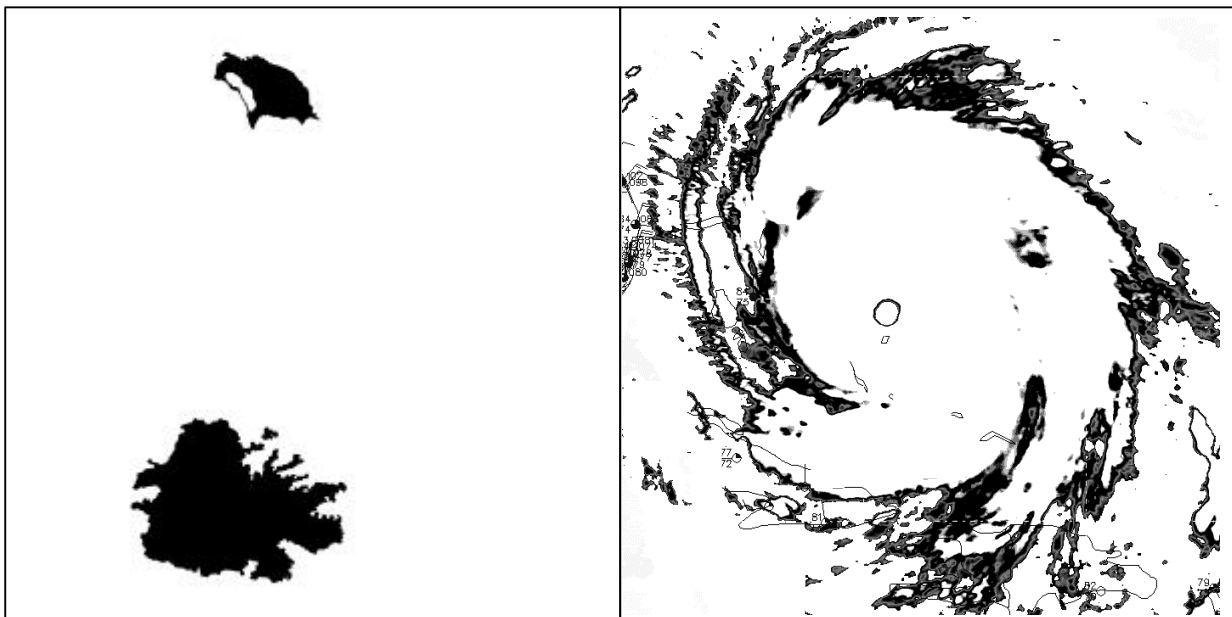




# HOUSING SECTOR RECOVERY PLAN ANTIGUA AND BARBUDA

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## Foreword

This plan has been produced by Stephen Hodges under contract with the Post Georges Disaster Mitigation Project (PGDM). The PGDM is funded by the US Agency for International Development and executed by the Unit for Sustainable Development and the Environment of the Organisation of American States.

A Post Disaster Recovery Plan should set goals for recovery after a disaster so that future events are much less damaging. This goal of this plan is simply well-built houses on safe sites. This plan attempts to break down the activities that need to be accomplished to meet this goal by sector, including the government, private sector, the finance and insurance sector and the householders themselves. All these groups have responsibilities for what happens in a storm, and so can also be part of a solution that will deliver safer homes for all.

The Plan is a framework that needs to be filled in with local experience. Many comments and issues have been already addressed after feedback, but there must be an ongoing process of review and revision to arrive at a plan that can be adopted. All feedback, comments, corrections and additions are welcomed, and will be addressed or inserted wherever possible. Please send to Stephen Hodges at [carphen@jol.com.jm](mailto:carphen@jol.com.jm).

Although focused on the housing sector and the vulnerability of housing to hurricanes, this plan is intended as an example to inspire other sectors to undertake a similar analysis. All the sectors are interdependent, the housing sector will only be truly able to stand up to a hurricane if other sectors (such as tourism, agriculture or fisheries) are equally prepared. Production of recovery plans for these sectors is a first step towards protection of these sectors against further disasters.

# HOUSING SECTOR RECOVERY PLAN ANTIGUA AND BARBUDA

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## Introduction to Recovery Planning

When a nation recovers from a disaster, particularly a natural event such as a hurricane, it is always hoped that it will be a “learning process “ and that the reconstruction will be less vulnerable than before. More often the opposite occurs, during the confused and chaotic aftermath of an event, poor decisions are made (for instance rebuilding in disaster prone areas) and disaster resistant materials and and construction expertise are scarce. As a result, homeowners put back what they can to house themselves, and most often, the “temporary” solution turns into the long term one.

When a hurricane strikes, resources are found for reconstruction, from various sources, private, government, insurance or assistance from abroad. This money is not usually available prior to a storm, to strengthen or rebuild the housing stock to withstand the forces. The post-hazard period therefore must be seen as an opportunity to guide the resources that do flow into reconstruction efforts that will withstand future events.

Preparing for the reconstruction, making the decisions that will guide the individuals and agencies, is necessary if reconstruction is to assist with mitigation of future disasters. This is because after an event, unless the decisions, for

instance on re-siting, are already made, or the required materials are available, reconstruction will start in inappropriate places using any materials at hand.

This guide is designed to remind and suggest to government, the financial and insurance sector, the building sector and householders of the roles they should play in preparing for reconstruction so that next time there will be less damage and work to set things right. In Antigua and Barbuda there is a high level of interest and activity by the Government and all concerned, promoted by the National Office of Disaster Services (NODS) and supported by USAID and OAS.

### **Components of Housing Sector**

The sector is guided by government, which has many roles, including: Coordination, Transport, Liaison with overseas sources of assistance, Importation, Training, Standards, Enforcement, Subsidy, Infrastructure, Land and Planning.

In addition, the private sector includes contractors, builders, tradesmen and building workers, hardware suppliers and retailers, as well as financial and insurance entities.

The clients are generally householders, although there are renters and landlords, as well as owners of land leased (or squatted upon) by householders. In addition, there are some organisations that represent householders (for instance, in groups of houses or apartments).

### **Issues, Pre and Post Hazard re Safer Housing**

Due at least in part to successive hurricane events, increased consciousness has led to rising standards (including for the effects of wave action). There is greater consideration of siting issues. NODS has had a coordinating role, raising many issues of siting and land management, while getting involved in leading changes to housing construction through its “Build it Strong” training manual. The Development Control Authority (DCA) plays a pivotal role in ensuring that development site selection and standards are established and followed.

The “Building Tradition” carried by the building industry is strengthened by programmes designed to promote safer, storm resistant buildings, by example, by setting standards and enforcing them, or by using training to promote good practice.

The normal government and private sector housing capacity, for materials, logistics, skilled workers, supervision and infrastructure, are stretched after

storms, and the industry relies on “outsiders” or persons not normally occupied in the sector. Planning for these enormous increases in the required workload must include these extra resources, and training and organisation put in place to use them effectively when they are needed.

## **Hazards**

The most common and most damaging hazard in Antigua and Barbuda are hurricanes. Hurricanes bring high winds and high rainfall, and can cause flooding, landslides and mudslides, storm surge and storm waves. A mitigation plan that deals with the threat of hurricanes must deal with their many different effects.

For the housing sector, additional threats of fires and earthquakes are to some extent taken care of if preparations are made for hurricanes, as masonry walls would already have reinforcement to withstand wind pressure, and nearby trees would be controlled to prevent damage.

This reconstruction plan will deal with hurricanes, which are the most damaging and common event. Seismic hazards must however be taken into account for standards, codes, design and detailing of all structures, and must be addressed in training.

## **Types of Damage**

Hurricanes do most damage to the roofs of houses. The associated walls are often damaged as well, and if not fixed down, lightweight houses can be blown off their footings. Flooding, wave and storm surge damage is also common, causing extensive damage in areas that are vulnerable.

The wind damage is primarily a connection problem, causing secondary damage to the materials themselves. This is exacerbated by inappropriate siting and design that can impose excessive forces on the structure. The flooding and wave damage is almost solely a siting question.

## Mitigation goals during reconstruction

Desirable goals to further hazard resilience during reconstruction include:

### **Goal 1. Siting:**

Siting considerations will be taken into account to reduce the vulnerability to future hazards

### **Goal 2. Design:**

Roof slope, shape and overhangs minimize forces

### **Goal 3. Materials:**

Relevant materials and connectors are used

### **Goal 4. Essential Details:**

Load paths are maintained and good details eliminate weak areas.

## **Pre-event activities necessary to meet mitigation goals**

These are the areas that need addressing to be able meet the above goals.

Specific activities are given in **ACTION** boxes in the four specific sectors. In

addition, questions that must be answered are asked in question boxes

### **Goal 1. Siting:**

Decisions about land use planning, zoning, required design elements and the requisite enforcement must be made prior to any hazardous event taking place if they are to have an preventative effect on the damage and losses that would occur. These decisions must be clearly communicated to all sectors and communities so that they can be informed and guided by the decisions.

#### **A Land use planning and hazard mapping**

Knowing where development should not take place and communicating this information to the communities can assist sensible siting decisions. Providing alternative land for re-siting communities in disaster prone areas is necessary, even if the removal does not happen until after a storm. If it is agreed that a community or a building should move when damaged, rebuilding is less likely to take place at the original site.

#### **B Enforcement of siting and zoning control**

Government has a role to keep abreast of construction in hazard prone sites, whether legal or illegal, and to advise or enforce laws to prevent such behavior. Particularly when construction is concerned, prevention is much better than cure. Publicity to make householders and developers aware of the dangers of siting buildings in hazardous areas would assist in compliance.

## **Goal 2. Design**

- A Building design awareness,  
Builders, designers and householders must be made aware of good shapes, appropriate materials and siting considerations. An understanding of the importance of these issues has been helped by the recent storms and associated activities.

## **Goal 3. Materials**

- A Standards  
A national standard for building materials needs to be established. Once adopted, these can be implemented through customs controls. Controlling, for instance, the gauge of galvanized sheeting allowed in also ensures that sub-standard gauges are not used in roofing.
- B Materials Availability  
Relevant building materials must be available in-country for initial post-event reconstruction demand, and sources of supply must be arranged so that there are alternatives should one source be hit itself. Steps should be taken to avoid and, if necessary, prohibit importation or donation of unsuitable materials
- C Request Lists  
Government and other organisations that request assistance from abroad after damaging events must ensure that they comply with the standards for materials to be used in the country. By doing this fewer inappropriate materials will be sent after a storm.

## **Goal 4. Essential Details**

- A Construction details  
Both builders and supervisors must understand safe construction details so that they can reconstruct buildings that are damage-resistant. The householders should also understand these issues so that they can insist on good construction and be willing to pay for it.
- B Training of builders as well as self help and temporary builders and supervisors  
Organizing training courses that existing builders can attend, as well as short courses for householders and persons who seek employment in construction after disasters, both in construction and supervision, would help to maintain high standards after a storm. This training would help to deal with the lack of capacity in the sector during reconstruction.

C Connections and load path analysis

The persons who repair and construct buildings need to think about what they are doing, and to analyze how the uplift forces on the roofs are transmitted through the various connections in the structure to the foundations.

Introduction of Load Path Analysis as a simple concept would remind builders, supervisors and householders to check all the connectors in a building. There is a need to develop and promote standards for these connectors.

D Retrofitting

Retrofitting of roofs that have not been damaged to increase their resistance to hurricanes can both save the expense of later reconstruction, as well as keeping the issues before the public.



## **SECTION I        GOVERNMENT**

### **Introduction**

Governments have a leading role to play in both the pre- and post-disaster periods. They coordinate both preparation and recovery efforts, and have the responsibility to guide the other sectors to prepare and to incorporate mitigation practices in their preparations. Households will undertake wall and roof replacement as soon as they can after a storm, using their own or donated resources. There is little capacity for education, decision making and enforcement available in the aftermath of an event. Only decisions taken and education that has been done in advance will affect the activities after the storm.

Often different government agencies have similar or contradictory roles, which can lead to confusion if not clashes over what should happen. Clarifying the roles is a necessary part of making straightforward systems of development control, post disaster activity and coordination.

Reconstruction will require less government input if training and promotion of good practice and standards has been carried out prior to the hazard event, and clear decisions on zoning have been effectively communicated to communities.

Safer building practices will be promoted if standards are set and enforcement practiced in government-led housing sites.

### **Government Role in Achieving Mitigation Goals During Reconstruction**

Desirable goals during reconstruction are that:

**Goal 1.        Siting:**

Siting considerations will be taken into account to reduce the vulnerability to future hazards.

**Goal 2.        Design:**

Roof slope, shape and overhangs minimize forces.

**Goal 3.        Materials:**

Relevant materials and connectors are used.

**Goal 4.        Essential Details:**

Load paths are maintained and good details eliminate weak areas.

**Goal 1. Siting:**

Mechanisms: Hazard maps and land use plans

Poor siting is a major contributor to housing damage in hurricanes, either from increased wind speeds in exposed sites, from flooding, storm surge, erosion or landslide. Given the limited land space in our territories, new developments are increasingly being planned on less safe sites.

**A Zoning and Enforcement**

Government has a responsibility to enforce planning and zoning laws, and must do so both promptly and equitably in order to gain the cooperation of communities and to avoid settlements growing in disaster prone areas. Although lack of resources often restricts the ability of enforcement agencies to carry out their mandates, this must be done and communicated widely prior to any hazardous event.

Involvement of communities in the mapping and determining of vulnerable areas and sites would have an effect on enforcement, as persons would avoid inappropriate sites if they knew the consequences. The community would also assist in stopping persons from building in vulnerable areas if they felt they were part of the system that includes the enforcement. The draft physical development plan recently prepared by the Development Control Authority (DCA) will guide the owners of land towards making the best decisions on use.

Decisions on siting need to include decisions not to rebuild in certain areas due to their susceptibility to hazards such as flooding. These decisions will save wasted effort during the early stages after an event, and prevent poor decisions being made in the confusion.

The various government parties, the DCA, the Ministry of Agriculture, and to some extent CHAPA and the Public Works Department, must rationalize their roles to allow clear decisions to be made.

Shortage of inspectors is always a problem. This could be assisted by charges for some of the services that are provided.

**ACTION:** Make clear decisions beforehand on redevelopment of vulnerable sites and communicate these decisions widely

**ACTION:** Assist the Development Control Authority with institutional capacity and sources of income

**ACTION:** Rationalize roles of DCA, the Ministry of Agriculture and other organisations

**ACTION:** Government agencies must be subjected to the same planning process and development standards as others

**ACTION:** Maintain enforcement of siting and zoning laws to prevent damage or demolition

## **Goal 2. Design:**

Mechanisms: Building guidelines

### **A Minimum standards**

Existing minimum building standards used in the region are useful and should be publicized and utilized more widely. They are, however, in some aspects conservative standards and there may be advantage in reviewing them to create more than one level: That is, an “absolute” minimum standard can exist, as well as a “desirable” standard, which might coincide with that promoted by financial or insurance companies. All stakeholders, financial, insurance, training and housing organisations need to be brought in to collaborate in promoting and inducing householders to use safe building practices.

**?** Do all ministries and government organizations have access to the OECS and CUBIC codes?

**ACTION:** Ensure that all ministries and government organisations use the same standards

**ACTION:** Promote a consensus on minimum standards and practice

**ACTION:** Make available and promote the Antigua and Barbuda national building code and guidelines

**ACTION:** Formalize and standardize national vocational standards

## B Safe Building Practices

Promotion of safe building practices to designers and householders (such as roof shape, slope and overhang, use of shutters) is needed in order to establish a new, disaster resistant “building tradition”. Safer buildings would then be built without having to have as much supervision.

**ACTION:** Promote safe building practices in training institutions, Government housing and publicity materials.

**ACTION:** Run workshops for householders on disaster-resistant design, siting and safe building practices

## Goal 3. Materials:

Mechanisms: A Bureau of Standards list of appropriate materials

### A Stocks of materials

Although commercial interests do keep stocks of relevant materials, it is important that sufficient materials are in country to meet post-event demand. A match of prior materials demand with present stocks needs to be done to see whether there are any large gaps in supply. Arrangements that would allow the use of local hardware merchant’s stocks for repair and reconstruction could speed the work of reconstruction. These stocks would then be replaced by donated or imported materials.

Consideration should be made to having alternate sources of supplies, for instance, from different countries, in case of difficulties with any one source. When several islands, especially the larger ones, are impacted at the same time, as in Hurricane Georges, suppliers tend to meet larger orders first, creating large delays in accessing materials. Joining with other affected territories to coordinate materials orders might allow more buying power.

**ACTION:** Investigate the joining with other territories for purchase of building materials after an event

**ACTION:** Conduct analysis of materials demand and timing following previous hurricane events

**ACTION:** Set up committee with professionals, hardware suppliers, contractors, Bureau of Standards and Customs to agree on materials standards.

The committee should do the following:

1. Clarify role of the Bureau of Standards
2. Decide on materials list with minimum specifications
3. Formulate regulations and designate an agency to control importation of building materials
4. Make arrangements for use of private sector stocks and suppliers

## B Relief requests

Analysis of recent events and the import documents would give an indication of the quantities and proportion of materials required for reconstruction after future events.

Minimum standards for materials to be used for reconstruction (minimum thickness of galvanized sheeting, use of pressure treated lumber) must be set with consensus from the stakeholders in the industry. These standards should be advertised so that individuals and private sector groups do not request inappropriate materials.

Ministries or organisations in contact with likely donors must indicate in advance the standards that are used and the materials that are likely to be needed. This would help to ensure that relevant materials are available as soon as possible after an event.

Decisions on allowing and facilitating the rapid importation of building materials through customs and the ports must be made before an event. This will help to ease congestion at the port. Customs will have the job of excluding sub-standard materials as they do during normal times. Training for the officers in the specifications and standards will be needed when they are set.

**ACTION:** Communicate minimum specifications and likely quantities to traditional donors and suppliers

**ACTION:** Review paperwork requirements for the distribution of relief supplies to reduce delays

**ACTION:** Train customs in identification of building materials and their specifications

**Goal 4. Essential Details:**

Mechanisms: Training, videos

A Training of builders as well as self help and temporary builders and supervisors

Training courses that existing builders can attend, as well as short courses for householders and persons who seek employment in construction after disasters, both in construction and supervision, would help to maintain high standards after a storm. These should be set up in Vocational Training establishments and promoted, for instance, by announcing that only tradesmen or firms whose employee's have attended such training will be considered for government work.

As there is no suitable training establishment in Barbuda, trainees would need to be brought to Antigua for training.

**ACTION:** Set up training courses for 1) Part Time Builders, 2) Builders as refresher courses and 3) Supervisors using technical vocational training system

**ACTION:** Support the training of builders from Barbuda

**ACTION:** Consider making training mandatory

**ACTION:** Set up list of trained contractors and supervisors for use after disaster

**ACTION:** Run workshops on essential details for householders

**ACTION:** Create good practice training videos for Householders and builders

**ACTION:** Consider a system of completion certificates to ensure compliance with DCA provisions and good practice

**ACTION:** Consider a licensing system for contractors and builders

## Other Government Issues

### Damage Assessment

To increase the capacity to rapidly collect damage assessment data after an event, organise and make use of available persons (such as retired technical personnel, persons whose jobs will likely to be temporarily suspended because of the event). This would require registration and training prior to the event.

To determine weaknesses to be addressed in the future, it is desirable that damage assessment reports indicate, where possible, the probable cause of the damage. This information could be assembled over time to indicate interventions that are needed.

**ACTION:** Formulate damage assessment reporting format to include probable cause and detail that failed

**ACTION:** Designate agency to assemble data on problem areas and materials

### Essential services

The housing sector and reconstruction is dependent on several services to operate. These include the road network, the ports, and the water supply. The vulnerability of these services need reviewing, and plans must made to clear and repair soon after an event.

### Tourism and Essential Service workers, availability

Much of the Caribbean is heavily dependent on tourism for its income. When there is a storm, sometimes the hotels are not badly damaged, but suffer because of the lack of staff who are busy with their problems at home. Resilience of workers' housing is important for the rapid reopening of tourism facilities and

services. A review of the vulnerability of staff housing should be done when assessing the vulnerability of the tourism facility itself, as they are interdependent.

### **Coordination of and adoption of roles by agencies, Private sector**

One of the principle roles of government in post event reconstruction and relief is the coordination of the many sectors that are involved in supplying materials or services. Coordination does exist with churches, for instance, but a mechanism to coordinate the efforts of the private sector and other groups would enhance the effectiveness of their involvement. It is better to bring the possible actors together before an event clarify roles and responsibilities.

Large-scale mobilization by private persons to rebuild is inevitable and needs planning and coordination to control, optimize and supervise the building work being undertaken

<p><b>ACTION:</b> Convene wide based disaster committee</p>
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### **Costing, prices and labour rates, control and publicity**

Prices of materials and labour can escalate after a storm. Householders are adversely affected especially as they are often not familiar with standard rates and prices. Drawing up “fair” materials and labour rates can reduce gouging and the inflationary effect this has. Flyers giving common materials and labour costs need to be prepared beforehand for distribution after the event; these sheets should be updated annually.

<p><b>ACTION:</b> Prepare material and labour cost information flyer</p>
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### **New government policies**

Proper siting can be promoted through zoning and land use controls, and proper building practices can be promoted through training and standards. Increasing the disaster resistance of lease land housing or Chattel housing presents additional challenges. The problem of poor attachment of these predominantly timber structures leads to massive damage in any strong storm. Some way of maintaining the land tenure status while allowing the proper connection to a strong foundation would be a landmark in assisting the poor in the region to weather hurricanes.



***ACTION:*** Formulate policy or regulations on lease land to enable proper attachment of small houses to foundations

## **Rental Housing**

Control and certification of housing to be rented would safeguard the public. An inducement to build safely could be introduced, allowing price controls or other means.

***ACTION:*** Control safety and disaster resistance of rental housing

## **SECTION 2      CONSTRUCTION SECTOR**

The Construction Sector - the contractors, builders, tradesmen, as well as building materials suppliers; creates the housing stock during normal times, and has the major task of reconstruction when there is damage during a hazard event. Buildings that survive and that resist damage are a testament to the quality and expertise of the individuals and companies in the sector, and the quality of the materials supplied.

The amount of damage during a storm can be enormous, and often overwhelms the capacity of the industry to respond. Preparation for these periods can assist the sector to work efficiently, to deliver quality work even in a time when the pressure is on, and to avoid delays due to shortage of materials.

Preparation can include training, of staff and tradesmen, both to assess damage as well as how to repair and supervise repairs. In the Appendix, Training outlines are given for these areas, as well as an outline for training persons not normally involved in construction, but who might take part in a reconstruction effort. Instead of reconstruction being a free-for-all effort, there would be great benefits if those temporary workers in the sector could work with existing companies, so benefiting from the guidance, equipment and backup available. Organizing a roster of persons who might be employed after a storm, and who could be trained in the basics of good practice of construction, would allow a construction company to take advantage of the increased work available in the aftermath of a storm.

### **Construction Sector Role in Achieving Mitigation Goals During Reconstruction**

Desirable goals during reconstruction are that:

**Goal 1.      Siting:**

Siting considerations will be taken into account to reduce the vulnerability to future hazards

**Goal 2.      Design:**

Roof slope, shape and overhangs minimize forces

**Goal 3.      Materials:**

Relevant materials and connectors are used

**Goal 4.      Essential Details:**

Load paths are maintained and good details eliminate weak areas.

### **Goal 1. Siting:**

Construction bodies must be aware of siting considerations and advise clients to prepare for excess forces or flooding should they continue to build in vulnerable areas. Additional features may be required to withstand the additional forces.

**ACTION:** Sell safety features and disaster mitigation measures to clients

### **Goal 2. Design:**

Recent storms have noticeably increased the public and the industry's interest in safe construction.

#### **A Promotion of good practice**

To consolidate and support the trend towards safer housing, the technical and professional persons in the sector must, together with government, decide on standards for good design. Promotion to all levels of the industry, through the hardware stores, would get the householder to appreciate the value of good design and be prepared to pay for it.

**ACTION:** Get consensus on good design by taking part in multi-sector organisations

**ACTION:** Promote good design through professionals, hardware stores and contractors

**ACTION:** Include seismic-resistant design in promotion and training

### **Goal 3. Materials:**

Adequate supplies of the right materials and connectors are needed in the country soon after a storm so that reconstruction can happen with proper building practices and connectors.

#### **A Material Stocks**

Storage of materials by hardware suppliers for sale and use after a storm should be based on the demand that from previous events and what was in short supply. Agreement with government for use of private sector stocks of materials to be replenished when government imports materials itself are an

obvious way to involve the private sector in the speeding the repair of the housing stock. Increased stocks must be considered, especially in Barbuda where stocks can run out *before* the storm as households and hotels batten down.

**ACTION:** Seek agreements and incentives from government for larger stocks and to provide stocks for emergency use

## B Sources of supply

More than one source of supplies should be identified. Because the source country for materials supply may also have been hit in a storm, or may have other problems shipping the required materials, alternative sources should be identified by hardware merchants to prevent possible delays. As the normal source of supply for Barbuda is from Antigua, if both islands are hit, a way must be found for Barbuda to access supplies directly from other sources.

**ACTION:** Identify alternate sources of supply

? What materials are needed immediately after a storm

**ACTION:** Clarify “port of entry” requirements for emergency supplies to Barbuda

## C Standards

It is important that the building industry and Hardware suppliers promote, use and sell only materials that will result in hurricane resistant construction. If inferior materials are available, such as thinner gauge galvanized sheeting, even if intended for other uses (temporary fencing, for instance) there will be temptation and financial pressure to use it for roofing. Together with the customs, the hardware suppliers must maintain standards for building materials available in the country.

**ACTION:** Take part in agreements on national standards for materials and use them to determine materials orders

? Are major suppliers likely to be hit? – do they have contingency plans

**Goal 4. Essential Details:**

Assuring good details is important for disaster resistance, as a storm will seek out defects and weak points and progressive damage will occur.

**A Use of Load Path Analysis**

Making sure that both supervisors as well as tradesmen check the connectors in a building to ensure that the uplift forces are transmitted safely to the ground is a good way of producing disaster resistant buildings. Training may be required, which would be part of the training programmes mentioned below.

**B Training of Building Tradesmen and Contractors**

Attending training courses in safe building construction should be part of working in hurricane prone countries. A training outline to be run by government vocational training establishment on safe building construction is attached as an appendix.

**ACTION:** Encourage training of construction industry entities

**C Training of Part time Builders**

After a hazard event, many more persons than normal become involved in building work, either through contractors or on a self-help or self-employed basis. A short training course for these persons in safe building practices is outlined in the appendix

**D Training of Supervisors**

After a hazard event, there are many more building sites active than during normal times and supervisory personnel are stretched to maintain standards on them all. There are many technical persons, either retired, in jobs that temporarily are suspended because of the storm, or self employed in related areas, who could provide technical inspection of the reconstruction efforts after a storm. A short course on the supervision of building works for these technical persons is attached in the appendix.

**ACTION:** Assist in setting up refresher courses for builders, training for part-time builders and supervisors

**ACTION:** Register part-time builders and supervisors for employment when needed after a storm

## SECTION 3

## FINANCIAL AND INSURANCE SECTORS

### Introduction

Hurricanes can do immense damage to housing, even when approved plans are used and the work inspected by the building inspectorate. Because of the infrequency of these events in recent years, the technical details that provide resistance, particularly to hurricane induced forces, have ceased to be a normal part of the way that housing is constructed. More recently, there has been a surge of interest in safer building practices, because of the frequent storms that have occurred.

The damage from a hurricane can be a huge setback for an individual household, and when there are many, this will set back development of the country as a whole. Insurance companies, who share the burden, and financial entities, who loan money for construction, will also suffer losses and setbacks, as their clients will be unable to pay, may have employment disrupted and may need further loans to repair their homes.

Technically, resistance to wind forces is possible and practical, and costs between 1 and 5 percent of the value of the house being strengthened, and is even cheaper if it is incorporated into the original construction, rather than being “retrofitted” afterwards. The cost benefit of a stronger house is enormous, as is the saving in time, stress and lost possessions.

Most of the government housing agencies now require resistance to disasters in their designs for construction of details to meet, for instance, uplift forces, and the presence of these details are part of the inspection of the work.

Borrowers are often not in a position to finance the works again if a home or building is damaged. Adding the 1-5% of cost to the loan to greatly increase the resistance of the structure contemplated or under repair assures the borrower that they will be unlikely to have damage that they cannot afford to repair.

Credit unions and other lending institutions lend to benefit their savers and members, and this credit is at risk in a disaster setting. By allowing the borrower the additional 1-5% on their loan, by not lending on vulnerable sites and by using a checklist to assure that technical details are in place to resist forces from hurricanes (and earthquakes), the loan is significantly better protected.

To assist with the stability of insurance companies after major disasters an insurance fund should be considered.

## Finance and Insurance Sector Role in Achieving Mitigation Goals During Reconstruction

After a storm, Desirable goals during reconstruction are that:

**Goal 1. Siting:**

Siting considerations will be taken into account to reduce the vulnerability to future hazards

**Goal 2. Design:**

Roof slope, shape and overhangs minimize forces

**Goal 3. Materials:**

Relevant materials and connectors are used

**Goal 4. Essential Details:**

Load paths are maintained and good details eliminate weak areas.

**Goal 1, Siting:**

Financial and insurance entities must take an interest in where the housing that concerns them is sited, and be cautious when dealing with housing in vulnerable areas. This is normal for some financing, because it requires planning permission, but this is not true for all. Zoning for risk insurance purposes would allow insurance cover in more exposed sites, even if it was more expensive.

**A Training**

Training of staff to advise clients on siting risks, to help them prepare for excess forces in wind prone sites, or flooding, is a responsible role for financial institutions to take. Disaster mitigation should be a fundamental consideration when financing construction in the Caribbean area.

<b>ACTION:</b> Train staff to advise clients on siting risks
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### Goals 2, 3 & 4: Design, Materials and Details

There are good examples in the Caribbean of insurance companies taking an interest in these three aspects of the houses that they insure, setting standards and providing a discount on premiums if the standards are met. Regional financing organisations, such as the Caribbean Development Bank, now take Disaster Mitigation seriously in their housing finance efforts. Some of the national financial entities have begun to follow this lead, good examples of which are

“Anjo Insurance”, which promotes the use of connectors and offers discounts for hazard mitigation activities, and “Antigua Masonry Products” who teach good practice. These activities will contribute to a reduction in vulnerability over time.

A Inspection Capacity

To have an effective influence on the disaster resistance of housing that is financed or insured by the sector, standards must be set and inspection or supervision must be done. If the financial or insurance entity does not have the capacity itself, it may be possible to use an existing housing or inspection agency to provide the assurance of compliance.

**ACTION:** Develop internal capacity for inspection or make arrangements with outside organisations to provide the service

**Essential Details**

It costs between 1– 5% of the value of a house to make it substantially resistant to hurricanes (either when being built or when being retrofitted). This sum is the amount required to significantly increase the resistance of a house and therefore safeguard the loan or insurance entity involved. Including the additional cost in the loan and requiring hurricane resistant construction make good business sense.

**ACTION:** Support mitigation details in housing



## **SECTION 4      HOMEOWNERS**

Homeowners are the ones who suffer the most from hurricanes. Their roofs and homes get damaged and they have to organize and most often pay for the required repairs. Particularly when hurricanes are frequent, as in the last few years, it becomes more important, when repairing after one storm, to put back a roof that will withstand the next. Resolving to rebuild a safer home is the first step, making sure it is sited in the safest place the homeowner can find. In the Appendix is a list of building design tips and details that will help resist hurricane forces and therefore limit the damage that occurs. There are also guides to assist with hurricanes before and after the storm. A flyer is included to remind householders of what they can do just before a storm to limit the damage, and a checklist for monitoring builders working on their home to ensure that safe building practices that will resist hurricane forces are used.

### **Householders Role in Achieving Mitigation Goals During Reconstruction**

Desirable goals during reconstruction are that:

**Goal 1.      Siting:**

Siting considerations will be taken into account to reduce the vulnerability to future hazards

**Goal 2.      Design:**

Roof slope, shape and overhangs minimize forces

**Goal 3.      Materials:**

Relevant materials and connectors are used

**Goal 4.      Essential Details:**

Load paths are maintained and good details eliminate weak areas.

**Goal 1.      Siting:**

Due to scarcity, often homeowners cannot choose the land that they get for housing purposes. They must assess the dangers of the site that their home occupies, and, carry out work that will reduce the threat where they can. Sites such as hilltops have no buffer from high winds, and must bear the full brunt of the storms.

Where there has been a storm and the building is badly damaged, consideration must be made of rebuilding at a safer site. The government disaster organisation should be able to help with hazard maps.

**ACTION:** Use DCA maps to determine recommended use for site

**ACTION:** Carry out retrofit activities to mitigate site based hazards

**ACTION:** Assess situation and move if necessary

**Goal 2. Design:**

The shape and design of a house determines to some extent the forces that are exerted on it by high winds. For example, large roof overhangs trap the wind and lead to greater uplift on the roof. When building or repairing a house, safe building practices should be followed. These will be discussed in the Appendix.

**ACTION:** Seek advice on good design to minimize stresses on building

**ACTION:** Assess house and reduce risk if possible

**Goal 3. Materials:**

The materials that you use for building should produce a strong structure, with connectors to withstand hurricane forces, which include uplift. Seek advice on the best materials and connectors to make your roof strong.

**ACTION:** Seek advice on quality and relevance of materials to use

**ACTION:** Consider your local problems. e.g. use treated lumber where termites are a problem

**Goal 4. Essential Details:**

The details of buildings, the connectors holding all the components together, carry the forces from the roof down to the foundations. It is possible to “retrofit” buildings to ensure that all the connections are adequate.

A checklist of details to look out for is provided in the appendix so that the householder can make sure that tradesmen who work on a house install what is needed to resist hurricane forces.

***ACTION:*** Check the “load path” and retrofit connections that require strengthening

***ACTION:*** Monitor tradesmen to see all work is done to hurricane resistant standards, or seek assistance for supervisory function

***ACTION:*** Seek out and attend design and detailing workshops