Solid Waste Plan, PRESOL.

It is important to note that all these efforts must be accompanied by processes of education and awareness-raising on the subject. Both the new law and the regulations describe the importance of reporting processes and training in the field, for the integrated management of waste is made from a participatory vision, integrating all sectors and promoting a recycling, reuse and separation of waste culture.

8. Key policies and regulations

8.1. ICT policy

The national policy framework for ICTs has two main facets: The National Telecommunications Plan and the policies and strategies contained in the National Plan for Development which has implications for competitiveness and innovation.

National Telecommunications Plan 2009-2014

This was created by Telecommunications Law No. 8642. The Telecommunications Law defines the regulatory framework for the general application for network operators and telecommunications service providers in the new context of an open telecommunications market. It contemplates regulations related to the use of the radio electric spectrum and establishes norms related to the access of telecommunication networks in the context of convergence.

The National Telecommunications Plan (2009-2014), on the other hand, is based in the World Summit on the Information Society agreements (held in 2003 in Geneva and re-signed in 2005 in Tunis with compliance in 2015).

In 2007 representatives from Latin American and the Caribbean created eLAC, an action plan for the development of the region's information society. ICTs were conceived as instruments for economic development that would propitiate a more inclusive society.

As mentioned, the communications sector experienced an important legislative change in 1998 with the opening of the communications market, regulated by Law 8660. The Free Trade Agreement, subscribed to by the country in December 2008 through Law 35001, strengthened this change. In this agreement (Annex 13) the country commits to a gradual and selective liberalization of selected telecommunication services: mobile telephones, internet and private networks.

International agreements signed by Costa Rican in the telecommunications sector are:

- Creation of the International Communication Union (UIT)
- Central American Treaty of Communications
- Dominican Republic-Central America Free Trade Agreement (DR-Cafta).

The Telecommunications Plan also establishes the Regulation Authority of Public Services (ARESEP) and the Superintendence of Telecommunications (SUTEL).

Regulating Authority of Public Services (ARESEP). This is in charge of the government's telecommunication policy. Its duties include the development of a regulatory framework for

specific issues, such as competition, access and interconnection, universal access, the customer protection and tariffs.

Superintendence of Telecommunications (SUTEL). According to the Telecommunications Plan, after the market opening, SUTEL will be independent of network operators and providers, but will be subject to telecommunications policy. The idea is to empower SUTEL so that it has all authority and duties to regulate operators and suppliers in the telecommunications market.

8.2. National Development Plan

The National Development includes a chapter on the topic of Competitiveness and Innovation, in which strategic goals are developed in order to consolidate the field in the current administration. The topic of Information Technologies and ICT communication is also included in the plan, with the main goal of promoting and stimulating scientific, technological, and innovation processes in order to improve people's quality of life.³⁵

Three strategic actions related to ICTs are included:³⁶

1. Social appropriation of scientific and technological knowledge to improve quality of life and productivity by using programs useful for academia, business, and civil society sectors. This action has another key goal: to create public policies assuring the social (or public) appropriation of scientific and technological knowledge.
2. Promote and consolidate a culture of enterprise and digital productivity, encouraging the use of digital signatures to expedite formal exchanges via the internet in a safe context, developing a platform that might be used by community technological centres in order to develop artistic and cultural skills and capacities.
3. Networking needs open wireless network and high bandwidth. Reinforcing the infrastructure of the network that connects academic networks with Latin American counterparties is also needed.

8.3. Climate change

In this section, there is a summary of the main regulations, policies, strategies, programs, and guidelines concerning global warming. In 2009, Costa Rica presented the Second United Nations Convention on Climate Change. That same year, the National Strategy on Climate Change was presented, seeking to define guidelines for the coming years. The strategy also describes the program of Climate Change of the National Meteorological Institute and the Strategy of Competitiveness and Carbon Neutrality Framework enacted during last

³⁵ MIDEPLAN (2010) P. 191

³⁶ Ídem pp. 193-194

administration. In 2010, the Regional Strategy was created to face global warming, integrated by the Central America Integration System (SICA by its Spanish acronym). Finally, the National Plan for Development (NPD) by the current administration and the Initiative Peace with Nature.

In the country, considering the rising importance of the topic, state institutions have created departments, instances, and programs to handle the challenges of global warming.

The Ministry of Environment, Energy and Telecommunications (MINAET) is the entity in charge of enforcing compliance of International Conventions, for this purpose, it has the following institutions:

National Meteorological Institute, which has prepared, together with other instances, the National Greenhouse Gas Inventory, as well as other studies and awareness and mitigation activities. The Costa Rica Joint Implementation Office (by its Spanish acronym OCIC) is the assigned authority to promote the participation of the public sector in environmental issues.

Costa Rica 2009: Second National Report to the United Nations Convention on Climate Change

The Second National Report to the Convention on Climate Change is a very important effort that gathers relevant information about the country and its activities concerning climate change. This includes information from the National Greenhouse Gas Inventory performed in the country in 2000 and 2005 and information on the environmental policies adopted by the country in recent years. This report was prepared by the National Meteorological Institute part of The Ministry of Environment, Energy and Telecommunications (MINAET), supported by UNDP.

The report outlines national conditions and the relationship of emissions and greenhouse gases. It also evaluates vulnerability and the effects of climate change in the last decades. The report concludes with a lengthy analysis of the need for technological transfer and the development of capacities and research for climate change in the country.

National Climate Change Strategy 2009

Given the global significant of the impacts of climate change and global warming, Costa Rica began an effort to co-ordinate initiatives in the field, which led to the creation of the National Climate Change Strategy. This strategy aims to assist in making decisions to comply with the national goal of being a carbon-neutral country by 2021.

The government has placed this as a major theme in recent years, this derives in specific guidelines that seek to guide efforts to prevent and mitigate global change.

Such strategy is structure along five key lines:³⁷

- Mitigation of greenhouse gases by reducing emissions.
- Rigorous analysis of vulnerability and definition of adaptation measures.
- Strengthening national capacities
- Public awareness and education.

The overall objective of the strategy is to reduce the social, environmental, and economic impacts of climate change and to take advantage of opportunities, promoting sustainable development through economic growth, social progress and environmental protection. According to the strategy: "This might be achieved by implementing mitigation efforts and adaptation initiatives so that Costa Rica can improve the quality of life of its inhabitants and ecosystems, and move towards a carbon neutral competitive economy by 2021".

Competitive Strategy, C-Neutral Brand: This is a global trend that labels products and services if they are sensitive to carbon footprints in order to differentiate them and alert environmentally aware consumers. The National Climate Change Strategy includes this as part of its strategy to position Costa Rica worldwide as part of the C-Neutral branding program. This brand defines the operations of an entire company and its likely impact on the climate during a product's life cycle. The brand was registered in 2008, and by 2009 it was in the process of international registration by the World Intellectual Property Organization (WIPO) in Geneva, Switzerland.

An important benefit of developing this brand is that companies that produce their goods and services in Costa Rica would be granted the certification C-Neutral and could use the label C-Neutral Costa Rica. Companies that produce their goods and services in other countries but still want to offset their emissions in Costa Rica, would be granted the appropriate certification, and could use the brand C-Neutral Made in Costa Rica.³⁸

The National Meteorological Institute's Climate Change Programme:

Meteorological Institute developed a climate change program in conjunction with the National Strategy for Climate Change Program, supported by technology to project future scenarios and undertake mitigation and prevention.

Some of these technological applications are climate projections that are made by computer models. They are often used for the creation of climate scenarios and simulations and

³⁷ MINAET. (2009a)

³⁸ Ídem pp. 80-81-82

requires information such as population growth and socio-economic development data, amongst others.

Predicting climate change scenarios is one of the first actions necessary to assess impacts, vulnerability, and adaptation to climate change, especially in the context of the potential impacts on key sectors of a country or region. Some examples of the sectors that require predicative mapping include: water resources, coastal resources, the economy, the ecology, human health, and agriculture. Climate change simulation has been developing in Costa Rica using the latest computer modeling technology (Precis, SDSM).

Regarding mitigation, the country has programs and initiatives dealing with issues such as energy efficiency, energy conservation and renewable energy to make energy supply more efficient technically, economically, and environmentally. The national program of Payment of Environmental Services and the territorial and financial consolidation of parks and biological reserves are amongst initiatives that reduce emission of greenhouse gases.

The National Meteorological Institute in the First Communication on Climate Change conducted an analysis of mitigation options across sectors emitting greenhouse gases. It has also co-ordinated an evaluation of vulnerability in the agricultural and coastal sectors, as well as in water resources and forest sectors. At the same time, it continues to conduct research in other sectors including health and biodiversity.

The institute has carried out an adaptation strategy focusing on the water resource sector in the Central Valley that is vulnerable to climate change. In Education and awareness, the Institute has developed educational materials, focusing on climate change awareness.

Regional Climate Change Strategy 2010

The regional climate change strategy is a joint effort of the countries that are part of the Central American Integration System (SICA): Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama.

The strategy is a complementary tool to national efforts for adaptation and mitigation of climate change. It attempts to formulate a regional policy that will allow member countries to make progress in achieving their goals, to face climate threats and to share joint actions.

8.4. National Development Plan 2011-2014

Costa Rica's National Development Plan 2011-2014 specifies four main policy arms governing strategic actions in the environmental sector: ³⁹

³⁹ MIDEPLAN. (2010d) p. 202

1. To promote measures and joint actions intra and inter-institutionally, intra and inter-sectors and /or with the participation of manufacturing sectors, academics, professionals, community and organized civil society in order to strengthen the capacity of governance with shared responsibility in the environmental, energy and telecommunications fields. It also aims to increase the coverage of national territory being protected.
2. To empower the country as a global environmental leader committed to environmental management and territorial planning, energy self-sufficiency, dealing with climate change and achieving a carbon neutral society.
3. To promote telecommunications as the driving force for human development.
4. To encourage in MINAET/ALES to conduct joint actions (public, private, community, and academic) aimed at facilitating an improvement in environmental quality in the country.

Nature Peace Office of the Presidential Palace: Peace with Nature (IPN, according to its Spanish acronym) is a presidential initiative launched by President Oscar Arias in his second term in 2006. This initiative aims to fight environmental degradation processes, climate change being a key strategic issue. The initiative is also responsible for ensuring compliance and commitment in Costa Rica to ensure that it is carbon neutral by 2021. The initiative aims to strengthen public policies and actions to reverse environmental damage by providing a higher quality of life for its citizens.

9. Policies and regulations for environment responsibility in ICT sector (ICT companies)

In Costa Rica there is a growing and dynamic information technology sector. Multinational companies operating in the country include Intel and Hewlett Packard which have their hubs in the country. Other areas that have expanded in recent years are software development, and call centres and the data centres which have been created by both local and foreign companies. All these business have high energy consumption.

Interviews with various players in this sector⁴⁰ and literature reviewed showed that there is no legislation regulating the energy use of companies in the technological sector. There is, as a consequence, a gap in the national regulations on the energy use of these companies.

Information on regulations policies for data centres were not found, and there are no incentives from the state for these organisations to be environmentally responsible. After this research the only measure we had found is a differential rate according to energy consumption imposed by the regulator ARESEP.

Despite the absence of a regulation on energy use in the technology sector, there is interest and some initiatives by some organizations in this sector to take measures to promote sustainable development and proper use of the energy used by their companies. Many of these green initiatives respond to the organizations' interest to provide added value to their companies in order to be more competitive in the national and international arenas.

Other companies outside the technology sector are making environmental strategies through internal policies to regulate, for example, the use of paper, the use of energy, the measuring of the carbon footprint by using certain indicators and monitoring information technology and communication used. Actions are also taken in constructing oxidation ponds for waste water from manufacturing process – as a result methane is produced and consequently reused to generate electricity for the same company.

An example of this is Scotia Bank, financial institution whose Technology Department is taking the initiative to measure its energy consumption and carbon footprint.

Another company that carries out activities in this field is Grupo Nación, a media organization. The company performs periodic measurements to determine its ICT energy consumption, and has policies for internet use. It has over fifteen years of experience in recycling practices and conducts awareness campaigns for its staff, many of them using ICTs, including the intranet and e-mail. Another practice at the company was the use of

⁴⁰ Information gathered in interviews

intranet to develop a virtual house to identify potential energy saving options in the workplace and at home.⁴¹

There are several other green initiatives in the business sector.

A green initiative in the major industrial sector in the country, which has been promoted by the National Chamber of Industry since 1998, is called the National Center for Cleaner Production. The centre is a non-profit organization which has the goal of building capacity in the areas of cleaner production, pollution, prevention, and eco-efficiency. It promotes the industry's strategy for cleaner production, which involves taking a series of actions within organizations both in the manufacturing processes itself and in the final products, so efficiency is increased and environmental risk reduced.

The "cleaner production" strategy is to reduce the consumption of raw materials and inputs, to improve product quality and process efficiency, and to reduce waste volumes and the cost of its management. With these actions, the strategy aims to reduce workplace accidents, to improve working conditions in harmony with the environment while improving corporate image.

Another guideline that promotes green business awareness is ISO 14001. The Standards Institute of Costa Rica (INTECO) is the entity in charge in the country. INTECO provides a Certificate of Environmental Management, known as INTE-ISO 14001. This norm promotes responsible environmental behavior within organizations. Standard INTE-ISO 14001 is an essential tool used as a framework for the construction of an environmental management system. It enables the compatibility and combined certification with other management systems such as INTE-ISO 9001 Quality Management and/or INTE-ISO 18001 Management System of Labor Risk Prevention.⁴²

With these norms, INTECO sets preferential rates for micro and small enterprises so that they can adapt to global market requirements. With the ISO-14001 standard, organizations take actions for sustainable development, they improve their efficiency in environmental performance, reducing their waste and reducing energy consumption. Some of the software production and ICT manufacture enterprises are INTE-ISO 18001 certified.

9.1. ICTs for mitigation and adaptation to climate change

In the strategic use of ICTs for mitigation and adaptation to climate change, Costa Rica has made several efforts to formulate policies. In the National Development Plan (2009-2014) the environment forms a central theme. Strategic guidelines have been defined in order to ensure the country's regulations on ICTs and the environment, seeking to harness the

⁴¹ Retrieved from http://www.empresa.org/doc/casos/AED_Grupo_NaciOn_Capacitacion_ambiental.pdf

⁴² Retrieved from <http://www.inteco.or.cr/esp/tiposcerti2.html>

potential of technology to improve environmental quality and promote public policies for proper waste treating technology.⁴³

The main objective is to ensure the environmentally sustainable development of ICTs, and in turn to boost the use of ICTs to improve the environmental quality of the country. The Telecommunications Plan proposes three strategic areas: environmental protection; technological waste management; and green procurement.⁴⁴

Environmental protection strategic guidelines

Specific objectives:

- To ensure performance and updating of environmental regulations in the development of telecommunications
- To ensuring the rational use of natural resources and the adoption of low-impact technologies for the environment
- To ensure the potential of ICTs to improve the environmental quality of the country, including measures on prevention, mitigation and adaptation to natural disasters.

Strategic line on e-waste management

Specific objectives:

- Ensure the integrated management of waste resulting from telecommunications activities.

Strategic line on green procurement

Specific objectives:

- To ensure the incorporation of environmental criteria in the telecommunications sector.

The National Development Plan of the new administration uses telecommunications as a driving force for human development proposed under its policy guidelines for the environmental sector.

⁴³ Retrieved from <http://www.prosic.ucr.ac.cr/prosic09/informe1.html>.

⁴⁴ IDEM

9.2. E-waste policies and regulations

Evaluations, strategies and legislation that have been developed in recent years on the subject of e-waste are presented below in chronological order.

Assessment of the status of integrated and sustainable management of e-waste in Costa Rica

In this assessment a description of institutional stakeholders involved in the management of solid waste was developed. It found that in 2003 there was still no formal sector, with various isolated initiatives, and that there were no integrated solutions. For 1995, it forms a new Environmental Law in which it states that solid waste is also the responsibility of the Ministry of Environment and Energy. It also found that there was no proper planning in the country, or strategic plans, either financial or environmental, for the management of solid waste. As a result of the above, the country had no national information or monitoring systems, making it impossible to manage the e-waste.

At the time of the assessment the country's trend was towards greater private sector involvement in the stages of collection, transportation, and disposal of e-waste. Micro-enterprises play a fundamental role in solid waste management collection, transportation, disposal and cleaning of beaches.

There was no specific legislation on e-waste management when the assessment was carried out. Questionnaires were circulated and interviews carried out with the companies that import and distribute e-waste, but none had policies, procedures or some form of rules and regulations on the subject. The same was found for companies using electronic equipment.

According to the assessment, "of the importers and distributors who generate waste and work with e-waste (a total of 46), 26% pay to dispose of the waste...while 54% say they do not pay to have the waste disposed of".⁴⁵

In 2003 none of the major sites for waste disposal had special plans to retrieve electronic material. It was found that only in the Rio Azul landfill 10 waste recyclers, both formal and informal, specialising in electronic equipment had received training.

Some of the conclusions of this assessment conducted were that although there was an effort in the sectors to deal with e-waste, this has not been sufficient. In the case of e-waste, it was determined that people do not consider this ordinary waste, so the vast majority keep, repair, or donate their old technology. According to market trends, the life of electronic devices is getting shorter. This means that the amount of e-waste will increase significantly.

⁴⁵ Retrieved from <http://acepesa.org/images/stories/documentos/informe-dae-electronicos.costarica.pdf>

It is important to note that a finding of this analysis was that among the respondents (companies, municipalities, workshops etc.) the majority expressed an interest in participating in a strategy of comprehensive waste management, just as it was determined that the issue of the management and recycling of electronic components could open new market opportunities for various sectors in the country.

A recommendation of this study was to create a strategy and a comprehensive law for the management of waste.

National Strategy for Integrated Sustainable Waste Electrical and Electronic Appliances

The National Strategy for Electronic Waste Management was developed in 2004, in a joint effort between the following organizations: Ministry of Environment and Energy, Ministry of Health, Ministry of Science and Technology, Chamber of Industries of Costa Rica, Costa Rican-American Chamber of Commerce/Lanier, American Association for the Economy, Health and Environment ACEPESA, Technological Institute of de Costa Rica (ITCR), and Costa Rica AVR-American Glass. This strategy was funded by the Bilateral Agreement on Sustainable Development Costa Rica Netherlands.

The strategy set a target that stipulated that by 2014 the country should be processing at least 60% of the e-waste entering the country. This requires the following steps to be taken:⁴⁶

1. Strengthening the business sector engaged in the management of e-waste, as well as the sector that repairs and reuses computers
2. Promote and strengthening the organization of companies engaged in the import, production and distribution of appliances and electrical and electronic components
3. Promote the development and adoption of a legal framework governing the management of e-waste
4. Promote the information, awareness and education of citizens for the responsible management of e-waste.

The strategy identified several key actions for integrated waste management:

1. For the sustainability of the strategy and its waste management system a charge for treatment should be implemented. This applies at the time of

⁴⁶ Retrieved from <http://www.acepesa.org/images/stories/documentos/estrategia-2004-05-25.pdf>.

delivering the equipment, and also when buying new technology. This should be done in coordination with the necessary actors.

2. It proposed the creation of a centre for the disassembly process, permitting the recovery of components that are still in good condition, and recovering materials for recycling that could be exported and sold. It encouraged the processing of materials locally as there is a local use for the recovered materials.
3. In order to have the necessary information for effective decision-making, a monitoring and recording system would be designed to track electronic equipment. This information would be provided by the customs office, business, importers and distributors.
4. The Ministry of Environment should monitor the strategy and ensure compliance with any waste management system developed.
5. The strategy also needed to develop a program for information-sharing, awareness and education for responsible management of e-waste, with the participation of various stakeholders, including the government, private and civil society.

The strategy also identified the role and responsibilities of different actors in the field of e-waste. These included importers, distributors and producers of components and electronic devices, as well as the Ministry of Environment and Health, and municipalities, who are responsible for creating an executing system (which will be financed by a charge levied on the purchase of electronic goods). Public and private companies dedicated to the collection, transportation, storing, dismantling and recycling of waste, must incorporate, by appropriate techniques, waste management into the working processes.

According to the strategy, consumers should pay for the collection, transport and treatment of discarded equipment and deliver it to the right places for recycling. The work to promote, educate and raise awareness was given to NGOs and business associations working in the field. For their part, universities and research centres should collaborate in the development of new environmental technologies for the treatment of e-waste.

Although the National Strategy was a breakthrough in the regulation of e-waste, it had no proposals for legislation that would make these actions mandatory.

PRESOL Solid Waste Plan

This plan, drafted in 2007, was developed by the international consortium of AMBERO and CEGESTI, with the help of GTZ German Technical Cooperation at the request of the National Waste Commission of the Ministry of Health. PRESOL's main objective was to update the National Plan for Integrated Waste Management developed in 1991. Interviews,

consultations, and workshops were conducted with institutions from all sectors related to the field to define priority areas and a country strategy through a participatory process. PRESOL conducted an analysis of the legal and administrative framework for solid waste management, analyzing its weaknesses and proposing laws and regulations for proper integrated waste management. Among its actions, PRESOL defined the responsibilities for the co-ordinate management of waste for the state, citizens, municipalities and the private sector.

Concepts such as re-use and recycling had not been integrated into the 1991 and did not deal with the management of electronic waste. As you can see the 1991 legislation did not have a comprehensive view of e-waste management. Rather it was based on a simplistic view of the processes, and considers "waste" worthless – a byproduct that the owner must simply get rid of rather than a resource to be exploited.⁴⁷

In 2007 there were no data on the quantities and characteristics of hazardous waste generated in the country, by both public and private institutions. Regarding dry batteries, there is an estimated amount of about 6,800 tons per year of used batteries, but there are no treatment plants. There is no available data on discarded appliances. For computer equipment it was estimated that by 2004, 12,000 tons of e-waste was generated. However there is no data on fluorescent lamps and lamps for street lighting (the Technological Institute of Costa Rica has launched initiatives that have resulted in the treatment of 25,000 street lamps and 3,000 fluorescent lamps).⁴⁸

There was no communication campaign on the e-waste management at the national level, and that it is essential to sensitize the various sectors of the community and inform them of institutional actions being taken.

As a last point PRESOL discussed the issue of costs, fees, and funding for the plan. It concluded that there are few options for proper disposal and few actors are willing to pay a fee for the proper disposal of e-waste. Because of this the investments required for proper management of many types of hazardous e-waste were not economically viable.

In general, municipalities in 2007 had no management fee for collection, transportation, and disposal of e-waste efficiently, and local government revenues are often not sufficient to cover the costs of waste management. Parallel to this problem was the lack of incentive for both citizens and companies to implement a recycling system.

PRESOL's study was of great importance to Costa Rica since it captured the delay in regulation and legislation of integrated waste management. It showed that although environmental issue have always been an important issue for the country, the 1991

⁴⁷ Retrieved from <http://www.programacyma.com/seleccion-documentos/presol-plan-de-accion/>

⁴⁸ Ídem.

legislation was insufficient and did not promote any kind of action to reduce greenhouse gases and the treatment of e-waste. It also did not have any type of control by the state for compliance with international conventions, laws, and decrees that the country had ratified.

Regulation of waste recovery centres

In 2008 PRESOL's Solid Waste Plan was approved and declared of national public interest. With the aim of complementing the plan a regulations on waste recovery was established in the same year. This regulation establishes the requirements and conditions that must be met by recovery centres.

The regulations also define the guidelines for physical-health facilities, as well as labour health practices that protect workers against all risks.

The new regulations established a period of one year for institutions that do not meet conditions and other guidelines established by the rules to meet the new requirements. Once the deadline has expired and new measures have not been taken, the establishment could be closed, as determined by the regulations.

Law for Integrated Waste Management

In July 2010 Law 8839 was published: the Law for the Integrated Waste Management in Costa Rica, which aims to "regulate the management of waste and efficient use of resources through planning and implementation of regulatory, operational, financial, administrative, educational, environmental actions and health monitoring and evaluation"⁴⁹.

The law calls for the formulation of a National Plan for Integrated Management of Waste to guide all the government actions, set priorities, guidelines and national targets. This plan should address the local government plans, sector programs, projects and other public initiatives. The plan must cover a period of ten years and be reviewed every three years.

An important point established by law is the participatory formulation of policy, the Plan and the regulations. This participation should be ensured by the Ministry of Health, which may create ad hoc committees to carry out the objectives of the law.

It also provides training on integrated waste management, which is also the responsibility of the Ministry of Health. The Institute of Statistics and Censuses will provide technical support for data collection.

⁴⁹ Retrieved from http://www.amcham.co.cr/documentos_privados/852_ley.pdf.

Another objective of the law is the creation of a national education program for integrated waste management. For this educational policies will be formulated to guide the program at all educational levels: pre-school, basic education and diversified.

The law specifies that both Ministry of Health and municipalities have key responsibilities in implementing the plan, as outlined in the table below:

Table 8

Intitutions	Functions
Ministry of Health	<ul style="list-style-type: none"> • To develop and implement national policies and the National Plan of Integrated Waste Management, and to periodically evaluate them and adapt them in coordination with the Ministry of Environment, Energy, and Telecommunications and the Ministry of Agriculture and Livestock. • To dictate the necessary regulations, by type of waste, for integrated waste management. • To verify the implementation of this Law and its regulations. To develop tools and technical regulations, necessary for integrated waste management. To promote and implement inter-institutional co-ordination. To define performance indicators. • To continuously assess policies, plans, programmes and regulations. • To managing the fund for integrated waste management. • To establish a national information system. • To promote incentives for integrated waste management.
Municipalities	<ul style="list-style-type: none"> • To establish and implement the strategic Municipal Plan for integrated waste management in accordance with the National Plan. To dictate regulations in cantons (smallest political unit in the country) for classification, selective collection and disposal of waste. • To promote the creation of an Environmental Management Unit, in charge of the process of integrated waste management. • To ensure that citizens are provided with a waste collection service that is accessible, timely and efficient. • To prevent and eliminate dumping sites in the county and unauthorised collection of waste. • To promote alternative systems for separate collection of recoverable waste such as containers or receivers, among others. • To promote training and educational campaigns to raise awareness amongst citizens in the cantons concerned.

Source: Law 8839⁵⁰

⁵⁰ Retrieved from http://www.amcham.co.cr/documentos_privados/852_ley.pdf.

Regulations for the Integrated Management of E-waste

The regulations define essential guidelines for the creation of SINAGIRE, the National System for Integral Management of Electronic Waste. This institution's role is to be the entity that takes the necessary actions to be an efficient and effective e-waste manager.

The regulation also stipulates the formation of SINAGIRE, whose executive committee must be composed of the following institutions:

- Ministry of Health, which serves as coordinator
- Ministry of Environment, Energy and Telecommunications
- Stewardship of the telecommunications sector
- Public Universities
- Institute of Municipal Development and Assessment
- Compliance Units
- Costa Rican Union of Chambers and Associations of Private Enterprise
- NGOs with experience in electronic waste.

The Ministry of Health must ensure the proper implementation of SINAGIRE, together with the Ministry of Environment, Energy and Telecommunications. MINAET is responsible for exercising control and monitoring the operations of e-waste managers, who are duly registered.

The regulations define as e-waste as follows: whole and flat screen monitors, laptops and desktop computers (including accessories), batteries for laptops and cell phones, uninterruptible power supply units (UPS), chargers, scanners, cell phones, printers, photocopiers, digital cameras, portable digital assistant units (PDA), multifunctional office equipment (printers, copiers and faxes), calculators, overhead projectors, slide projectors, internet routers, and wired and wireless and media players.

The regulation states that it must create an Enforcement Unit, which is to be formed by a producer or a group of several producers so that they together fulfill the responsibilities set out in the regulations. Producers will be responsible for the recovery of discarded equipment and have this responsibility throughout the life cycle of their products (applicable to their own brand only). Producers must report the weight of the equipment recovered to CEGIRE in line with the compliance plan. They should also inform consumers about the process of integrated management of e-waste and where to find collection sites.

The regulations define the following responsibilities for each actor:

Table 9

Sectors	Principal responsibilities
Ministry of Health	<ul style="list-style-type: none"> • To ensure the implementation of SINAGIRE. • To control and follow up operations of managers of electronic waste. • To co-ordinate with the General Direction of Customs, Ministry of Finance, in regards to the record of imports of electronic equipment.
Producers	<ul style="list-style-type: none"> • To report to CEGIRE’s directors the annual weight of electronic equipment recovered by the Compliance Plan.
Final consumers	<ul style="list-style-type: none"> • Final users are responsible for disposing e-waste in authorised collecting sites when replacing or disposing their equipment in whole or in part.
E-waste managers	<ul style="list-style-type: none"> • Must be registered at the Ministry of Health Tasked to ensure a clean environment and safe treatment of e-waste. • To keep a record of the movement of e-waste annually

Own source⁵¹

⁵¹ <http://digeca.minae.go.cr/documentos/residuos%20solidos/Reglamento%20residuos%20Electronicos%20%20decreto%20N%2035933.pdf>.

The table below summarizes the regulations and policies discussed for each action area in the field of ICTs and environmental sustainability.

SUMMARY TABLE		
	Stakeholders	Regulation /policies
e-waste	In the government sector, the institutions responsible for integrated waste management are MINAET, the Ministry of Health, Municipalities and SINAGIRE. Universities have also promoted the issue, campaigning as ITCR and UCR, and the programme A Sustainable Campus. Civil society organisations that have developed the theme are ACEPESA, ASEGIRE. Private sector initiatives have been increasing in the country, including the the Chamber of Industries of Costa Rica. Some of these companies that buy e-waste to be sold abroad are: La Bodeguita, Ecological Services, FORTECH, Environmental Projects and Village HOPE Export, among others.	The main regulations are: National Plan for Solid Waste Management (PRESOL) in 2007. Regulations for Recovery Centres in 2008. The Law for the Integrated Waste Management, in 2010. Regulations for the Integrated Management of Electronic Waste, in 2010.
ICT for mitigation and adaptation	Institutions such as the Volcanological and Seismological Observatory of Costa Rica, the National Meteorological Institute and the National Emergency Commission develop different technologies to monitor and track weather events in order to prevent and manage natural disasters related to climate change. They ICTs to enhance community communication processes and in geographic information systems, among others. Other initiatives have been developed by the CAMTIC in conjunction with the Organisation for Tropical Studies to develop climate change technologies.	The National Development Plan 2011-2014 proposes the development of initiatives to tackle climate change. Among them are the use of mass media, monitoring of climate scenarios, and building a telecommunications platform that is modern and sustainable environmentally. Climate change is not referred to in the National Development Plan 2009-2014.

<p>Energy use for ICT enterprises</p>	<p>Some initiatives aimed at managing energy resources have been developed by the CAMTIC, CEGESTI, and the National Chamber of Industries. Initiatives by technology firms and other sectors that promote sustainable activities in organisations such as proper management of energy, the efficient use of the internet, the measurement of carbon footprint, recycling have also been developed. These involve internal policies to offer a value-add to organisations and make them more competitive domestically and internationally.</p>	<p>There is no legislation or policy that regulates the technology sector. ISO standards on quality and management offers the INTE-ISO 14001 standard for the industry sector, which promotes environmentally responsible behavior within organisations. Some IT companies use the ISO, but these are independent initiatives.</p>
<p>ICT to inform and advocacy in climate change</p>	<p>Several important initiatives carried out by universities and UNED with the Environmental Education Centre, and the UCR with PROSIC. Other civil society organisations active here include the Terra Nostra Association, RED-DES program, and the Regional Disaster Information initiative.</p>	<p>Not applicable</p>

10. Findings and analysis

The following observations can be made regarding this study:

- In terms of policies and regulations on the use of ICTs for climate change, there is very limited information. Only the National Development Plan defines strategic areas for the use of ICTs for environmental sustainability. However it does not specify actions on the issue of climate change. A similar situation is found in the National Climate Change Strategy 2009 where the use of ICTs is not defined.
- Despite the lack of definition of national strategies on using ICTs for climate change, there are several actors who have developed initiatives on the strategic use of ICTs for mitigation and adaptation to climate change and dealing with awareness-raising, advocacy and green outreach initiatives. However these initiatives are isolated from each other.
- The climate change issue is of national and government interest. This is reflected in the formulation of a National Climate Change Strategy and the establishment of policies. However the strategic use of ICTs for climate change is very poorly developed in these strategies.
- The research did find a regulatory framework for energy resources consumed by technology companies. These are basic guidelines for saving energy and industry regulations for ICT. However there are no policies that promote the rationalised use of energy within ICT organisations.
- The issue of ICTs for climate change is gaining momentum in the country, evidenced by the substantial increase in research activity in both the academic and government arenas, and in the formulation of national strategies about ICTs and climate change.
- ICTs are a key tool in raising awareness around climate change, especially amongst younger generations.
- There was a major breakthrough in 2010 when e-waste regulations were ratified. Within this regulatory framework, entrepreneurs and civil society are expected to develop initiatives.
- It is important to note that social sustainability is directly linked to environmental sustainability, so it is essential to promote awareness and advocacy campaigns on ICTs and climate change and the integrated management of e-waste in the country.

11. Advocacy recommendations

ICT consumption is increasing in the country. Because of this, an education campaign for Costa Rica citizens about the social consequences of their decisions to buy, use and discard ICT equipment is very important at the moment.

The public sector has the responsibility to analyse the environmental consequences of ICT sector activities in the context of the telecommunications open market. It also has to regulate and control the energy consumption of this economic activity. A national discussion about this topic is needed as well as good regulations and criteria to assess and stimulate environmental responsibility in this sector. At the same time, other economic activities with extensive use of ICTs like banks, the public sector and industry have the responsibility to develop an efficient energy consumption and e-waste management programme. It is important to develop a multi-sectorial discussion about topic of e-waste, that includes enterprises, SUTEL, FONATEL, MICIT, MINAET, ICE, universities and civil society.

For Sulá Batsú, supporting the strengthening of ICE as a national enterprise is very important in the context of telecommunications liberalisation. ICE could integrate environmental responsibility, low-energy consumption, e-waste management and a good information and education consumers campaign as part of its marketing strategy. It will be an example for the other international telecommunication companies and a different approach to that taken by any other ICT service provider.

Because of the current regulations, Costa Rica has an important opportunity to develop actions related to e-waste. There is a need to create opportunities for more excluded segments of the population to develop local e-waste-based business initiatives. It is important to train students from *Instituto Nacional de Aprendizaje* (INA) and Technical High Schools to manage and transform e-waste into new computers and other products. This includes the the re-use of computers at schools, libraries, health centres and other spaces, and the development of new initiatives in communities that repair computers, install free software and develop training courses. With these actions the benefits will no only be for those enterprises that can export e-waste containers to other countries, as is happening now.

On the other hand, it is important to improve and emphasise the use of ICTs for climate change in Costa Rica. Education and citizen information campaigns have to be developed by universities and the public sector. The population of Costa Rica must participate in the analysis of the consequences of climate change. It is also very important to connect research results with public policies and public actions in the country.

It is also important to improve the coordination between different organisations working on risk management, climate change and early alert and warning systems. ICTs can play an

important role in information centres. At this moment the information is segmented by institution: the country could have better results with an integrated information system. A political agreement is needed.

Finally, there is a need to develop an international ICT free trade certificate for the responsible use of ICTs that integrates indicators about environmental impact, e-waste, carbon footprints, energy consumption, clean production and others factors.

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13. Appendixes

List of abbreviations

Abbreviations	Name of institution	E-mail address
ACEPESA	American Association for Economy, Health and the Environment	http://www.acepesa.org/
ASEGIRE	Business Association for Electronic Waste Management	http://www.asegire.com/
CAMTIC	Costa Rican Chamber of Information and Communication technologies	http://www.camtic.org/ES/
CEGESTI	Centre of Informatics and Industrial Technological Management	http://www.cegesti.org/
CICR	Chamber of Industry of Costa Rica.	http://www.cicr.com/
CNE	National Emergency Commission	www.cne.go.cr/
CRID	Regional Information Center for Disasters in Latin America	http://www.crid.or.cr/
HP	Hewlet Packard	http://www8.hp.com/lamerica_nsc_cnt_amer/es/home.html
IBM	International Business Machines	http://www.ibm.com/cr/es/
ICE	Costa Rican Institute of Electricity	www.grupoice.com
IFAM	Institute of Municipal Promotion and Advice	www.ifam.go.cr/
IMN	National Meteorological Institute	http://www.imn.ac.cr/
ITCR	Technological Institute of Costa Rica	www.itcr.ac.cr/
KC	Kimberly Clark	http://www.kimberly-clark.com/
MINAET	Ministry of Environment, Energy and Telecommunications	www.minae.go.cr
OET	Organization of Tropical Studies	www.ots.ac.cr/
OVSICORI	Volcanological and Seismological Observatory of Costa Rica	www.ovsicori.una.ac.cr/
PRESOL	National Solid Waste Plan	
PROSIC	Information Society Program	www.prosic.ucr.ac.cr/
RED-DES	Digital Resources Program for Sustainable Economic Development	http://www.red-des.org/
SICA	Central American Integration System	http://www.sica.int/
SINAGIRE	National System for the Management of Electronic Waste	
TELETICA	Televisora de Costa Rica	www.teletica.com
UCR	Univerisity of Costa Rica	www.ucr.ac.cr/
UNA	National University	www.una.ac.cr
UNED	National Distance University	www.uned.ac.cr/
VICAL	Vidriera Centroamericana	www.vicesa.co.cr

Index cards per initiative

Name of the initiative: National climate change strategy
Sector: government
Description: Ministry of Environment, Energy and Telecommunications (MINAET – Ministerio de Ambiente, Energía y Telecomunicaciones). Government initiative that involves three action lines: <ul style="list-style-type: none">• Mitigation, vulnerability and adaptation• Measurement, capacity development and technological transference• Education and awareness raising
The strategy answers to local and global responsibility to face climate change.
URL: www.minae.go.cr , www.encc.go.cr

Name of the initiative: Alternative communication network for emergencies
Sector: government
Description: MINAET. Initiative of the direction of telecommunications. It was developed to carry out a study analyzing globally competitive practices to be considered in the requirements of an alternative communication network to attend cases of national emergency.
URL: www.telecom.go.cr

Name of the initiative: National plan for telecommunication development
Sector: government
Description: Initiative of the direction of the telecommunication sector. Presents an analysis of the state of the Information Society in Costa Rica, considering the global and Latin American evolution regarding telecommunications.
URL: www.telecom.go.cr ,

Name of the initiative: Universidad Nacional - UNA (National University) sustainable campus
Sector: Universities
Description: Initiative that contributes to sustainable development and strengthening the environmental culture of the university and national community. It's objective is to solve the main environmental problems of the University. One of its priorities is dissemination and involving the student community. It has also done work on treating e-waste.
URL: unaweb.una.ac.cr/unasostenible

Name of the initiative: Programa Institucional de Gestión Ambiental Integral -ProGAI (Institutional Program for Integral Environmental Management)
Sector: Universities
Description: Program of the University of Costa Rica that involves departments, faculties, regional headquarters, research units and programs to make the most of the resources of the University of Costa Rica.
URL: www.progai.ucr.ac.cr/sitio/index.php

Name of the initiative: 2009 report of PROSIC - Programa de la sociedad de la información y el conocimiento- (Program on information and knowledge society).
Sector: Universities
Description: Report from this program of the University of Costa Rica about the influence of ICTs in the different areas of the Costa Rican life: institutional, social, scientific, economics, politics and culture.
URL: www.prosic.ucr.ac.cr/prosic09/cap6.pdf

Name of the initiative: Disasters No No web platform
Sector: Universities
Description: It is a web site that promotes disaster prevention by using an educational platform for children between the ages of 9 and 12. The site was developed as a research project by the Central American Department of Geology and the Institute of Educational Research, of the University of Costa Rica.
URL: desastres-no-no.ucr.ac.cr/inicio.html

Name of the initiative: BANACLIMA Project
Sector: Civil society
Description: The National Banana Corporation - CORBANA (Corporación Bananera Nacional), has a system to monitor climate in the banana plantation area called BANACLIMA, which registers, processes and summarizes climate variables live and makes them available to the different regions of the country.
URL: www.corbana.co.cr/intro_banaclima.shtml

Name of the initiative: Centre of Geophysical Research (CIGEFI - Centro de Investigaciones Geofísicas)
Sector: Universities
<p>Description: the Centre addresses in the following topics: physical oceanography, seismology and volcanology, atmospheric physics, prevention and mitigation of natural disasters, assessment of land resources, climate and climate variability and satellite meteorology.</p> <p>Among its work, one can find:</p> <ul style="list-style-type: none"> • Processing of satellite images for meteorological and oceanography studies. • Studies of climate parameters in Central America and the Caribbean • Regional impact of meteorological phenomena, variability and climate changes. <p>CIGEFI has joint projects with international institutions: University of Sao Paulo, National Autonomous University of Mexico (UNAM – Universidad Nacional Autónoma de México) and national institutions: Costa Rican Institute of Electricity (ICE – Instituto Costarricense de Electricidad) and the National Meteorological Institute (IMN – Instituto Meteorológico Nacional).</p>
URL: http://www.vinv.ucr.ac.cr/girasol/girasol-ediciones/archivo/GIRASOL6/acon2.htm

Name of the initiative: Allies for Climate Change Program (ACC - programa de Aliados por el Cambio Climático)
Sector: Civil society
<p>Description: Private initiative that seeks to intervene in climate change. It provides services to measure and offset carbon emissions, through mechanisms such as the Ecological Seal for vehicles, direct work with enterprises, Green Vacations, targeted at the tourism sector and the Give Life postcard initiative.</p> <p>The main action of the ACC program is focused on climate change adaptation.</p>
URL: www.programaacc.com

Name of the initiative: Brand C-Neutral (Marca C-Neutral)
Sector: Private enterprises
<p>Description: It is a global trend for products and services to include in their labeling their awareness towards their carbon footprint. This differentiates their product and benefits consumers who are conscious about climate change. The branding provides information about the companies operations and the impact that the product's life cycle may have upon the climate.</p>
URL:

Name of the initiative: Climate Change program of the National Meteorology Institute.
Sector: Government
Description: Together with the National Strategy, a climate change program has been designed, to be able to project future scenarios and carry out prevention and mitigation actions with the support of technology. Some of the technological applications are related to climate projection, using informatics models to create climate scenarios.
URL: http://cglobal.imn.ac.cr/

Name of the initiative: Peace with Nature (Paz con la Naturaleza)
Sector: Government
Description: Peace with Nature is a presidential initiative promoted by Oscar Arias during his second administration in 2006. The initiative battles against processes of environmental degradation, placing climate change as a strategic area of intervention. It also seeks to ensure that Costa Rica meets the commitment the country acquired to be carbon neutral by 2021.
URL: www.pazconlanaturaleza.org

Name of the initiative: National strategy for integrated and sustainable management of electric and electronic waste.
Sector: Government
Description: It was developed in 2004, with participation from the following organizations: <ul style="list-style-type: none"> • Ministry of Environment and Energy • Ministry of Health • Ministry of Science and Technology • Costa Rican Chamber of Industry • Costa Rican American Chamber of Commerce / Lanier, • Central American Association for Economy, Health and Environment (ACEPESA - Asociación centroamericana para la Economía, la Salud y el Ambiente) • Technological Institute of Costa Rica (ITCR - Instituto Tecnológico de Costa Rica) • Central American glass enterprise (VICESA). <p>The strategy was part of the project: "Designing a sustainable strategy to minimize and handle waste from electronic components in Costa Rica and the Netherlands, taking advantage of the innovative experiences of Dutch enterprises". It was funded by the Bilateral Agreement for Sustainable Development between Costa Rica and the Netherlands.</p>
URL: http://www.acepesa.org/images/stories/documentos/estrategia-2004-05-25.pdf

Name of the initiative: Solid waste plan (PRESOL - Plan de Residuos Sólidos)
Sector: Government
Description: This plan was developed in 2007; it was created by the international consortium AMBERO and the team of the Centre of Technological and Industrial Management (CEGESTI – Centro de Gestión Tecnológica e Industrial), with support of the German cooperation (GTZ) and by request of the national waste commission of the Health Ministry. The objective of the plan is to update the National Plan for Integral Waste Management of Costa Rica, developed in 1991. Interviews, consults and workshops were carried out with institutions from all of the sectors related with the topic, to define priority areas and the country strategy through a participatory process.
URL: http://www.programacyma.com/seleccion-documentos/presol-plan-de-accion/

Name of the initiative: National Strategy of Information and Communication Technologies (ICT)
Sector: Civil society
Description: National Strategic Development plan to optimize the use of financial, human, material and technological resources for the ICT sector in Costa Rica
URL: http://www.camtic.org/ES/estrategia_nacional_tic/estrategia_en_breve/

Name of the initiative: Pact for Life (Pacto por la Vida)
Sector: Civil society
Description: web site that fosters dialogue among stakeholders, sectors and territories with the purpose of creating a Mesoamerican region with socially fair and balanced environmental management.
URL: www.pactoporlavid.net

Name of the initiative: Centre for Cleaner Production
Sector: Civil Society
Description: It is an initiative of the Chamber of Industry of Costa Rica. The centre was created as a project in 1998 by initiative of the United Nations, that answering the requests of several institutions and with the economic support of the Swiss government, promoted its creation with three participants: the Chamber of Industry of Costa Rica, the Technological Institute of Costa Rica (ITCR) and CEGESTI. The entity is created to ensure compliance with guidelines from UNIDE, in issues such as promoting cleaner production in the national environment. The Centre's fields of work are: <ul style="list-style-type: none"> • Technical assistance • Training (for enterprises, universities and government entities). • Information dissemination • Management of a specialized information centre

- Supporting the State in developing national policies regarding environmental management
- Promoting technological transfer and foreign investment
- Consulting in environmental management and quality systems, specially for SMEs.

With the support of GTZ (German cooperation), the centre develops la climate change strategy of the industrial sector, which entails identifying actions and making proposals to the sector to face, mitigate and adapt to climate change.

URL: http://www.cicr.com/index.php?option=com_content&task=view&id=27&Itemid=

Name of the initiative: Regional Information Centre about disasters in Latin America (CRID - Centro Regional de Información sobre desastres en América Latina y el Caribe)

Sector: Government

Description: Joint initiative of six organizations who decided to unite efforts with the purpose of addressing the issue of natural disasters in Latin America and the Caribbean. The Centre has a large compilation of information about risk management, mitigation and adaptation to climate change.

Among the Centre's objectives are:

- To offer information services of quality and optimize the compilation and processing of information about disasters.
- To create and maintain information and documentation centres on disasters, both regionally and nationally.
- Promote communication using Internet and develop electronic information services.
- Contribute to the development of the Regional Information System about Disasters.

URL: <http://www.crid.or.cr/index.shtml>

Name of the initiative: Ambientados (in environment)

Sector: Private

Description: Campaign to collect recyclable material (glass, aluminum, paper, plastic, ink cartridges). With the profits from what is collected the initiative buys seeds to plant trees in the urban areas of Costa Rica. It receives the support of Kimberly Clark and has several collection centres through out the country and holds the national record on material collection.

URL: http://www.teletica.com/buscador.php?palabra=Ambientados&Submit=%A0&fs=1&buscador_select=teletica

Name of the initiative: Villagar Export
Sector: Private
Description: It is a program to collect computer materials and export them to different countries to comply with a recycling process bound by international regulations. They offer the collection service for small and medium enterprises in Costa Rica.
URL: http://www.villagarexport.com/programa-de-recoleccion/

OTHER ORGANISATIONS MENTIONED	
Geep Central America and Caribbean	http://www.geepglobal.com/
Servicios Ecológicos M.B.B S.A	http://www.reciclajecr.com/
Hope Proyectos Ambientales	http://www.hopeambientales.org/index.html
Club Rotaract	http://www.rotaractcostarica.org/
CO ² Neutra 2021	http://www.co2neutral2021.org/
Association Terra Nostra	http://www.terranostra-cr.org/
DELL	www.dell.com/cr
EPSON	www.epson.co.cr
FORTECH	www.fortech.cr/
HOLCIM	www.holcim.co.cr/
Ministerio de Salud	www.ministeriodesalud.go.cr/
Walmart	walmart-centroamerica.com/
INTEL	www.intel.com/costarica/encostarica.htm

Summary of sectoral activity

GOVERNMENTAL SECTOR			
TOPIC	NAME	KEY INFORMATION	NAME OF INITIATIVE
ICTs to mitigate and prevent climate change. E-waste. Energy resources consumed by technology companies in Costa Rica.	Ministry of Environment, Energy and Telecommunications (MINAET)	It is the agency responsible for the Rectory on Electronic Waste and Climate Change. Its objectives are: - Develop and implement National Policy and Plan - Develop tools and technical regulations. - Set goals and indicators. - Evaluate policies, plans, programs and technical regulations	National Climate Change Strategy 2010. Mains emergency communications.
ICTs to mitigate and prevent climate change.	Telecommunications Sector (MINAET)	Created in 2008 when it issued the General Telecommunications Law and the Law for Strengthening and Modernisation of the public entities in the telecommunications sector.	National Plan for Telecommunications Development
E-waste.	Ministry of Health	It is the agency responsible for the monitoring and control of e-waste in the country. - Supervise operators, generators and municipalities. - Establish National Information System - Monitor compliance-management goals. - Inventory and diagnosis of generators, transmission and volumes of waste.	
E-waste.	National System for the Management of Electronic Waste (SINAGIRE)	Plays an important role in the proper handling of e-waste for its members and is the unit responsible for compliance with the regulations for the Integrated Management of Electronic Waste.	Campaign E-waste collection.

E-waste. Energy resources consumed by technology companies in Costa Rica.	Costa Rican Institute of Electricity (ICE)	Take control of variations in climate change because they are important for hydro-power production. Manages weather stations and seismic monitoring. Involved in collection of mobile phones.	
E-waste.	Municipalities	They are responsible for the collection of e-waste in each of their municipalities. -Establish and implement the Municipal Plan. - Have Environmental Management unit with budget and staff.	Campaign E-waste collection by municipality.
ICTs to mitigate and prevent climate change.	Volcanological and Seismological Observatory of Costa Rica.	Use text messaging to cell phones to send information to: Red Cross, Fire, press and community organisations. Also uses social media to communicate message.	
ICTs to mitigate and prevent climate change.	Instituto Meteorológico Nacional.	Is attached to MINAET. Is responsible for all meteorological activities in the country. It is the body responsible for weather monitoring to assist in disaster prevention and air and sea navigation. Conducts studies, in the fields of meteorology, climatology, climate variability, air pollution, ocean-atmosphere interaction, global warming, climate change and others to support national development.	Climate Change Program.
ICTs to mitigate and prevent climate change.	National Emergency Commission (CNE)	Using ICTs for risk management, disaster prevention, monitoring and tracking the weather.	Regional Information Center for Disasters in Latin America

ACADEMIC SECTOR			
TOPIC	NAME	KEY INFORMATION	NAME OF INITIATIVE
E-waste.	National University (UNA).	The University has several strategic programmes, including A Sustainable Campus programme where participating schools and colleges look to strengthen environmental awareness and sustainability on campus. It also has a poroject which is responsible for the incorporation of ICT in academic work. It currently have160 courses online.	UNA Sustainable Campus
E-waste.	Technological Institute of Costa Rica (ITCR)	The ITCR signed an agreement with the company Sims Recycling Solutions U.S. to treat waste generated in the country. It was agreed in this partnership that certain components that cannot be recycled in Costa Rica and electronic materials that are highly toxic to humans would be exported to the company which has the expertise and technology needed to give appropriate treatment.	
E-waste. ICTs to mitigate and prevent climate change.	University of Costa Rica (UCR)	University of Costa Rica organises an environmental week in June. This year, they collected recycled ICT. Students and university staff participated in the collection campaign.	Pro-GAI. Institutional program of integrated environmental management. PROSIC. Information Society Programme

<p>Use of ICTs for advocacy, and the promotion and strengthening of green initiatives.</p> <p>E-waste.</p>	<p>National Distance University (UNED)</p>	<p>The UNED has the Environmental Education Center (AEC). Now focuses more on the officials but they have several projects including using ICTs to help the student community.</p>	<p>Institutional Project Sound Management of WaterEnergy and Solid Waste</p>
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PRIVATE SECTOR			
TOPIC	NAME	KEY INFORMATION	NAME OF INITIATIVE
E-waste.	HOLCIM	<p>Producer and supplier of cement and concrete. Fuel was obtained from treating its own waste and the waste of other companies. To this end, the company partnered with Environmental Services Geo cycle SAG in waste management.</p>	
E-waste.	Kimberly Clark	<p>For several years has sponsored and collaborated with national campaigns in e-waste recycling.</p>	E-waste Campaign.
E-waste.	Geep Central America and Caribbean	<p>It is a company dedicated to collecting and exporting e-waste.</p>	
E-waste.	Hewlet Packard	<p>Is another of the companies in Costa Rica active in waste management processes. They also work with commercial customers to make arrangements for collection.</p>	
E-waste.	EPSON	<p>In 2008 promoted recycling of its branded equipment. Offered consumers discounts for future purchases if they delivered their equipment to that brand that no longer worked.</p>	

E-waste.	La Bodeguita Company	This company receives e-waste such as computers, cell phones, televisions, and then exports to Indonesia, Vietnam and Hong Kong.	
E-waste.	Servicios Ecológicos M.B.B S.A	It is a recycling company that includes within its recent range of e-waste for shops, offices, industries and homes.	
E-waste.	INTEL	Have developed a programme with technical colleges in the country.	
E-waste.	FORTECH	Is a company that has developed technologies for clean high-tech companies and chemical industry. Is a company that is certified by the Ministry of Health for the operation and management of e-waste.	
E-waste.	IBM	Provides support services such as financial and technological solutions of software and hardware. From Costa Rica offers services to 19 countries in America. (US, Canada, among others.)	
E-waste.	HOPE Environmental Projects	E-waste collected.	
Electronic waste.	Vidriera Centroamericana. VICAL	American Glazier Group. The company is responsible for glass recycling in the region, and considering the challenges of recycling glass from screens.	
E-waste.	Wal-Mart	It has several supermarket chains in Costa Rica (Más x Menos, Hipermás, Pali, among others.) Has a Sustainability Program in Central America. Its goal is to sell products that sustain the environment.	Sustainability Program in Central America. (April 2010)

E-waste.	Televisora de Costa Rica	Collection programme.	Campaigns Collection of recyclable material (paper, aluminum, glass, plastic, cartridges and toners)
E- waste.	Office Depot	Campaigned for e-waste collection.	

CIVIL SOCIETY			
TOPIC	NAME	KEY INFORMATION	NAME OF INITIATIVE
E-waste.	Club Rotaract de San Pedro y Curridabat	Is a volunteer service organisation found in more than 200 countries. Has worked in various campaigns to collect electronic waste in the country.	Reciclón 2010
ICTs to mitigate and prevent climate change. Energy resources consumed by technology companies in Costa Rica.	CO ² Neutral 2021	Is a group composed of young professionals in various fields whose collective goal is to work towards a carbon-free country by 2021 . Among its tasks is to think and act on e-waste management, working together with students from Yale University to share perspectives and experiences.	
E-waste. Use of ICT for advocacy, promotion and strengthening of green initiatives.	Association Terra Nostra.	Promote the integrated management of e-waste in the country and through social networks.	
E-waste.	Business Association for Electronic Waste Management (ASEGIRE)	Is the body responsible for ensuring compliance with e-waste regulation in all of its companies.	
E-waste. Energy resources consumed by technology companies in Costa Rica.	Centre of Informatics and Industrial Technological Management. (CEGESTI).	It is a private organisation that was created in 1990 to promote sustainable development in Latin America in the area of consulting, training, research and information-sharing.	

E-waste.	American Association for Economy, Health and the Environment (ACEPESA)	Work in Central America looking for sustainable solutions for solid waste management. Is a non-governmental organisation that seeks to provide technical information and promote joint public and private efforts in sustainable development in the region.	
Energy resources consumed by technology companies in Costa Rica. E-waste. ICTs to mitigate and prevent climate change.	Costa Rican Chamber of Information and Communication technologies (CAMTIC)	It is a business association – a private non-profit organisation established in 1998. Its rationale was to form a strategic block to strengthen and assist the development of ICTs. As CAMTIC began operations representing only the software sector, today representing over 90% of all domestic software companies. The CAMTIC established partnerships with: 1. CEGESTI. Education ICT companies. CEGESTI energy efficiency provides training for businesses. Online and classroom courses. 2. OTS (Organization for Tropical Studies). Development of green technology. 3. CENAT and Universities. For research on green digital technologies.	National Strategy Information and Communication Technology. National strategic development plan aimed at optimizing the use of financial, human, material and technological appropriated for the ICT sector in Costa Rica.
E-waste. Energy resources consumed by technology companies in Costa Rica.	Chamber of Industries of Costa Rica.	Represents the country's industrial sector since 1943. In environmental terms has a standing committee on environmental sustainability where the emphasis is on three axes: integrated waste management, water resources, rational use of resources and environmental regulations related to these topics.	National Centre for Cleaner Production.

Interviews

ORGANISATION	INTERVIEWEE
Coordinator of the American Association for Economy, Health and the Environment (ACEPESA)	Victoria Rudin.
Association Terra Nostra	Silvia Mora.
National University. Program: UNA Campus Sostenible	David Benavides.
National Meteorological Institute. (IMN)	Roberto Villalobos.
Costa Rican Institute of Electricity. (ICE)	Eddy Sánchez. Sadi Laporte Molina. Maritza Rojas.
Legislative Assembly / Partido Acción Ciudadana Advisor.	Felipe Arguedas
Legislative Assembly.	Giovanni Rodríguez.
Data Center COST.	Luis Murillo. Francisco Rodríguez.
Executive Director of the Training Centre for Information Technology (CENFOTEC) and Member of the Technology Research Club.	Ignacio Trejos
Costa Rican Chamber of Information and Communication technologies (CAMTIC) and Internexo Manager Technology Company.	Paul Fervoy.
Science and Technology Coordinator (CONICYT)	Vinicio Porras
Centre of Informatics and Industrial Technological Management. (CEGESTI)	Pablo Rojas.
National Center for Clean Production (CNP+L)	Carlos Perera