

## Introduction

*For having lived long, I have experienced many instances of being obliged, by better information or fuller consideration, to change opinions, even on important subjects, which I once thought right but found to be otherwise.*

— Benjamin Franklin

Competent authorities agree global warming is occurring and that human activities are causing a rapid acceleration of climate change. Not only is our planet experiencing multiple types of extreme weather events, but their intensity and frequency have also increased. It is also well recognized that climate change is having a direct impact on the natural environment. Coral reefs are bleaching, populations of frogs and many other species are becoming extinct and birds are suffering from limited food supplies where they nest each year. A major contributing factor is the greenhouse gas carbon dioxide, which is rapidly building up in the atmosphere. It has been increasing gradually over the last 100 years after being proven to be relatively stable historically. For your convenience at the back of this book, in the

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“Observational evidence from all continents and most oceans shows that many natural systems are being affected by regional climate changes, particularly temperature increases.”

(IPCC 2007 page 1  
Summary for Policymakers)

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end notes and essential reading recommendations section, you will find some of the authorities I have quoted as well as many of the resources that I have found to be helpful for learning how to reduce your carbon dioxide impact. This book offers suggestions and advice for protecting our dwellings from the impact of global warming, so that we can prepare for the coming climate changes.

Weather cycles, including extreme weather events, will never completely disappear. Our homes need to be constructed to be more resilient in the face of these cycles. This book starts with the premise that global climate change is occurring and that as the climate shifts, current construction and maintenance practices in various parts of North America will need to readjust in order to prevent structural damage and indoor

Canada's risks from climate change would include increasing intensity of thunderstorm activity resulting in increased wind storms, tornados, lightning, hail and flooding. Melting permafrost already has begun to cause structural damage in northern parts of Canada. As temperatures warm and soil moisture content shifts toward drier conditions the risks from drought and expansive clay soils increase. Presently the recognized areas of expansive clay soils are in some of the more populated central portions of Canada, along the border with the United States. Tornado risks will also increase. Tornados form when cold air from the north meets warmer tropical air from Mexico. As the climate warms it should be anticipated that the frequency of tornados in Canada will increase as the meeting place for the warm and cold air shifts northward. Rising sea levels could also inundate low-lying coastal towns. The risk to buildings from trapped moisture is a potential problem, but chances are the United States will serve as an early warning device since the climate in Canada would need to shift fairly dramatically to go from being a cold climate to a mixed-humid climate. Most Canadians have homes constructed to deal with freezing conditions and frozen plumbing, but problems with ice damming may increase since a warmer climate means the winter temperatures will be closer to the melting point. Typically, when snow remains solidly frozen ice dams don't form. The problems develop when the snow repeatedly defrosts during the day and then refreezes at night so that the water is unable to drain away before it refreezes. The warming trend is likely to increase the incidents of these types of problems in Canada.

air quality problems from developing. This introduction to the damaging conditions that result from climate change, as they may affect our homes and living environments, will serve as a roadmap for prevention measures to help maintain our homes as shifts in climate occur. Some first-aid measures are easy and inexpensive to apply. Other measures may require retrofit techniques for remodeling existing homes to prevent or reduce damage from problems induced by climate change shifts. Modifying our building construction methods to conform to nature's demands will help our homes function properly so that they will not tend to deteriorate and suffer extensive damage.

In order to weather or recover easily from extreme events our homes need to be tuned and maintained to function properly during normal times. If not recognized early, normal wear and tear can provide a weak point for extreme weather or climate change to cause greater and more costly damage. We tune up our cars and change their oil regularly. We visit the doctor for routine checkups. But most people wait for something to break before recognizing problems that are developing in their homes.

North America has a wide variety of climate zones with corresponding construction codes in place. Each of these various zones is based on regional climate differences and generally requires different construction styles for building durability. Buildings certainly can have problems unrelated to climate change. These deficiencies can occur from sloppy construction practices, inadequate maintenance and incorrect remodeling practices which lead to many expensive repairs. As climates change, however, building maintenance and construction practices need to be appropriately adjusted to prevent additional problems. Present construction failures provide clues to

Some part or another of the United States is at risk from every type of extreme weather event discussed in this book. One reason is that the United States includes an incredibly diverse climate and topography spanning multiple climate zones. The lowest and highest points in North America — Death Valley and Mount McKinley — are found in the United States. Alaska sits in the extremely cold north while Florida is located in the hot-humid tropical zone and Hawaii, being surrounded by the Pacific Ocean, exhibits a marine climate.

Most of Mexico is a hot-humid or hot-dry climate. Projections for climate change make it unlikely for Mexico to experience cold climate problems. Temperatures are projected to continue to increase, which is likely to increase risks from wildfire, drought and heat waves. Mexico has few tornados, and most of them occur near the US-Mexico border. Mexican hurricanes are rare. Hurricanes spawn in the Gulf of Mexico but are more likely to make landfall further north. Mexican west coast hurricanes were virtually unheard of until 2006. The risk of expansive clay soils has not been well studied in most of Mexico; however, the condition is well documented in and around Mexico City and Queretaro. Flash flooding is common since rain on dry soils tends to run off instead of seeping into the soil.

what may occur as planetary stresses and climate change begin to affect our homes.

Climate change may result in either acute or chronic problems for our buildings. Most acute problems develop rapidly from extreme weather events where the damage is generally easy to recognize, such as that caused by hurricanes, tornados, flooding events and lightning. These events are often catastrophic for many buildings and sometimes affect entire communities or regions. Chronic weather events such as drought or periods of high humidity, in otherwise moderate climate zones, may result in damage from slower shifts in climates that are less apparent. These damaging climate effects often seem less dramatic, but they can cause as severe or even worse damage than rapid catastrophic events if they aren't discovered and remedied quickly.

Fortunately the conditions leading to the chronic effects can often be predicted, or discovered early enough to arrest and reverse the damage. These more slowly developing conditions include structural damage from expansive clay soils in areas experiencing drought or desertification. When expansive clay soils are present in areas where the soil is becoming drier, buildings may slowly be ripped apart, much like an earthquake in slow motion. Expansive clay soils have been recognized as a problem for decades prior to global warming becoming an issue. According to Phil Camp, "The American Society of Civil Engineers estimates that half of the homes in the United States are built on expansive soils and half of these will have some damage. The group claims that these soils are responsible for more home damage every year than floods, tornadoes, and hurricanes combined" (Camp). At this time there

have been no studies to determine what percentage of this damage is related to climate change.

Another chronic condition that may result from slow shifts in climate is mold growth and water damage. These don't always require a liquid water spill or flood and may develop from trapped water in a vapor form. Shifts in temperature and humidity can result in water vapor condensing into liquid water in wall cavities. Mold and water damage has sometimes been referred to as "slow fire." Water can cause every bit as much damage to a building as fire, only at a slower rate. Fortunately, most of the problems from water vapor and mold can be prevented if the issues are recognized early and appropriate action is taken.

Most buildings today are constructed in such a way that they will require major remodeling or repairs sometime before they reach the age of 25. Roofs typically need replacement every 15 to 30 years, kitchens and baths are updated as the plumbing and fixtures wear out or become outdated, and most houses need routine painting or sealing. These remodeling events provide an excellent opportunity to begin to respond to climate change by upgrading proactively. A little extra investment in time and money during necessary maintenance activities can prevent or limit costly damages later. By recognizing the climate-related stresses developing in and around your home you may be able to apply temporary measures to control or prevent the deterioration until more permanent remodeling solutions can be instituted.

*Extreme Weather Hits Home* will not be able to anticipate every condition that may arise from climate change where you live. There are bound to be surprises. It is important to recognize that many of the measures in this book are considered initial steps to protect our homes. However, responding to our planet's changing climate quickly and allowing it to heal itself is, ultimately, the necessary course. Otherwise the widely fluctuating weather patterns and severity of the climate change are likely to worsen to a condition that may be beyond even heroic measures.

As more and more buildings become damaged by extreme weather events, insurance coverage is likely to become more expensive or even unavailable. Many types of damages are already excluded from insurance policies and government disaster assistance programs. Unfortunately, many building owners are unaware of these limitations and are unprepared to deal with them and the financial hardships when they arise.

Professional assistance can help with recovery from many types of losses; however, catastrophic events such as major floods and hurricane damage often result in insufficient community resources being available for a quick and adequate response. Prompt action on the part of the building owner, therefore, can help reduce the adverse impacts. Also, knowing what work needs to be done and when to do it can help the homeowner select and oversee the work force for needed prevention measures or repair.

The preventative measures presented in this book are based on the assumption that we can and will take action that will get carbon dioxide and other greenhouse gas emissions under control. Not all damage resulting from climate change will be avoided, but prompt recognition and application of first-aid techniques may help to reduce the costs of damage, correction and repair to your home. First-aid is used to temporarily sustain a patient's life until more intensive professional help is available. Of course, recognizing the patient is in distress is always the first step that may lead to its successful administration. If it becomes apparent that more drastic action is necessary, temporary first-aid measures can help provide the necessary time for the completion of more extensive retrofit and remodeling measures.

Naturally, if we don't deal with the causes of climate change, this book's first-aid suggestions for your home are likely to provide only short-term or less than adequate results. Long-term unstable climates mean that building codes will need to change and new construction will need to be designed and built to be more resilient. However, if we take definitive action to reduce greenhouse gas emissions, the planet will

most likely repair itself and reverse the shifts that are occurring. My goal is to alert you to some of these developing issues and provide suggestions for taking appropriate action, giving you the power to make choices that are best for your family, your home and our planet.