

**The climate changes, threatens and demands adaptation:**  
*A look at the Cuban experience of protection against climate change*





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## Executive Summary

This study comes about through the interest of Oxfam in deepening and clarifying the elements that are at the foundation of the processes to combat climate change, developed and implemented in Cuba since the mid nineties. The general perspective is that there are useful elements that should be incorporated into regional and global campaigns on climate change.

The objectives of this study are to identify and share the good practices and policies of the Cuban State and people with regard to climate change. Specific areas of interest were prioritized, including: identifying current and future risks attributable to climate change, protecting lives from climate change hazards and reducing the impacts of climate change on agriculture.

Over the last four decades Cuba has made important progress in developing policies and practices for emergency preparedness and response, especially for disasters provoked by hurricanes. This effort has been the result of a combination of directives and priorities identified by the central government, along with initiatives from the population itself, already accustomed to more than four decades of exercises and real evacuations that must be carried out several times per year.

The effects of climate, though already severe, are growing ever more harmful for water, soil, agriculture, health and the forests on the island. There is already evidence of problems in the water supply, erosion, decrease in crop yields, proliferation of vectors which cause disease and reduction in forest coverage. Future scenarios point to devastating effects over the coming decades in practically all under-developed countries. One of the advantages that Cuba has for facing climate risks is its complex and effective national civil defense system that allows the country to minimize – or even eliminate – the loss of human lives during the severe hurricane season that the Cuban people face year after year.

Starting in the early nineties a research program began on the impacts of climate change on the population, agriculture, water and health. These efforts continued throughout the rest of that decade and into the next. Some of the most concrete achievements include acquiring capacity for identifying climate risks, developing educational and communication programs, promoting human safety, health maintenance, supporting agriculture and protecting natural resources, all in the context of adaptation to climate change.

Despite this, Cuban society still faces enormous challenges. These include the extension of agro-ecology practices, reduction of damages caused by disasters, expanding preparedness practices, improvement of early warning systems and progress in the “Energy Revolution” to de-centralize and generate energy more efficiently and free from oil.

**The main lessons that Oxfam has identified in Cuba's strategies for adaptation, risk reduction and disaster response are:**

**a. Preparation for hurricane response improves risk reduction and adaptation to climate change.**

Cuba began its program of climate adaptation with simple efforts to prepare for disasters caused by hurricanes. We can now say that through education, dissemination of warnings, use of the mass media, local organization and the watchful attitude of the population, Cuban society in general is now at less risk during these kinds of events, and is better adapted to face a scenario in which extreme events including hurricanes will be more intense and frequent.

**b. Climate change can be dealt with starting with social models that put people at the center of the State's responsibilities.**

Many measures now viewed as adaptation efforts were not originally seen through that lens when they were implemented in Cuba in the sixties. Supplying drinking water for the majority of the population, providing health care and universal education are now basic tools for climate change adaptation. These efforts help explain why the Cuban model of disaster risk reduction is considered to be one of the most effective in the world.

**c. Protecting and preserving ecosystems benefits adaptation.**

The pioneering efforts to protect soil, decontaminate and preserve water resources, improve forest coverage and adopt agro-ecology practices have been shown to control the risk of disasters caused by climate and facilitate adaptation of human and natural systems to climate changes. Basic ecosystem functions are indispensable to absorbing climate impacts with minimal trauma.

**d. Issues of adaptation, disaster risk reduction and human development are closely linked.**

Problems caused by disasters and climate extremes are the result of prior development processes that led human and natural systems to lose their capacity to contend with natural phenomena cycles with minimal trauma. Disaster risk reduction and the need for adaptation to climate change depend on improving the standard of living for the people. Access to housing in safe areas, basic education, timely information, health services and healthy ecosystems are at the foundation of the pioneering efforts for human safety described in this document.

Social investment, high levels of education and instruction for the population and the priority the Cuban government has assigned to tackling climate change are all key factors that explain the progress made on this issue. Other elements that favor successful coexistence with climate risks are: the capacity to implement national programs for the reduction of energy and water consumption, and to promote agro-ecology practices that are more resilient to the effects of climate change.

Despite Cuba's different economic, social and political model, Oxfam recognizes its climate change strategy exhibits interesting and relevant elements for reflection. This conclusion is reinforced by Cuba's cooperation with various countries on these issues, and demonstrated by the fact that civil defense authorities from other countries visit Cuba to study its experience. Delegations from peasant organizations around the world also travel to the island to study agro-ecology.

Many of Cuba's strategies can also be implemented by local governments elsewhere, which now hold greater power and administer more resources than ever before. Their proximity to the population and the actors within the territory – in many cases accompanied by international cooperation agencies – can be effective for developing and implementing local strategies to face the challenge of climate change.

In this context, it is important to highlight the learnings that Cuban case offers which can be useful for other countries that face the great challenge of growing impacts of disasters in the context of climate change. The crux of the issue is the level of political willingness that governments have to put humans at the center and as the final beneficiary of their policies and actions.

# Introduction

This study springs from the interest of the Oxfam cooperation agency in deepening and clarifying the strategies to combat climate change that have been developed and implemented in Cuba since the mid-nineties. The general view is that there are useful elements that should be incorporated into regional and global campaigns on climate change.

The objectives of this study are oriented toward identifying and sharing best practices and policies of the Cuban State and people with regard to climate change. Specific areas of interest were prioritized, including: identifying current and future risks attributable to climate change, protecting lives from climate change hazards and reducing of the impacts of climate change on agriculture.

Research included an extensive program of structured interviews<sup>1</sup>, bibliography and document review, and field visits that were held for a period of approximately one month in September and October, 2009.<sup>2</sup>

Since the sixties, in part out of necessity after the devastating impacts of Hurricane Flora in 1963, Cuba began a pioneering effort to protect the lives of its inhabitants through a widespread process of preparation for emergency and disaster response, especially for those emergencies caused by hurricanes.<sup>3</sup> The attention paid to the issue of disasters is imbedded in a complex civil defense system which works to ensure that the moment a hurricane hits, people and some of their goods are protected.<sup>4</sup>

In terms of preparation and response the characteristics of the Cuban model are fairly clear. The same does not hold true with respect to disaster risk reduction, a concept that is related but radically different from disaster management, and which can also be found in the practices developed in Cuba. Here widespread efforts have been made in the fields of identifying risk factors, land use planning, promoting education, building safety, protecting agriculture and recovering forest resources.<sup>5</sup>

More recently, and in the context of the crescendo of discussion around climate change, its causes, effects and possible intervention options, Cuba has been one of the countries at the forefront of adopting measures to improve understanding of the phenomenon and to implement actions reducing the vulnerability of the population to a climate that is not only variable but also changing.<sup>6</sup>

The lessons, methodologies and practical experiences that Cuba offers could be the subject of greater debate and analysis to evaluate their possible contributions toward other efforts to confront climate change in other countries in the Latin American region or around the world.

This would not be the first time that Oxfam benefits from the learnings derived from the Cuban experience in climate-related disaster risk reduction.<sup>7</sup> The island's experience in the field of climate change can now be understood, from the perspective of adaptation, as intimately linked to hazards, disasters and their management.<sup>8</sup>

This is why Cuba appears as one of the countries with the greatest relative progress in the field of adaptation. Cuba's advances in disaster management and disaster risk reduction have allowed it – without explicitly trying to do so – to be at an advantage in the face of the possible challenges of an uncertain and changing climate with more frequent extreme events such as hurricanes: This is precisely the specialty of the national civil defense system.<sup>9</sup>

The essay is divided into six sections. The first section offers a brief overview of the impacts of climate change in Cuba in selected strategic sectors. The second section characterizes the components and processes that aid in understanding the Cuban civil defense system.

In the third section the initiatives related to the reduction of the climate hazards are discussed in further detail. Evidence is offered that the approach taken in the past with regard to the problem of disasters, and later of hazards, fits perfectly within the parameters of what we now consider appropriate adaptation to climate change.

Sections four and five contain the principal findings of the study in terms of progress made in the field of mitigation and remaining challenges and lessons learned in Oxfam from the Cuban model of climate risk reduction, respectively. Finally, the sixth section presents the principal conclusions of the study on adaptation, mitigation, risk reduction and disaster response.

# 1. The effects of climate change on natural resources, agriculture and health

*“Climate change provokes significant soil degradation. The high intensity of precipitation, cyclones and hurricanes and sea water intrusion lead to an increase in salinity. This in turn demands specific measures and the support from the farmers responsible for applying the technical measures proposed by the Soils Institute”.*

**Mario Riverol, Researcher at the Soils Institute**

**In this section data is provided to offer a clearer idea about the effects of climate on water, soils, agriculture, health and forests, already severe and growing more damaging.**

## 1.1 Natural resources

Climate change leads to a reduction in annual precipitation due to greater frequency, duration and intensity of droughts<sup>10</sup> and to the severe contamination of subterranean waters from rising sea levels and salinity<sup>11</sup>. Future scenarios by international organizations project that this trend will intensify in coming decades. These phenomenon are particularly concerning in the Caribbean, where they directly affect the availability and quality of water in coastal aquifers. “Island states, often small, are very vulnerable to all of these circumstances as we have no rear guard. There is nowhere to go” explains Arnaldo Álvarez of the Ministry of Agriculture<sup>12</sup>.

Cuba is a very vulnerable country in terms of availability and distribution of water resources. Rainwater is the only water source. Moreover, between 1960 and 2000 precipitation fell by between 10% and 20%. The country lacks great rivers. Its most important aquifers are exposed to saline intrusion<sup>13</sup>.

Mario Riverol, a researcher at the Soils Institute, notes that “Climate change provokes significant soil degradation. The high intensity of precipitation, cyclones and hurricanes and sea water intrusion lead to an increase in salinity. This in turn demands specific measures and support from the farmers responsible for applying the technical measures proposed by the Soils Institute”<sup>14</sup>.

In the eighties, a 1:25,000 scale topographical study of Cuba’s soils revealed the magnitude and intensity of the processes of degradation. The results showed that over 40% of soils suffered from erosion, an alarming figure given its direct impact on agricultural yields. Soils in Cuba, according to data from 2004, exhibited poor drainage (40.3%); salinity (14.9%); low levels of organic materials (68.7%); acidity (40.3%); fertility (44.8%), compacting (23.9%) and erosion (43.3%)<sup>15</sup>.

Climate change also threatens Cuba’s forests due to rising sea levels (in the case of the mangroves), median temperatures, extreme natural events (hurricanes) and reduction in average rainfalls. Therefore it is necessary to continue to increase forest coverage. This is the objective of the Plantation Program, which seeks to achieve 29.4% forest coverage by 2015.

In a scenario in which temperatures rise by 2.6° C, Cuba could suffer an increase in sea level of 9 centimeters by 2030 and 17 centimeters by 2050. Other scenarios that assume a temperature increase of 4.2° C project a rise in sea level of 15 and 27 centimeters, respectively, for those same years. This rise would translate to an estimated loss of 6% of the territory and 14% of coastal forests by the year 2100, especially mangrove forests, as a consequence of marine intrusion<sup>16</sup>.

Marine intrusion is already seen in diverse areas as a consequence of dammed rivers, deforestation and coastal erosion caused by anthropic activities. To the south of Havana in Batabanó Gulf and Ensenada de la Broa, a swampy area bordered by mangroves providing a natural coastal shield against hurricanes, irreparable damages have already occurred. Coastal erosion has caused the coastline to retreat between 30 and 90 meters over the last five to ten decades, eliminating the red mangroves, the principal coastal protection in the area<sup>17</sup>.

Another especially revealing case of marine intrusion is the case of the Ciénaga de Zapata (Zapata Swamp), located in the Matanzas province. The region holds the greatest quantity of natural forests in the country (14%). La Ciénaga de Zapata, the largest wetland in the Caribbean, will disappear primarily as a consequence of the rising sea level.<sup>18</sup>

Drought is another frequent climate hazard for agriculture, and it represents an important obstacle to the efforts to guarantee food security in the country. The drought suffered in the eastern region between 2003 and 2007 demonstrated the great vulnerability of Cuban agriculture to this hazard. Tens of thousands of head of cattle were lost, and water for the more than 300,000 inhabitants of the city of Holguín had to be hauled in trains and trucks for months.<sup>19</sup> Cuban scientists warn that drought may expand and grow more severe in the eastern region where over 25% of the Cuban population lives.<sup>20</sup>

## 1.2 Agriculture

Agriculture is one of the production activities most sensitive to changing climate conditions. In Cuba, as in other areas of the Caribbean, there are added threats to agriculture from sea water intrusion into freshwater courses, rising median temperatures with ever shorter rainy seasons, suffocating summer (dry season) temperatures, heavy rains and extended periods of drought.<sup>21</sup>

An increase in the surface extension, duration and intensity of agricultural droughts, along with soil degradation and a reduction in water resources, will cause many species of animals and plants to undergo transformations in their lifecycle, with a notable reduction in agricultural yields for the most fundamental staples of the country. Other consequences of climate change in the agricultural sector include modifications in the behavior of pests.<sup>22</sup>

The intense hurricane season of 2008 generated declines in agriculture and livestock production (700,000 tons of food were lost in just 10 days), in addition to damages in fields and agricultural facilities that led to a further reduction in agricultural production of 7.3% in the first quarter of 2009. In Cuba, the impacts observed in tobacco and potato crops reflect climate changes in the country from the second half of the previous century..

Potato production, as a mild temperature crop, requires irrigation in Cuba and could become impossible to continue by the middle of this century. In 2008 the nocturnal temperature in Cuba rose four degrees above the median, which resulted in a reduction of 35% in the production of this tuber. The introduction of a potato variety that is more resistant to the new climate conditions is being studied as an adaptation measure.

### 1.3 Health

Various international organizations have stated that climate change is the greatest health risk of this century. Its effects will spread rapidly, and with great scope and intensity. According to the Inter-Governmental Panel on Climate Change (IPCC), the negative health effects caused by rising temperatures will depend on factors such as education in the population, sanitation aid, public health infrastructure and economic development<sup>23</sup>. The more these capacities are developed by a society, the greater its capacity for adaptation.

Small increases in temperature can have grave effects on people. In Cuba the median temperature has risen by .07° C since 1951, and by the year 2100 an increase of between 2.7° C and 7° C is expected according to different scenarios<sup>24</sup>.

With these forecasts, an increase in cardiovascular and respiratory disease is expected, along with greater incidence of infectious diseases such as dengue fever, diarrhea, chicken pox, and other viral illnesses. There will also be an increase in allergic and asthmatic conditions, skin cancer and ocular lesions (cataracts)<sup>25</sup>.

The Cuban population is trending toward greater longevity. When a significant part of the population reaches 60 years of age or older, it will be exposed to greater risks due to effects associated with climate change. In areas of the Pinar del Rio province where there have already been certain levels of salinization, there are blood pressure problems now being detected due to high concentrations of salt in drinking water<sup>26</sup>.

As a result of climate change, many natural processes of degradation of resources such as water, soils and forests will become more intense and frequent (as in the case of hurricanes and salinization). Alterations in temperature and humidity will translate to disruptions in the production of essential crops. There will be additional effects from the outbreak and proliferation of viruses, bacteria and fungi.

On a national level Cuba has been very aware of these problems. The country has developed a complex system for disaster management and risk reduction to protect its population against the threat of hurricanes, and to maintain balance with its natural surroundings.

## 2. Responding to hurricanes: An example of disaster risk and impact reduction in Cuba

Despite the continual impact of hurricanes and droughts in Cuba, this country is recognized around the world as an example of good practices in disaster risk reduction and disaster management. Its broad civil defense system includes a series of legal, institutional and educational initiatives, as well as attitudes fostered among the population. This system protects lives in the cases of extreme hazards such as hurricanes and reduces losses and damages in less severe cases such as localized flooding or droughts.

*In the case of disaster risk reduction and management associated with hurricanes, the Cuban model includes a series of preparatory actions for response that are based in the formal education system, annual large-scale simulations and a broad framework of logistical support that involves practically all areas of State resources.*

As a result, although total losses and economic damages may be high, the losses of human life are extremely low. This is especially evident when compared to what happens in neighboring countries such as Haiti, the Dominican Republic and Honduras that are also affected by hurricanes.

In 2008, hurricanes Gustav, Ike and Paloma caused substantial damages in over half a million homes, making them the most devastating storms in Cuban history. Material losses reached ten billion dollars, equaling 20% of the Gross Domestic Product, with 5 billion dollars of that total in the housing sector alone. This total exceeded all of the damages recorded from 2002 to 2008, some eight billion dollars. Despite this, the death toll was only six men and one woman (see table 1 for a panorama of the approach to women's issues in cases of disasters).



Photo 1: Damages to homes in the wake of Hurricane Gustav in San Cristóbal, Pinar del Río. Marc Ingelbrecht

*Table 1: Cuban women and socio-natural disasters*

Factors affecting human vulnerability to socio-natural disasters include health, environment, organization, institutionality, construction, education level, economic status, access to information and participation in decision-making. Women in developing countries have, generally, less access than men do in each of these categories, limiting their capacity to confront and recover from impacts. Likewise, the responsibility to “keep the home afloat” falls often upon women, who ensure that the family has food, water and energy (firewood, charcoal, etc.)

The situation for Cuban women (51% of the population of the country) is quite different in this sense. According to official reports, Cuban women account for over 66% of the professional and technically trained workers of the country, 49% of the researchers, 63% of university graduates, and overall 45.6% of the workforce and 38.3% of management. Approximately 30% of the recently created Centers for Risk Reduction Management are directed by women.

The Human Development Index classifies Cuba in position 51 out of 177 countries<sup>27</sup>. When this is combined with the development index related to gender, which takes into account factors of sexual inequality, Cuba is positioned at number 2 out of 156<sup>28</sup>.

In the disaster response system established in Cuba, pregnant women, along with older and ill persons, as well as children receive special protection. They receive prior warning – door to door – regarding when, how and where they will be evacuated. Most people, approximately 80%, will go to homes of family and friends, and the rest to facilities equipped as shelters where they will be ensured medical assistance and food during their stay.

Tensions at shelters are reduced by a number of strategies including organized supervision, health services and maintenance, and keeping family groups intact. Evacuating and sheltering groups of families who are neighbors in their daily lives and who will return to being neighbors after the evacuation ends helps to facilitate coexistence.

Long-term shelters used when families lose their homes attempt to create small family cubicles to facilitate intimacy. The Federation of Cuban Women gives constant assistance and support to women and their families to help them process the difficult situation. This process is supported by social workers through recreational and participatory activities carried out by “cultural brigades.”

It is especially significant that none of the women interviewed over the course of this study expressed having felt more vulnerable than men in cases of disasters. All of the women interviewed said that they felt well informed and safe. There are no known cases of violence during stays in the shelters.

The challenge would be to transition from a protection-based approach to women, to recognizing and empowering their role at all levels<sup>29</sup>.

In 2008, the hurricane season forced the evacuation of over three million people. According to official data, nearly one half million took refuge in evacuation centers. 10,000 vehicles were used, over 160,000 students returned to their homes and nearly 3,000 tourists were relocated.

The Civil Defense System mobilized 87,000 people. The key factors in this effort were:

- A strong organizational structure at all levels, based on political will at the highest levels of decision-making.
- An appropriate legal framework and the capacity to implement it.
- A meteorological system capable of making reliable predictions for decision-making.
- Prior experiences confronting similar phenomena.
- A trusted communications system involving national and local media, and even ham radio operators
- An educated, informed and prepared population

The 2004 hurricane season, with numerous destructive storms, led to a push for the adoption of measures<sup>30</sup> for planning, organization and preparation for disaster situations. These measures required that every organization and institution (ministries, companies, factories, hotels, schools, businesses, cooperatives, etc.) generate disaster reduction plans, understand the disaster hazards and determine their vulnerability and risk in extreme situations.

Likewise, there is a monitoring and early warning system for seismic phenomena, led by the National Center for Seismic Study (CENAIS by its Spanish acronym), which maintains constant observation of the growing recent activity in the Caribbean.

Various publications such as Oxfam America's "Cuba: Weathering the Storm, Lessons in Risk Reduction from Cuba", have described in detail the characteristics of the Cuban risk reduction and disaster management systems<sup>31</sup>.

The Early Warning System (EWS) in Cuba includes four phases: information, alert, alarm and recovery. In each of these phases, and according to the location and strength of the hurricane, the population is informed of what it must do. (See tables 2 and 3 for examples of the chronologic report of the alert phases)

Protecting homes by removing antennas, water deposits and any kind of debris that can be washed away is essential to preventing damages. Evacuation of the vulnerable population by transporting people to shelters can help guarantee their safety. Shelters are generally schools or public buildings that have been conditioned for that purpose and in which food, water, health services and medicines are available.

After hurricanes have passed, efficient recovery is of the utmost importance. Efforts are made to ensure that shelter stays are as short as possible and that the population is involved in rehabilitation work. In the case of damages to homes, workers are granted a certain number of work days according to the damages sustained. Aid distribution corresponds to an assessment of

damages and the social situation in each case, prioritizing people who are sick, children, older persons with physical impairments, pregnant women, etc.

As the President of the Municipal Administration Council of Los Palacios in the Pinar del Rio province reported to an Oxfam delegation, these strategies have allowed the population itself to establish priorities, while authorities simply ensure that the different Peoples Councils (local jurisdictions) receive approximately equal resources in keeping with the number of affected persons requiring support.

*Table 2: Hurricane Michelle. A successful experience of the Early Warning System*

**October 31**

The Cuban National Forecast Center warns of a tropical storm developing, and that the population must stay alert. The Government and Civil Defense System are warned.

**November 1**

The forecast models and the meteorological situation suggest that "Michelle" will hit Cuba as a category three or four hurricane within three or four days. This threat leads to the broadcast of an Early Warning, spreading information about when the storm is expected to hit the country and which areas may be the most affected. Hurricane Plans are updated.

**November 2**

The alert phase for Eastern and Central Cuba is established. Radio and television media provide information preparing the country for the hurricane threat. Meteorological information is much more frequent and the evacuation begins.

**November 3**

"Michelle" is now officially a category four hurricane. No high intensity hurricane has hit Cuba since 1952; two generations of Cubans have never felt the effects of this level storm. Civil Defense sounds the alarm, and all evacuations and protection measures must be completed before nightfall. The Forecast Center declares imminent impact of the hurricane by the next day. All day the television stations show images of the effects of high intensity hurricanes.

**November 4**

The hurricane, with gusts of up to 250 km/hour, affects 45% of the Cuban territory, where 5.8 million Cubans, 53% of the population, lives. Damages are widespread and immense: 1.86 billion U.S. dollars in losses; 166,515 houses damaged and 12,597 homes totally destroyed, 125 electric towers destroyed, 5,761 telephone poles down, 9 TV and microwave towers down and 54% of the sugar cane crop is affected.

Despite all this, only 5 people lose their lives. The credibility and frequency of the risk message during the Early Warning avoided rumors and ensured that the population knew what was going on at all times, allowing them to take appropriate action.

In its 2008 – 2012 Framework Program, the Program Office of the United Nations Development Program (UNDP) in Cuba mentioned that the high frequency of extreme natural phenomena is affecting the capacity for recovery in the country, and that within the territory there are still variations in response capacity<sup>32</sup>.

A challenge for the future is to reduce these differences, as well as to minimize the number of people who must be evacuated and the evacuation distances. A large part of the solution lies in the challenge and goal of ensuring that every locality in Cuba has at least ten houses with strong roofs, allowing these buildings to serve as local shelters in the case of hurricanes.

*Table 3: Institutions involved in the disaster prevention system*

Civil Defense is in charge of formulating and implementing all risk reduction measures and procedures. When there is a possible danger, Civil Defense must provide decision-makers with proposed response measures. Decision-making in the course of an emergency is centralized by the General Staff of Civil Defense, in consultation with Government authorities.

Despite this centralization, such local authorities as Provincial and Municipal First Secretaries of the Cuban Communist Party (PCC), Presidents of Municipal and Provincial Peoples Power Assemblies, heads of Civil Defense in local territories, provincial and municipal leadership of each Ministry, and social organizations all carry out their response plans for each phase of the emergency.

They are supported by Centers for Risk Reduction Management at each level of government. This system allows for centralized decision-making, key in an emergency, while de-centralizing implementation, which allows for agility and flexibility in preparation and response.

### 3. Adaptation to climate change in Cuba: An early initiative in the Americas

*“Nearly 20 years ago... Cuba created the National Commission on Climate Change to study the impacts this phenomenon has on the population, agriculture, food production, the availability of fresh water and health”.*

In the beginning of the second decade of the 21st century, recognition that development processes have gravely altered the parameters of our climate obligates countries and their governments to implement urgent measures to contend with climate hazards. Adaptation to climate change is a concern for the future for most of the governments of Caribbean island states. In Cuba this effort has been ongoing for quite some time, and involves not only the creation of plans but also concrete actions in the field.

Previous efforts for capacity-building in preparation for and response to hurricanes have been an advantage in the adaptation process. At the same time, a series of novel and illustrative actions have been carried out in the fields of health conservation, protection and sustainable use of natural resources, territorial planning, reduction of the vulnerability of the agriculture and livestock sector, and reinforcement of homes and infrastructure.

Nearly 20 years ago, in 1991, before there was an international commitment to tackle the causes of climate change, Cuba created the National Commission on Climate Change to study the impacts this phenomenon has on the population, agriculture, food production, the availability of fresh water and health. In 1991, President Fidel Castro expressed in the Rio Summit that: “There is a species at risk of extinction: man.” This statement helped to prioritize research on the issue in Cuba. In 1997 the National Climate Change Group, which carried out the first assessment on variations and changes observed in Cuba’s climate, was formed.

In the First National Communication on the United Nations Framework Convention on Climate Change in 2001, Cuba drafted a series of concrete measures for the rational use of water resources, protection of beaches and mangroves, agricultural improvements, conservation of forest resources, appropriate use of territorial planning, protection of biodiversity and wildlife, and preparation of the healthcare system’s strategy for adaptation to climate change<sup>33</sup>.

Since 2007 work has been done to develop and implement a Cuban Society Program to Face Climate Change. According to Cuban specialists, the plan analyzes all sectors of the Cuban economy in terms of adaptation, underlining the existing hazards, vulnerabilities and risks. Hazards and challenges to water resources, agriculture, coastal areas, health, biodiversity and human settlements are analyzed down to the municipal level.

Ramón Pichs, the Sub-Director for the World Center for Economic Research and Co-President of the IPCC Working Group III, explained in an interview that: “Strategies for response to climate change in Cuba are based on the recognition of climate change as a relevant problem that requires commitments at the highest political levels. There are two basic response strategies: adaptation and mitigation. Both strategies should be complementary”<sup>34</sup>.

Adaptation seeks to reduce the vulnerability of human and natural systems to the impacts of climate change. These impacts are different for men and women, proportional to the gaps in gender equality and human development in a country.

“Nearly 20 years ago... Cuba created the National Commission on Climate Change to study the impacts this phenomenon has on the population, agriculture, food production, the availability of fresh water and health.

In Cuba, due to the extensive incorporation of women into economic and social life, the gender-based implications of climate change are less pronounced than in other countries of the South. But despite active public policies, women, , suffer the consequences of damage to housing or limited availability of fresh water with greater intensity. This is especially true if they are heads of households. Likewise, in the case of the spread of disease, women still shoulder a disproportionate burden of taking care of patients. Since adaptation to climate change is focused at the local level in Cuba, women can play an important role in highlighting gaps and differentiated needs.in territorial, municipal and local power structures

Adaptation does not totally eliminate damages, but it does reduce vulnerabilities to the greater risks brought on by climate change. Some of the main adaptation initiatives carried out in Cuba in terms of capacity-building, protection of health and water resources, agro-ecology and protection of ecosystems are examined below:

### **3.1 Accumulating capacities to identify climate-associated risks**

Given the emphasis that Cuba has placed upon education since the 1959 revolution, the island has accumulated important levels of scientifically and technically qualified human capital to analyze climate, geological and social processes related to climate change and variations.

In the scope of institutions dedicated to meteorology, the environment, education, infrastructure planning and housing development, clear efforts have been made to analyze the problems and challenges of mitigation and adaptation to climate change. There are established practices to spread information and alerts which are valuable adaptation measures. These efforts have been broad enough to allow Cuba to establish cooperation programs with other countries to provide advisory support in climate analysis and adaptation needs.

Cuba maintains high levels of investment in education and research, which has allowed the country to create its own scientific potential and to have recommendations for adaptation and mitigation processes that are an important foundation for political decision-making. National and local institutions such as the Meteorology Institute and the Environmental Agency together carry out numerous studies on climate change, variability, and resulting impacts, which are key inputs when it comes time to design and implement necessary adaptation measures.

According to the 2007 report from the Ibero-American General Secretariat, Cuba is among the most active countries of the region in South-South cooperation<sup>35</sup>. The “Reality on Aid” special report on cooperation cites that “Since the 50s, Cuba has been involved in South-South cooperation activities with over 167 countries in Asia, Africa, Latin America and the Caribbean”. (See table 4 for an example of this cooperation)<sup>36</sup>.

*Table 4: An example of South – South collaboration to face droughts*

From 2003 to 2005 scientists and experts from Cuba and the Dominican Republic studied the tendencies and frequency of meteorological and agricultural droughts in said countries. This has led to knowledge transfer, improvement in the National Surveillance System, Forecasts and Early Warning for droughts in Cuba, and the creation of the initial foundations for system development in the Dominican Republic. This collaboration has built capacity in both countries to reduce vulnerabilities and strengthen response to droughts through policy recommendations and proposed adaptation actions and measures. One value-added element is the replicability of the model and usefulness of the recommendations for other Caribbean countries.

In terms of aspects linked to climate change, Cuba has participated in projects with other Caribbean and Central American countries.

Cuba has been investing in education for decades, and that has led to greater awareness and preparation of the people in the case of socio-natural disasters and climate change. Obligatory schooling up to age 14 is a key arena for teaching issues related to climate and risk reduction. This topic is included in specific subjects that may also include first-aid exercises.

Since 1986 Civil Defense has carried out an exercise called “Meteor” each year at the beginning of hurricane season. The purpose of this exercise is to train the population, and institutions, about how to act in case of hurricanes.

The media also plays an important role. Radio and television (95% of homes have electricity) periodically broadcast information programs and messages on risk reduction, mitigation and disaster preparedness. Weather forecasts from the Meteorology Institute on television news programs are a main source of information for the population, and they are broadcast frequently. This meteorological information is complemented with reports from affected areas, unifying efforts and resources with municipal television centers and provincial channels to inform about preparation, effects suffered and reconstruction efforts. In one case a video produced by a youth group in the municipal television station of Jesús Menéndez in the province of Las Tunas was later broadcast on the evening news of the national station and was very moving.

The Cuban Program to Face Climate Change includes research and mapping of hazards, vulnerabilities and risks for the entire country, including strong winds, intense rain and seawater intrusion, among others. The rising sea level, with direct effects for tens of thousands of inhabitants of the southwestern region of Cuba, may lead to a greater number of floods and seawater overflow into several cities and main economic centers.

The Physical Planning Institute is the institution in charge of establishing risk levels for settlements in coastal areas, along rivers, on hillsides and mountains, etc., and of deciding where building may be done. Defining risk zones for hurricanes helps to reduce their effects.

After disasters, the National Housing Institute coordinates with authorities to assess the damages to homes, deciding which must be rebuilt, reinforced

or repaired. A work plan is designed for each of the houses affected and resources are thus distributed. Nevertheless, the shortage of construction materials and the economic restrictions in the country impose severe limitations and extend reconstruction timelines.

In Cuba, flooding, landslides and forecasts of rising sea levels are promoting the adoption of adaptation measures with the objectives of:

- Reducing migratory movements from the mountains to the coastal plains.
- Improving access roads to coastal settlements, essential for evacuating the population in case of disaster.
- Avoiding urban, industrial or tourism constructions with a projected use of over 50 years in the coastal areas most exposed to rising seas.
- Building defensive engineering works (dikes) in coastal areas, gradual relocation of certain coastal settlements and improvement of existing construction.

### 3.2 Health system: a rapid response system to confront climate risks

Daily practices to deal with vectors for diseases have helped Cuba to adapt to climate change. There is a complex existing system of early warnings and outbreak control measures that are vital for adaptation in a context of climate change in which the proliferation of viruses, bacterias and fungi is anticipated.

Climate change represents a challenge for the National Health System, not only because certain climate situations have produced increases in diarrheas, severe respiratory infections and chicken pox, but also because these health problems can appear in different months and seasons from their historical patterns<sup>37</sup>. Despite a strong program over the last 19 years to substitute the importation of pharmaceutical supplies and medicines through which the country now produces 562 of the 869 medicines used in its health system, it continues to depend on importation for the rest and there continue to be temporary partial shortages.



Photo 2: To face the health challenges of climate change, measures are being taken to strengthen the primary care system and take preventative actions. Baldrich/Oxfam

Cuba has a rapid response system to combat vectors for disease and pests based on an Early Warning System that generates quarterly, monthly and daily reports. This system allows for predictions to be made on the behaviors and probable dangers of different diseases, which serve to orient an appropriate response. The “Sentry” system detects foci of infection in order to avoid epidemics (see Table 5 explaining citizen collaboration in the health system.) In this process, the cooperation of the media and schools is fundamental to achieving the collaboration of the population in trash collection and in monitoring the hygiene conditions in water deposits.

To face the risks that climate change poses for health, actions are being taken to strengthen the primary care system and preventative measures, to improve the system of epidemiological monitoring, to bolster hygienic and sanitary conditions in human settlements, to expand water treatment systems and to strengthen vaccination programs for high-risk groups.<sup>38</sup>

*Table 5: Citizen collaboration in the healthcare*

Citizen collaboration is mainly accomplished through existing structures (for example the Committees in Defense of the Revolution and the Federation of Cuban Women), in workplaces, with social workers and in military training units. This strategy was implemented after the dengue fever epidemic of 2001 – 2002. The Ministry of Public Health decided that to ensure good prevention it was necessary to incorporate the population into community-level work. Since then, and especially in cases of sanitation emergencies, a door-to-door system has been established. Health surveys identify dengue symptoms including headaches, muscle pains, high fever and others. Once an infection focus is discovered, it is reported and greater levels of service, observation and intervention are provided.

### 3.3 Adaptation in water systems

Water use and shortages have been dealt with in Cuba since the late sixties, when a national effort began to increase access to potable water for the general population. Later, and with climate change impacts and projections, the Cuban government has continued in its policy of expanding coverage while taking into account the needs for decontamination and rational water use.

At the beginning of the 21st century, Cuba declared adaptation measures to be a priority, seeking to be more efficient in the use of water for irrigation, to protect water sources from salinization and to reduce contamination. Likewise, efforts have been redoubled to educate the population and to enable them to adopt sustainable practices for water use and for the protection of water resources.

The significant number of reservoirs built, especially from 1967 to 1990, has allowed the country to use 239 reservoirs and 800 micro-dams to ensure access to water for 95.6% of the population and sanitation for 94%.<sup>39</sup> This hydro-development covers the great part of demand. Despite these levels of access, the annual availability of 1,221.5 cubic meters of water per inhabitant is classified as a situation of water stress. In addition, there are effects in certain aquifers from the rise in sea levels and the reduction in river flow due to upstream dams.

As part of the aforementioned Cuban Program to Face Climate Change, the National Water Resources Institute developed an Action Plan for Water Resource Adaptation to Climate Change and a Water Savings and Rational Use Program.

Contamination was detected in the hydrographic basins of certain provinces in the country in 1997 due to the growing contaminant load as a result of the absence of waste water treatment systems or of insufficient treatment. These deficits have not been corrected in the short term due to the lack of economic resources to do so.

To satisfy the needs of those areas of the country that have a water deficit, inter-basin transfers are being executed, including Holguín – Camagüey, Northern – Southern Guantánamo and Sancti Spiritus – Camagüey. This is an enormous investment for the country and an example of what may be supported by compensation funds provided by polluting countries <sup>40</sup>.

In its First National Communication in 2001, Cuba concluded that policies for adaptation to climate change should guarantee the rational use of water resources. To that end, the following measures are being adopted:<sup>41</sup>.

- i Rehabilitation of aqueducts and sewers in the principal cities of the country and other important locations for more efficient water use
- ii Increased maintenance of the national water infrastructure
- iii Greater efficiency in water for irrigation (60% of the total) through the application of appropriate technologies, thus reducing losses in transport and distribution
- iv Review of the water consumption norms for crops and adaptation of different varieties to new drought patterns
- v Reducing the contaminant load in receiving bodies of water through the treatment, re-use and economic exploitation of waste water and solids
- vi Construction of dikes against the intrusion of sea water
- vii Relocation of wells to no less than 2 or 3 kilometers from the coast and modification of their design and use
- viii Promotion of the rational use of water with incentives for saving water
- ix Improved collection, storage and use of rainwater and treated waste
- x Improved environmental education for the sustainable use of water

### 3.4 Adaptation through agro-ecology and sustainable ecosystems

Ecosystems are fundamental for the reproduction of human life. They provide basic environmental services for air, water and food supplies, in addition to playing an essential role in regulating climate. Along these lines, the measures developed in Cuba for conserving soils, adopting agro-ecology, combating conditions of drought and preserving forests are now seen as valid practices to increase crop yields, maintain essential basic services and improve capacities for adaptation to climate change.

Although in 2006 over 60% of Cuban lands were for agricultural use, Cuba is a country that imports nearly 80% of its food. At the same time, the proportion of cultivated lands diminishes year after year, going from 65% in 1989 to 49% in 2005. A program to transfer idle (usufruct) lands launched in September, 2008, received 120,000 requests by April, 2010 for nearly one sixth of the total agricultural fund (over one million hectares).



Photo 3: Valle de los Ingenios accounts for 70% of the agricultural lands of the municipality of Trinidad. Due to monoculture, soils have been degraded and yields have fallen. With the introduction of agro-ecology, cooperatives have been able to double and even triple production. Baldrich/Oxfam

Soil degradation and erosion (inherited in large part from the colonial period, in addition to the effects of 30 years of the green revolution<sup>42</sup>), have resulted in some three million hectares with low fertility levels. This may be the environmental problem of the greatest magnitude in the country. For that reason in 2001 the National Soil Conservation and Improvement Program was implemented to contribute to the rehabilitation of affected lands and to the national food program.

The program promotes soil conditioning techniques among farmers, seepage control through channels and barriers, terracing and contour planting, drainage (fundamental to diminish salinization and loss of biological activity in soils) and quality control for irrigation waters. From 2001 to 2008 farmers have been paid 102 million pesos for the correct application of these kinds of measures in over 600,000 hectares of land around the country. The success of the program is reflected, among other aspects, in the increase in hectares that the program covers each year and the annual increases attained in the application of worm castings and compost. In the production institutions where the program is applied, greater average crop yields can be observed, along with improvements in the environment in general, according to Soils Institute Specialist Mario Riverol.

Since the mid nineties, the need to find alternative fertilizers for degraded soils led the National Association of Small Farmers to implement a national agro-ecology program with "farmer to farmer" methodology. Currently over 100,000 rural and farming families in the country are producing and applying green fertilizers, compost, vermicast, organic fertilizers, microorganisms and other methods. This effort is deemed by the "Vía Campesina" global network as the largest in the world <sup>43</sup>.



Photo 4: Over 100,000 Cuban farming families produce and apply green fertilizers, compost, vermicast, organic fertilizers, microorganisms and other materials. This experience is deemed by the "Via Campesina" global network to be the most extensive in the world. Baldrich/Oxfam

Achievements include the application of organic fertilizers – with a production of over 150,000 tons of worm castings in the first semester of 2007 – incorporation of harvest wastes and green fertilizers, production of compost, use of manure, biological materials and animal power, among other initiatives. In 2008, after the impacts of 3 hurricanes in the country, rural family agriculture showed good indices of resiliency with only a 13% drop in production compared to 2007. Agro-ecology plots and plantations had fewer losses, around 50%, while monoculture plantations lost between 90% and 100%<sup>44</sup>.

Agro-ecology, compared to conventional monoculture agricultural systems in which men play predominant roles (which reinforces their power within families), favors the incorporation of women and entire families in agricultural activities, diversifying income sources and contributing to more equitable relationships within family structures. Agro-ecology is, without a doubt, one of the foundations for sustainable rural development <sup>45</sup>.

To reduce the impact of droughts, different inter-basin transfers are being implemented in the eastern and central zones of the country, which allow for better distribution and storage of water in drought contingency plans. Work is also done to improve the surveillance and monitoring of extreme events as an adaptation measure. Early Warning Systems (EWS) for droughts (both meteorological and hydrological) include diagnosis, prognosis and information systems.

To produce food under conditions of reduced moisture in soils as the result of rising temperature and reduced precipitation, adaptation strategies are being promoted, though some are still at a theoretical level and pending implementation. Strategies include:

- i. Greater efficiency in water use for crops (agriculture consumes 60%-70% of the water resources), through improvements in irrigation technology, training and capacity-building in irrigation techniques and water management for superficial irrigation, etc.
- ii. Progressive introduction of crops and varieties that are more resistant to droughts and pests, using practices in which scientists and farmers work together to improve seeds.
- iii. Redistribution of crops in the country to ensure that if a region is affected by an extreme event there are certain production levels in other regions, as well
- iv. Recommendations given for planting only when the minimum required moisture in soils has been reached (to avoid loss of seeds)
- v. Specialization of crop production by territory according to climate conditions to avoid the effects of agricultural, meteorological and hydrological droughts (in potatoes and rice) or effects of hurricanes (in citrus crops)
- vi. Increased refrigeration facilities, seed banks and local seed production appropriate for each micro-climate in municipal seed producing plantations or by local producers and their cooperatives.
- vii. Development of agriculture and livestock production in higher elevation areas
- viii. Planting of short-cycle varieties such as vegetable crops in areas where there is some moisture
- ix. Greater resistance and crop durability in droughts through agro-ecology
- x. Installation of semi-protected crop systems, sheltering crops from solar radiation.

Reforestation began in Cuba in 1959 when forest coverage in the country was at 14%. In 2007 coverage surpassed 25%. "Cuba is one of the few countries in Latin America that reports sustained annual increases in forest coverage" affirms Arnaldo Álvarez, of the Ministry of Agriculture <sup>46</sup>.

To respond to climate change Cuba is applying the following measures in the forestry sector:

- i. Forestry policy that includes reforestation and management to increase coverage.
- ii. Energy forestry to avoid degradation in protection forests.
- iii. Replacement of firewood cooking methods with electric methods through the mass distribution of electric cooking devices.
- iv. Strengthening investigation and control of poaching and extraction in forests to avoid further degradation.
- v. Creation of forest plots for forest recovery, including payment for environmental services to families living on the plots.
- vi. Growing involvement of the population in reforestation.  
(See table 6 for details on citizen collaboration and forestry)

*Table 6: Citizen collaboration and forestry*

For over 15 years the “Plan Turquino – Manatí” was in place to provide socio-economic support to families living in mountainous areas, with the objective of allowing them to continue to reside in these areas. This plan included reforestation and forest management with the participation of the local population.

In the nineties the reforestation program created the Bonus System to give incentives to small rural families for participating in this kind of work.

In the forest plots land is given to a plot-holder, who receives a salary and a home. A portion of the terrain is dedicated to producing food for family consumption and sale. This system is also open to individual owners and cooperatives. If upon finishing the third year the planted (repopulated) area has a survival rate of 60% or more, the farmer begins to repay less than the established price for the loan requested for reforestation. In the case that the survival rate of the reforested area is 90% or greater at the end of the third year, the State gives the farmer a bonus that may be up to 30% of the initial investment.

The government budget assigns extensive resources to the bonus system that, despite this, are almost never fully spent. One of the challenges lies in ensuring that this alternative is more fully taken advantage of by the farmers and plot-holders.

This fund could also receive contributions from countries from the North, without being linked to emissions rights or other market mechanisms.

## 4. Climate change mitigation and energy revolution

*“The Energy Revolution proposes a reduction in energy consumption down to one third of the level consumed in 1990, and it includes measures that range from social actions to energy policies”.*

If all of the countries in the world had per capita carbon emissions similar to those in Cuba, humanity would not be facing as severe a crisis as the one before us now. Cuba does not have quantitative commitments for emissions reduction. However, since 2005 the “Energy Revolution” project adopted to increase energy savings, efficiency and renewable sources has allowed Cuba to reduce greenhouse gas emissions and to contribute, albeit humbly, to the mitigation of climate change.

The Energy Revolution proposes a reduction in energy consumption to one third of the level consumed in 1990, and it includes measures that range from social actions to energy policies. Over nine million incandescent light bulbs have been replaced at no cost. This measure, still being debated in many industrialized countries, has been implemented with support from Cuba by Venezuela, Bolivia, Nicaragua, Panama, Nigeria and other Caribbean countries.

Other measures for energy savings have included replacing older refrigerators, water pumps, air conditioners and other appliances with new models, which families pay for over time. The aforementioned distribution of three million cooking appliances has increased electricity consumption but allows for savings in propane gas. The final savings in fuel for electricity generation is estimated at 680 thousand tons of oil annually. The gas that is a byproduct oil production, previously simply released into the atmosphere, is now used in cooking food and obtaining electricity.

Another measure has been the decentralization of electric energy generation through the construction of local generation plants which have reduced losses in energy transportation and vulnerability in the case of disasters. In 2008, after hurricanes Gustav and Ike, only the hardest hit areas were without electricity for more than one week. Previously, damages in high tension lines would cut off energy for 2 to 3 months. All in all, the challenge of de-carbonizing the energy grid in the country still persists.

The Energy Revolution also promotes greater use of renewable energies. Eolic energy has passed its trial by fire as the three existing facilities for wind power resisted the direct impacts of two hurricanes in 2008. Traditionally windmills are used in agriculture, particularly to bring water up from wells for cattle. There is a country map identifying the most ideal areas for installing eolic parks, and energy production through eolic means is projected at 500 megawatts by 2020. This goal will depend on the availability of financial resources to pursue it.

Despite important progress made by Cuba in solar energy in the nineties, its 8,111 solar modules are located above all in social facilities such as health centers, schools, and community video rooms, in houses in isolated areas and in tourism facilities. The widespread use of solar energy is doubtless a technological and financial challenge for the country.

Generation of hydropower is currently growing through a program in collaboration with China which will multiply several times over the current volume of power generated. But due to its geographic conditions, this source cannot even contribute 10% of the electric energy consumed by the country. Other forms of renewable energy include biomass, particularly sugar cane, still in the research phase.

## 5. Current challenges and lessons learned by Oxfam in Cuba

*“The political will that governments have to place human beings at the center and as the end objectives of all of their policies and actions is of the utmost importance”.*

Facing climate change in Cuba is informed by a holistic vision, combining actions and policies for mitigation, adaptation, risk management and disaster response, even when some of these actions were not originally considered or designed for this purpose. While the country may be the exception in certain indices, there are many aspects that could be of great interest for other countries’ policies and programs and for citizens to reclaim their rights.

### 5.1 Challenges for mitigation and adaptation

The principal ongoing challenges include:

- To reduce material losses and to fully recover from damages that will occur when a hurricane affects the island. While human lives have been saved in the case of socio-natural disasters, material damages have been copious and vulnerability remains high. Reconstruction has not always been carried out with a focus on reducing future risks, due both to shortages in materials as well as to the lack of knowledge or a rush to “resolve” as President Raúl Castro recognized several months after the hurricanes of 2008.
- To promote and incorporate into daily practice a risk reduction and disaster management approach. Hurricane Ike brought severe winds to areas of the country whose population had no prior experience with that phenomenon (hurricane Flora in 1963 caused mostly flooding). Perhaps for that reason, despite all of the warnings, many people in these areas did not have an adequate perception of these risks.
- To promote an agro-ecology approach with mixed crops and staggered vegetation across different harvest cycles throughout the year. In the year 2010 over 100,000 rural families and cooperatives were already implementing these methods. Despite this, there are still more families who do not apply these techniques and whom the government must include in their agro-ecology program. In plots that use this model, recovery was observed to be substantially faster than plots with monoculture production after the 2008 hurricanes<sup>47</sup>. Another relevant aspect is the energy balance which, while highly positive in the case of agro-ecology plots, is based mainly on hydrocarbons in the case of great extensions of monoculture production.
- To expand the energy revolution. While mitigation is not the principal challenge in a country with as few emissions as Cuba, the almost exclusive dependence on non-renewable energy sources (hydrocarbons for energy production) brings up the need to decentralize energy generation, previously based on antiquated and wasteful technology,

and to make it more efficient. The recognized need to develop new energy from renewable sources – wind, sun, water, biogas and biomass – is affected by the shortage of capital. This is one of the limitations that comes with the policies of the United States government toward Cuba that deny access to capital, technology and goods <sup>48</sup>.

- To carry out education and awareness-raising campaigns to cope with changes in agricultural production and consumption habits. This could be the case for rice, a basic staple of the Cuban diet (Cuba produces just 30% of the rice it consumes), whose production requires great quantities of water. The introduction of varieties of rice that are more resistant to hydro stress is currently being studied.
- Overcoming the green revolution schemes and transitioning to a sustainable agro-ecology system based on diversified plots.

Climate change and the needs for adaptation and disaster risk reduction that it creates, are linked to the issues of human development and the to protection of the livelihoods of the most vulnerable sectors of the population. One of the keys lies in identifying and promoting strategies that can solve the every day problems of development and improve security before an ever more uncertain climate.

## 5.2 Lessons learned

Based on observation and interactions with Cuban authorities and civil society, it is possible to extract a series of learnings. Of these lessons learned, four can be highlighted:

- a. Preparation for hurricane response requires processes for risk reduction and adaptation to climate change. Cuba began its climate adaptation programs with simple efforts for preparation in the case of disasters caused by hurricanes. Strategies of education, alerts, use of mass media, local organizing and vigilant attitudes of the population allow the society at large to be at less risk for events of this kind., Employing these strategies, Cuba is better adapted to face a scenario in which extreme events (including hurricanes) are more intense and frequent.
- b. Climate change can be faced through a societal model in which human beings are at the center of State actions. Many measures now seen as purely adaptive actions were not understood as such when they began in Cuba in the sixties. Potable water supply for the majority, health services and education for all are now basic tools to adapt to the changing climate. They also explain why the Cuban model for disaster risk reduction is considered to be one of the most effective in the world.

- c. Ecosystem protection and preservation of basic services facilitate adaptation. The efforts pioneered by the island for soil protection, decontamination and protection of water resources, improvement of forest coverage, and incorporation of agro-ecology practices have been shown to be very appropriate for climate disaster risk control and adaptation of human systems to climate change. The basic functions of an ecosystem are indispensable for the absorption of climate impacts without grave consequences. In the case of Cuba this has been clearly demonstrated.
  
- d. Adaptation, disaster risk reduction and human development are all inter-related issues. The problems derived from disasters, climate extremes and climate change are the result of past development problems that caused human and natural systems to lose their capacity to deal with natural cycles and phenomena without sustaining trauma. From that point of view, the issue of disaster risk reduction and the needs for adaptation to climate change are linked promoting improvement in the standard of living of the population. Access to safe housing, basic education, timely information, healthcare services and healthy ecosystems are at the core of the pioneering efforts to strengthen human security that have been described throughout this document.

The Cuban experience offers useful learnings for other countries that face the challenge of disasters in the context of climate change. The political will of governments to place human beings at the center and as the ultimate objective of their policies and actions is of the utmost importance

## 6. Conclusions

*“Adaptation, mitigation and disaster risk reduction and response in Cuba are the result of a long road travelled. The work they have done is clearly related to and dependent on the process of strengthening human security through the recovery and sustainable use of natural resources, access to water for human consumption, increased productivity through agro-ecology, sustained social investment and the construction of a broad central and local organizational fabric”.*

Relatively high and sustained social investment is one key factor for success in processes of adaptation. In Cuba’s case this investment has enabled the reduction of geographic, gender-based and race-based gaps in knowledge and participation in society.

An educated and healthy population is better equipped to face the challenges of climate change. The existence of many trained researchers is a strength. So is having a population with a comparatively high education level and a demonstrated interest in the public good.

Climate change is a main concern of the highest authorities of the country, and for quite some time it has been an issue that has been deemed a political priority at all levels. This has facilitated a sustained effort of research and actions for adaptation and mitigation. Some key elements for successful management of climate risks include the following:

### **Adaptation:**

- Multi-disciplinary research to determine effects and identify alternatives
- Comprehensive sector-based and territorial policies and programs
- Programs for training, information and awareness-raising for the population
- Construction to avoid seawater intrusion and to reduce vulnerability
- More efficient use of water and regional distribution using inter-basin transfers
- Promotion of agro-ecology systems that are more resilient to the effects of climate change

### **Mitigation:**

- Political will and the capacity to prioritize policies and investments to partially modify the electricity generation grid, with a public monopoly on the generation and distribution of electricity. This includes the willingness to develop and promote renewable energies.
- An economic system and business community that demand urgent renewal – especially with the high cost of oil.
- Capacity to dictate and implement national programs for reducing energy and water consumption, for example through replacing appliances.
- A forestry policy that increases forest coverage.
- Strong public advocacy to maintain low levels of energy consumption

### **Risk Management:**

- Global and detailed research on existing hazards and measures to reduce vulnerability and risk.
- Preparation as a permanent activity (annual “Meteor” exercise)
- Clear structures and mandates for participation of neighborhoods and households

### **Disaster response:**

- Mobilization of authorities and of the population to respond to the emergency
- Existence of a strategic reserve of basic supplies
- Combination of centralized direction along with local decision-making

The greatest obstacle in the country to confront climate change is lack of resources, for example in order to: increase the housing fund to reduce vulnerability to hurricanes, to expand constructions that limit seawater intrusion, to increase irrigated areas that reduce vulnerability to droughts or to more quickly transition from the current energy grid to a system that depends less on hydrocarbons.

Substantial contribution from the countries with the greatest emissions to initiatives within the national strategy to confront climate change effects is a necessity and a demand. This is true not just in the case of Cuba but for all of the countries of the South who are footing the bill for something that has not given them any corresponding benefits.

Despite the unique nature of Cuba's economic, social and political model, Oxfam considers that the Cuban strategy to confront climate change has interesting and relevant elements for reflection. Cuba has cooperated in this field with numerous countries and played an advisory role for mitigation measures. Many civil defense authorities from other countries visit the island to study the Cuban experience and delegations from farmers' organizations attend agro-ecology courses on the island.

Differences between central and local powers and the frequent changes of political parties in power can affect the responsiveness and depth of policies and programs in many countries. This is a limiting factor in the case of a phenomenon such as climate change which demands long-term strategies. However, many elements from the Cuban experience can be employed by local governments as well, which hold important powers and administer their own considerable resources. Their closeness to the population and actors in the territory – often times accompanied by international cooperation – may be effective in developing and implementing local strategies to deal with climate change.

Adaptation, mitigation, risk reduction and disaster response in Cuba is the result of a long road travelled. The work they have done is clearly related to and dependent on the process of strengthening human security through recovery and sustainable use of natural resources, access to water for human consumption, increased productivity through agro-ecology, sustained social investment and the construction of a broad central and local organizational fabric. The transformation of local, national and global societies is an unavoidable task in a world threatened by climate change.

The message of the Cuban experience is that the challenges presented by climate change may be better faced by emphasizing actions that raise the quality of life and human security. This is precisely the challenge that Oxfam has assumed since its creation, through different programs in support of development and humanitarian response.

# Notas

## 1 The following interviews were carried out

Alainís Martínez	Ministry of Agriculture
Alicia Mercaderes	Ministry of Agriculture
Alina Rivero	Institute of Meteorology
Arnaldo Álvarez	Ministry of Agriculture
Bárbara Garea	Center for Management of Prioritized Programs and Projects
Braulio Lapinel	Institute of Meteorology
Daney Seco	Center for Risk Reduction Management, Güira de Melena
Eduardo Planos	Institute of Meteorology
Joel Hernández	Environmental Agency
Jorge Mario García	National Institute for Water Resources
Lázaro Pérez	Center for Risk Reduction Management, Güira de Melena
Lídice Castro	Environmental Agency
Lorena Menéndez	Institute of Meteorology
Luis Paz	Institute of Meteorology
Mario Riverol	Soils Institute
Oscar Solano	Institute of Meteorology
Paulo Ortíz	Institute of Meteorology
Ramón Pichs	Global Economy Research Center
Ricardo Berriz	Environmental Agency

- 2 Oxfam would like to thank the Environmental Agency (AMA by its Spanish acronym) of the Ministry of Scientific Technology and the Environment (CITMA) in Cuba, who provided us with abundant materials and organized interviews with experts on the topics included as well as field visits to further understand the issue [0].
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