# Climate Change Adaptation Plan:
## U.S. Department of the Treasury

Prepared by:

**U.S. Department of the Treasury**
**Departmental Offices**
**Office of Environment, Health, and Safety**

**June 2014**

## Executive Summary

Climate change is one of the most significant events to face our nation. Its impacts are difficult to predict, vary greatly from region to region, and will influence civilization for the foreseeable future. As the science increasingly confirms the existence of anthropomorphic climate change, it is apparent that action must be taken to prepare for the effects of a warming planet.

The U.S. Department of the Treasury recognizes that climate change will be one of the major challenges of the 21st century and assumes aspects of its operations and mission will be impacted by changes in climate, sea level rise, increased energetic weather events, and energy availability. Taking a comprehensive approach which incorporates new knowledge, risk assessment, and changing conditions, Treasury is and will continue to work to adapt facility operations and programs to accomplish our mission.

Our goal is to develop practical, nationally consistent, legally justifiable, and cost effective measures, both structural and nonstructural, to reduce our vulnerability, while increasing our resilience to climate change. We are engaged in a collaborative approach, partnering with other federal agencies. This collaboration takes advantage of our different perspectives and expertise so that our progress reflects the best available and actionable science. We are developing and implementing plans, policies, and infrastructure adaptation in parallel, rather than sequentially, so that adaptation begins soonest for projects that are most vulnerable. We will refine our adaptation based on any new knowledge that is gained.

This report also provides details on current adaptation planning and implementation progress. We believe that the scope, collaboration, and the resources applied to climate change adaptation planning demonstrate the importance Treasury has placed on this critical challenge to the sustainability of our mission, operation, and our responsibility to the nation.

**TABLE OF CONTENTS**

## Contents



# 1 Treasury Climate Change Adaptation Plan

## 1.1 Policy Statement for Climate Change Adaptation

*I. Background:*

The Department of the Treasury (Treasury) is the executive agency responsible for promoting economic growth, creating job opportunities and ensuring the financial security of the United States. Treasury is responsible for a wide range of activities, including advising the President on economic issues, encouraging sustainable economic growth, and fostering improved governance in financial institutions. Treasury's operation of coin and currency production, disbursement of payments to the public, revenue collection, and borrowing activities are all critical to the nation's financial strength and stability.

The effects of climate change on Treasury's operations and facilities are difficult to forecast. Climate change-related events are becoming more common and their effects could significantly impact Treasury's ability to fulfill its mission.

Therefore, climate change adaptation is a necessary complement to mitigation; both are required to build resilience to climate change.

*II. Purpose:*

a) Adaptation planning will allow Treasury to minimize the negative impacts of climate change that are already occurring and increase resilience to these impacts.

b) Through adaptation planning, Treasury will identify how climate change is likely to impact its ability to achieve its mission, operate its facilities, and meet its policy and program objectives in the future. Through adaptation planning Treasury will develop, prioritize, implement, and evaluate actions to moderate climate change risks and exploit any new opportunities that climate change may bring.

c) Management decisions made in response to climate change impacts must be informed by science and require that scientists work with those managers who are confronting climate change impacts and evaluating options to respond to them. By integrating climate change adaptation strategies into its programs and operations, Treasury helps ensure it invests taxpayer resources wisely and that Treasury services and operations remain effective in current and future climate conditions.

d) Through climate adaptation planning, Treasury is contributing to the federal government's leadership role in sustainability and pursuing the vision of a resilient, healthy, and prosperous Nation in the face of a changing climate.

e) The goal of this policy is to help Treasury execute its mission and operations securely, effectively, and efficiently even as climate changes occur.

*Ill. Vision:*

a) This policy directs Treasury Bureaus to integrate climate change adaptation planning and actions into their programs, policies, and operations.

b) Treasury Departmental Offices shall undertake climate change adaptation planning, in consultation with its Treasury Bureaus, and implement the results of that planning using the best available science and information. Treasury shall consider potential climate change impacts when undertaking long-term planning, setting priorities for

scientific research and investigations, and making decisions affecting Treasury resources, programs, policies, and operations.

c) Treasury shall update its climate adaptation plan on a regular basis. The plan shall include each of Treasury's bureaus, as appropriate, and incorporate the findings and directives of this policy. The plan shall identify how climate change may impact Treasury's ability to achieve its mission, programs, policies, and operations. The plan shall identify and prioritize actions and establish a mechanism to evaluate progress and continue to improve Treasury's capacity to adapt to current and future changes in the climate effectively.

d) Each Treasury bureau shall, in a manner consistent and compatible with its mission:

i. analyze how climate change may impact the bureau's ability to achieve its mission, policy, program, and operation objectives by reviewing existing programs, operations, policies, and authorities to: (1) identify potential impacts of climate change on the component's areas of responsibility; (2) prioritize and implement response actions; and (3) continuously assess and improve capacity to adapt to current and future changes in the climate.

ii. identify to the Treasury Office of Performance Budgeting through the annual budget process areas where budget adjustments are necessary to carry out the actions identified under this policy.

iii. identify for its Chief Counsel and, as appropriate, the Treasury Office of the General Counsel areas where legal analysis is needed to carry out actions identified under this policy.

iv. coordinate actions with the Treasury Climate Change Adaptation Work Group established in Section III below.

e) Treasury shall fully implement the principles and guidance outlined in Executive Order 13514, *Federal Leadership in Environmental, Energy, and Economic Performance,* and Executive Order 13653, *Preparing the United States for the Impacts of Climate Change,* to include any related implementing instructions, and other applicable authorities.

f) Treasury shall apply the guiding principles and planning framework for climate change adaptation found in the *Progress Report of the Interagency Climate Change Adaptation Task Force: Recommended Actions in Support of a National Climate Change Adaptation Strategy.*

g) Treasury shall coordinate with other agencies and interagency efforts, including the Interagency Climate Change Adaptation Task Force, on climate change adaptation issues that cut across agency jurisdictions, including areas where national adaptation plans are being or have been developed, and shall identify a process for sharing climate change adaptation planning information throughout the agency and with the public.

*IV. Agency Coordination and Implementation*

a. The Senior Sustainability Officer is responsible for ensuring the implementation of all aspects of this policy. This policy does not alter or affect any existing duty or authority of individual components or offices.

b. Through this policy, the Senior Sustainability Officer establishes the Treasury Climate Change Adaptation Work Group to oversee and coordinate agency-wide climate change adaptation planning and implementation. The Departmental Offices' Environmental Program Manager chairs the Work Group, which will include representation from each bureau, as appropriate.

c. This policy is effective immediately and will remain in effect until it is amended, superseded, or revoked.

Nani Coloretti, Assistant Secretary for Management

4/30/2014
Date

## 1.2 Introduction

The Treasury Department is the executive agency responsible for promoting economic prosperity and ensuring the financial security of the United States, and is organized into the Departmental Offices, eight operating bureaus, and three independent inspectors general. The Departmental Offices are primarily responsible for economic and financial policy formulation, while the bureaus are chiefly the operating units of the organization.

**Departmental Offices**

The Departmental Offices (DO) are the headquarters component of the Department of the Treasury. DO is comprised of 8 separate policy management units. These are:

*Domestic Finance* promotes economic growth and stability by developing and executing policies and guidance in the areas of financial institutions, federal debt finance, financial regulation, capital markets, financial management, fiscal policy, and cash management. Domestic Finance also includes the Federal Insurance Office, created by the Dodd-Frank Wall Street Reform and Consumer Protection Act, and the Office of Financial Stability, which is responsible for overseeing the Troubled Asset Relief Program (TARP). The office supports the work of the Financial Stability Oversight Council (FSOC), with a dedicated policy office that functions as a secretariat for the FSOC, and the Office of Financial Research.

*International Affairs* protects and supports U.S. economic prosperity by strengthening the external environment for U.S. growth, preventing and mitigating global financial instability, and managing key global challenges. In addition, International Affairs manages the U.S. position in the Groups of Seven (G-7) and Twenty (G-20), the Multilateral Development Banks, the International Monetary Fund (IMF), the strategic & economic dialogue with China, and numerous other international and bilateral fora.

*Terrorism and Financial Intelligence* (TFI) marshals the Department's intelligence and enforcement functions with the dual aim of safeguarding the financial system against illicit use and combating intransigent regimes, terrorist facilitators, money launderers, drug kingpins, and other national security threats.

*Economic Policy* reports on current and prospective economic developments and plays a critical role in the determination of appropriate economic policies. The office is responsible for the review and analysis of domestic economic issues as well as changes and trends in the financial and housing markets. Economic Policy also plays an important role in the development of the President's Budget each year.

*Tax Policy* develops and implements tax policy and programs; reviews regulation, guidance, and rulings to administer the Internal Revenue Code; negotiates tax treaties; and provides economic and legal analysis for domestic and international tax policy decisions. Tax Policy also provides revenue estimates for the President's Budget.

*Treasurer of the United States* has oversight over the US. Mint and the Bureau of Engraving and Printing, and is a key liaison with the Board of Governors of the Federal Reserve System.

*Community Development Financial Institutions (CDFI) Fund* expands the capacity of community development financial institutions and community development entities to provide credit, capital, tax credit allocations, and financial services to underserved domestic populations and communities.

*Management/CFO* is responsible for managing the Department's financial resources and oversees Treasury-wide programs, including human capital, information technology, and acquisition management. The Assistant Secretary for Management also serves as the Director of the Office of Small and Disadvantaged Business Utilization (OSDBU).

**Other Offices**

Other support programs include Executive Direction, which is largely comprised of the Offices of General Counsel, Legislative Affairs, and Public Affairs.

**Inspectors General**

There are three independent offices of inspectors general: the Treasury Inspector General, the Treasury Inspector General for Tax Administration (TIGTA), and the Special Inspector General for the Troubled Asset Relief Program (SIGTARP).They provide independent audits, investigations, and oversight of the Department of the Treasury and its programs.

**Bureaus**

Treasury's bureaus employ 98 percent of the Department's workforce and are responsible for carrying out specific operations assigned to the Department.

*The Internal Revenue Service (IRS)* is the largest of the Department's bureaus and determines, assesses, and collects tax revenue for the federal government while assisting taxpayers in complying with their obligations.

*The Office of the Comptroller of the Currency (OCC)* charters, regulates, and supervises national banks and federal savings institutions to ensure compliance with consumer laws and regulations and a safe, sound, and competitive banking system that supports citizens, communities, and the economy.

*The Bureau of the Fiscal Service (Fiscal Services)* was formed from the consolidation of the Financial Management Service and the Bureau of the Public Debt. Its mission is to promote the financial integrity and operational efficiency of the U.S. government through exceptional accounting, financing, collections, payments, and shared services.

*The United States Mint (Mint)* manufactures and distributes circulating coins, precious metal and collectible coins, and national medals. The United States Mint also maintains physical custody and protection of most of the nation's gold and silver reserves.

*The Bureau of Engraving and Printing (BEP)* designs and manufactures high-quality currency notes and other financial documents that deter counterfeiting and meet customer requirements for quality, quantity, performance, and accessibility.

*The Financial Crimes Enforcement Network (FinCEN)* safeguards the financial system from the abuses of financial crime, including terrorist financing, money laundering, and other illicit activity by administering the Bank Secrecy Act (BSA) and maintaining the BSA data system.

*The Alcohol and Tobacco Tax and Trade Bureau (TTB)* collects Federal excise taxes on alcohol, tobacco, firearms, and ammunition and assures compliance with tobacco permitting and alcohol permitting, labeling, and marketing requirements to protect consumers.

This report presents information required by Executive Orders 13514, *Federal Leadership in Environmental, Energy, and Economic Performance,* and Executive Order 13653, *Preparing the United States for the Impacts of Climate Change*. In addition to the Treasury Adaptation Policy Statement, we also present a plan to assess vulnerability to climate change, while contributing to adaptation planning, implementation, and resilience.

## 1.3 Challenges

Treasury considers global changes in climate resulting in localized impact a significant issue. Such challenges include demographic shifts and land use, world population, aging infrastructure, persistent conflict, declining biodiversity, globalization, and changing social values and economic conditions (USACE 2011). Alone, these changes can have significant impacts; however they can also combine in unpredictable ways, resulting in potentially surprising and/or abrupt changes that threaten public health and safety.

Resource shortages have the potential to affect Treasury's ability to carry out its mission as well. Although climate science has improved greatly in the last decade, applying the information in a meaningful way at the regional/local level remains a challenge. Specific affect is not yet possible and additive crises remain difficult to plan for.

Treasury also recognizes that collaboration, both nationally and internationally, is the most effective way to develop practical, consistent, and cost-effective measures to reduce potential vulnerabilities resulting from global changes (Stockton and White 2011). We will continue to work closely with other agencies having aligned mission areas to take

advantage of any synergies. Our Climate Change Adaptation Plan is a living document and will be updated as initiatives and developments warrant such.

# 2 Vulnerability Assessment

## 2.1 Treasury Mission and Functions

Treasury's mission is to maintain a strong economy and create economic and job opportunities by promoting conditions that enable economic growth and stability at home and abroad, strengthen national security by combating threats and protecting the integrity of the financial system, and manage the U.S. Government's finances and resources. This highlights its role as the steward of U.S. economic and financial systems, and as an influential participant in the world economy.

Focused on promoting economic prosperity and ensuring the financial security of the United States, the Department is responsible for a wide range of activities, including advising the President on economic issues, encouraging sustainable economic growth, and helping ensure a stable financial system. Treasury operates and administers systems that are critical to the nation's financial infrastructure, such as disbursing payments to the American public, collecting taxes, producing coins and currency, and issuing debt necessary to run the federal government. The Department's basic functions include:

- Managing federal finances.
- Collecting taxes, duties, and monies paid to and due to the United States.
- Pay the bills of the United States.
- Producing currency and coinage.
- Managing government accounts and the public debt.
- Supervising national banks and thrift institutions.
- Formulating financial, economic, trade, and tax policies.
- Enforcing federal finance and tax laws.
- Investigating and prosecuting tax evaders, counterfeiters and forgers.
- Contributing to national security by combating illicit financial networks and protecting the integrity of the U.S. and global financial system.

Treasury works with other federal agencies, foreign governments, public stakeholders, and international financial institutions to encourage global economic growth, raise standards of living, protect the financial system from abuse, and to the extent possible, anticipate and mitigate the consequences of economic and financial crises. While these strategic goals are primarily related to finance and maintaining a strong economy, the stability of the Department's facilities and related infrastructure are vitally important.

In order for Treasury to achieve its mission, protection of its facilities from the adverse effects of climate change must be a priority. The Department of the Treasury's Strategic Plan states that unanticipated challenges or sudden crises can place significant demands on the Department. Climate Change is one external factor that could have a significant impact on Treasury's ability to achieve its strategic goals.

## 2.2 Climate Change Impacts to Treasury's Mission

We believe that by understanding the drivers and impacts associated with climate and other global changes, and their influence on our strategic mission and goals, Treasury will increase its resilience and remain operational. Next we consider major climate change impacts that may significantly reduce our ability to meet our mission requirements. Such vulnerability assessment is classically referred to as risk analysis, and which we employee here.

### 2.2.1 Drivers

The primary drivers of climate change impacts that could affect Treasury's mission are changing temperature and precipitation regimes, increasing global sea level, and associated physical processes (Brekke et al. 2009). Changing temperatures affect the form of precipitation, evapotranspiration, and sea-surface temperatures. Altered evapotranspiration from vegetation and land surfaces can impact the amount of water reaching streams, lakes, and reservoirs. Changes in sea-surface temperatures can alter ocean and atmospheric circulation and affect the intensity and frequency of coastal storms.

Precipitation changes are expected to differ across the country, with some areas receiving more and others receiving less. There may also be changes in seasonal patterns and extremes of precipitation. Depending on location, precipitation changes could lead to more climate variability and more frequent occurrence of extreme events such as droughts and floods.

### 2.2.2 Impacts

Potential impacts include changing water availability, demand, and quality; weather pattern changes and an increase in severe weather events; ecosystem or species transitions or alterations; coastal and estuarine conditions; and energy production and demand. Appendix F in the *Federal Agency Climate Change Adaptation Planning, Support Document*, dated March 4, 2011, provides a comprehensive list of climate change impacts.

For the purpose of this plan, we have outlined potential climate change impacts associated with the drivers discussed above that could influence the key areas of energy disruption, currency production, environment, population migration, and potential employee impacts. These impacts are shown in Table 1, along with the key areas they are expected to impact.

**Table 1. Potential Climate Change Impacts to key Treasury Functions.**

| Climate Change | Impact | Affected Aspect* |
|---|---|---|
| Increasing average air temperature | Change in form of precipitation (snow vs. rain) | E, M |
| | Changes in ecosystem structure and function | E |
| | Changes in invasive species or pest distribution | E, M |
| | Changes in geographic range and incidence of vector-borne, waterborne, and zoonotic diseases | M, I |
| | Reduced efficiency and generating capacity of power plants | P, C |
| | Changes in energy demand | P, C, E |
| | Altered ocean circulation → changing tide & surge regimes | E, M |
| | Increased extreme events → heat waves, cold waves, ice storms, blizzards, dust storms | E, M, I |
| | Changing persistence of large-scale atmospheric features | E |
| Changing precipitation: increasing variability, altered seasonality, and changing intensity or frequency of extremes (flood and drought) | Changing or more variable municipal & industrial water supplies | C, M, I |
| | Changing water conditions for ecosystems | E |
| | Changing frequency of coastal and riverine flooding | E, M, I |
| | Changes in stormwater runoff | E |
| | Changes in drought frequency and intensity | E, M, I |
| | Changing levels of pollutants in runoff | E |
| | Changes in snowmelt onset and volume | E |
| Sea Level and coastal storm changes and associated tides, waves, and surges | Increased storm waves, surges, tides | E, I |
| | Changes in estuarine structure and processes | E |
| | Altered saline intrusion into coastal aquifers | E, M |
| | Inundation of low-lying land | E, M, I |
| | Changes in wind regimes | E |
| | Changes in ecosystem structure and species distributions, including invasive species and pests | E, M, I |
| | | |

* P=Potential Power Disruption, C=Currency Production, E=Environment, M=Population Migration I=Potential Employee Impacts

Additional information regarding areas of potential climate change and their effects are described in Appendix A.

## 2.3 Managing Impacts to Strategic Missions and Goals

Our expectation that understanding climate change related drivers and their impacts on our mission is clearly aligned with the concept of adaptation, which is "Adjustment in

natural or human systems to a new or changing environment that exploits beneficial opportunities or moderates negative effects." (CEQ 2010).

Treasury is taking a collaborative approach. This has required a new attitude of partnering between agencies that recognizes the value of our different perspectives and expertise so that guidance reflects the best available, and actionable, science. We are developing and implementing plans, policies, and infrastructure adaptation in parallel, rather than sequentially, so that adaptation begins sooner in areas that are most vulnerable. The Department is taking a phased approach that allows us to identify uncertainties, so that we begin adaptation in areas where uncertainties are relatively small. Thus, risk of adverse consequences is lower. Treasury seeks to describe the future in ways that are compatible with our need for economic analyses, and that encompass all of the processes affecting our projects and facilities, including socio-economic and environmental. Finally, our adaptation planning and implementation must be credible, relying on logical, rational, and legally justifiable methods, processes, and policies.

## 2.4 Agencies with Similar Climate Change Impacts and Management Challenges

Treasury administrative and policy offices will encounter issues similar to other federal agencies including: USDA-Rural Development; Housing and Urban Development (HUD); Small Business Administration (SBA) and others. Since these agencies operate primarily from office buildings, they would face climate change challenges associated with those types of structures. These could include: the need to monitor and track employee health impacted by climate change (especially disease, heat induced illness, and water shortages); population migration caused by floods, drought, and extreme heat and potential infrastructure impacts (utilities, transportation).

Within Treasury, the Mint and BEP have comparable missions and face similar climate change impacts, and management challenges. Their mission is to supply the United States with sufficient coinage and currency for commerce. Challenges in the supply chain (energy, raw materials, and water supplies) as a result of climate change could impede this mission in the future.

The IRS collects Federal Insurance Contributions Act (FICA) taxes from workers for the Social Security Administration. These are insurance premiums that protect workers and covered family members in times of need. Both agencies track employee earnings and mailing addresses which could be made more difficult if people are forced to frequently move due to extreme weather events.

## 2.5 Treasury Collaboration and Coordination

Treasury has identified areas of shared activities where possible collaboration could occur in the future. Treasury is currently assessing the number of mission critical and mission dependent sites/facilities that are leased from or through GSA. Treasury intends to partner directly with GSA to address the vulnerabilities of these sites and facilities to incremental climate change and variability.

Current Treasury collaborations are ongoing within the IRS and include:

- The Center for Disease Control and Prevention (CDC) has contingency plans in place to distribute vaccinations through IRS offices during a pandemic.
- The IRS provides free tax assistance at Federal Emergency Management Agency (FEMA) Disaster Recovery Centers.
- The Small Business Administration provides financial assistance to businesses located in declared disaster areas which parallels IRS special tax law provisions to assist with business financial recovery after natural disasters.
- IRS is participating in CEQ's workgroup to coordinate a federal response to drought conditions in California (the workgroup is led by GSA and EPA Regional Administrators). This group will work with local and state authorities to coordinate an effective federal response.
- IRS is cooperating with a GSA Federal Triangle Flood Mitigation Study to determine vulnerabilities and mitigation strategies for future flood events in the DC Federal Triangle area as was experienced in 2006. The GSA study will identify means by which each building can be hardened to prevent flood waters from inundating the building while limiting the impact to the historic fabric.
- For the IRS Main Headquarters building at 1111 Constitution Avenue, NW, GSA successfully tested a moat gate installed inside the existing moat at Constitution Avenue and 12th Street.
- IRS participates in the Treasury Climate Change Adaptation Workgroup whose members work to address climate change adaptation and resilience planning throughout Treasury.
- IRS has attended interagency workshops on Building a Climate Resilient National Capital Region. These workshops have included representatives from federal agencies, local government, and non-profits.
- Recently, IRS participated in a GSA-led workshop focusing on potential risks to infrastructure and telecom systems in the event of extreme heat events and sea level rise in DC.

BEP participates in Treasury and EPA workgroups on climate change assessment and adaptation to gather information to better understand potential impacts of climate change on BEP facilities and operations. They then share this information with other organizations where possible and when requested. Some examples include:

- Participating in a NOAA workshop on climate change impacts on federal facilities in Washington, D.C.

- Reviewing climate change information developed by the Metropolitan Washington Council of Governments.

Information from future assessments of staff, operations, and facility vulnerability to climate change will be shared with other local agencies and entities to promote consistent planning and a joint response when possible. Treasury will remain diligent in efforts to leverage opportunities that support and encourage climate resilient investments by providing incentives through guidance, and grants where possible.

# 3 Treasury Climate Change Adaptation Planning and Implementation

## 3.1 Treasury Accomplishments to Date

Treasury has taken steps to help manage the effects of climate change in certain areas. Some previous and ongoing efforts include:

- Emergency electricity generators and back up batteries to power key facilities in the event of power outages.
- Refinement of incident command and continuity of operations plans.
- Increased use of telework and flexible workspace.
- Vulnerability assessments are ongoing.

Because IRS represents such a large proportion of the total Treasury workforce, they have several actions already underway to support climate change adaptation

- Use of temporary Tax Assistance Centers in disaster areas (IRS).
- Postponing tax filings in areas that are declared natural disasters.
- Special tax law provisions to help taxpayers and businesses recover financially from the impact of natural disasters.
- IRS Real Estate and Facilities Management (REFM) has conducted a preliminary assessment of vulnerable facilities (see 3.4.1). Moving forward, REFM plans to work with other relevant IRS stakeholders to address risks at these facilities, as appropriate; these stakeholders may include Physical Security & Emergency Preparedness, Employee Support Services, the Human Capital Office and/or additional groups.
- IRS telework efforts and the Treasury climate change adaptation workgroup are ongoing. Headquarters REFM has the lead on recently initiated communications and response strategies. Additional interagency efforts were recently initiated with field offices and other business divisions possibly being engaged for support.
- Specifically for the Fresno campus, IRS is participating in a multi-agency federal workgroup to assess responses to drought conditions in California.

- The 2012 National Agreement between the IRS and the National Treasury Employees Union (NTEU) greatly expanded the list of positions in IRS meeting eligibility requirements for frequent telework. The IRS Human Capital office has expanded telework eligibility to more occupations within the agency. Workstation sharing will facilitate expanded use of telework and less reliance on physical agency offices, which will promote continuity of operations in response to climate change events.
- Workstation sharing will also serve to promote space reduction efforts at IRS, further reducing the reliance on office space by allowing for the closure of smaller offices that could also be vulnerable. These efforts have three primary goals:
    1) Enhance IRS emergency response capability and employee awareness.
    2) Promote continuity of operations and reduce dependency on office space.
    3) Mitigate potential damage due to climate change events.

Other bureaus have recently completed or have on-going actions that will add to their overall resilience to climate change:

- Based on BEP's assessment, there may be an increased risk of flooding associated with sea level rise and storm surge. District of Columbia flood insurance risk maps indicate the facility is within an area that would be impacted by a category 4 storm surge. BEP reviewed the potential impact of sea level rise using the Climate Central sea level rise analysis maps for Washington, DC, which suggested that a sea level rise of 10 feet or greater would be required to impact the facility. BEP plans to hire a contractor to conduct a more detailed analysis of this risk during FY15. The results of this study will help the BEP determine what actions should be taken to mitigate any risks.
- The Mint and BEP are implementing energy and water efficiency projects to reduce their use of these critical resources thus decreasing their exposure to the risks associated with insufficient energy and water supplies.
- The Mint maintains a contingency stock of finished coins and materials to ensure a sufficient supply to meet the needs of the American people in the event of a production disruption.
- Waterproofing the areas around indoor pad-mounted electrical transformers has recently been completed by Departmental Offices in the Main Treasury building. Future plans include moving data center servers off-site. Employees who are "telework-ready" will be encouraged to telework during a significant event.

## 3.2 Integrating Adaptation and Mitigation

Carbon dioxide emissions are a primary focus of Treasury's mitigation strategies. These include improving energy efficiency and using energy sources that produce less or even

zero carbon dioxide. Choices made about emissions reductions now and over the next few decades will have far reaching consequences for climate-change impacts. The global climate change threats facing Treasury facilities and programs are complex. Efforts to adapt to the effects of climate change must be evaluated with many factors in mind, including GHG emissions reductions, resource conservation measures, budget restrictions, and competing priorities.

## 3.3 Considerations for Improving Climate Adaptation and Resilience

Treasury continues to identify efforts to incorporated climate adaptation and resilience into procurement, acquisition, real property/leasing decisions. Primary responsibility for planning and implementing these activities fall on the individual bureaus. Examples include:

- IRS data centers are typically equipped with access to Uninterruptible Power Supply (UPS) systems; the UPS provides short-term emergency power to allow time for employees to shut down critical equipment in the event of a power failure. To the extent possible, critical equipment is often connected to redundant power supplies, so that if one piece of equipment fails, it can be supplied from another. However, even with these safeguards, data center equipment would be susceptible to facility-wide events affecting all equipment.
- Any future BEP acquisitions or leases are expected to utilize GSA processes and will include evaluation of the location of critical systems within the facility to minimize flood risk. The infrastructure for BEP's existing facilities is believed to have sufficient design capacity to withstand projected near to medium-term changes in heating and cooling load associated with climate change. BEP upgraded the back-up power system to its DC Facility in 2011.
- Climate change effects are not expected to impact BEP's ability to procure critical materials such as currency inks or paper for the production of currency; however, climate change may lead to increased droughts and higher costs for water. BEP's production process uses a substantial amount of water to clean inks from presses as they operate. BEP is currently installing a recycling plant at the DC Facility that will reduce water use for this process by 90-95%. An additional recycling plant is expected to be installed at BEP's Western Currency Facility (WCF) after FY2016.
- All future BFS facilities that are constructed will be equipped with generator power and a secondary source of power if cost effective or available.
- Back-up generators are in place for Main Treasury and Annex with a contract in place to supply diesel fuel in the event of long-term use. The Main Treasury generators can operate 8 hours on a full fuel load at maximum power. The generators only supply key areas of Main Treasury, not the entire building. Annex generators (2@1000 kW each) power the entire building. All generators operate on diesel fuel and a contract is in place to supply fuel in the event of long-term use.

At this time, Treasury has not detected any barriers to investments. However, we will continue to improve processes that will ensure such barriers will be identified as part of future actions that include adaptation planning. In addition, Treasury has not identified policies or funding programs that increase the vulnerability of built systems, economic sectors, or communities to climate change related risks.

## 3.4 Risk-Informed Decision-Making For Climate Change

Treasury is exploring ways to incorporate climate change uncertainties into decision making. One method is a single risk management framework currently being developed by the US Army Corps of Engineers (Krewe, 2008). It enables the development of broadly applicable and transparent processes that take into consideration climate change. The framework is systematic, scalable, simple and flexible and can be applied at the project level. It is intended to be applied across the entire project life-cycle, since climate change uncertainty may require making sequential decisions over time and updating design and plans to incorporate new and changing information.

The risk assessment approach includes consequence and likelihood assessment. The framework can employ qualitative and/or quantitative techniques for risk analysis and outlines how to choose an approach. It also describes formulation of risk management alternatives under changing conditions, an important consideration for climate change adaptation. The framework emphasizes the need for stakeholder involvement throughout the decision process. The risk management framework will be a foundation for developing strategies to incorporate climate change into the decision making processes at Treasury.

### 3.4.1 Risks to Mission, Operations, and Programs

Potential risks to Treasury's mission, operations, and programs could be wide-ranging based on the degree of climate change induced impacts that occur. One potential impact that is seen as a significant risk is the anticipated stress on the electricity grid from air conditioning systems during extreme heat events. Interruptions to the power supply caused by brownouts and blackouts have the potential to cause severe disruptions to all Treasury activities. Other potentially damaging impacts include:

- Supply chain interruptions.
- Fuel supplies for long term generator use may not be sustainable.
- Employee health may be affected by temperature extremes and vector-borne and water –borne diseases.
- Water supplies may become unreliable.
- Telecommunications failure.
- Water infiltration/flooding causing failure of below grade electrical systems.
- Damage to transportation infrastructure.

IRS leases all of its facilities through GSA and has delegated operations and maintenance authority at 10 facilities. In assessing the risk of climate change on mission and operations, IRS has focused primarily on the main campuses and data centers, both because of their risk factors and because of the size and significance of their operations. The potentially vulnerable sites identified are:

- Brookhaven, NY campus
- Fresno, CA campus
- Martinsburg, WV Computing Center
- Memphis, TN Computing Center
- Washington, DC Headquarters

These sites were chosen based on the following criteria:

- Susceptibility to climate change-related incidents:
    - Proximity to coasts.
    - Recent exposure to extreme weather.
    - Susceptibility to storms, severe weather, and negative effects of weather events (flood, drought, power loss).

- Risk of impact from climate change-related incidents:
    - Reliance on public transportation systems.
    - Number of employees affected.
    - Extent of systems impacted (IRS, Treasury, TIGTA).
    - Mission critical and/or Headquarters operations.
    - Cost of failure (tax interface, employee systems, sensitivity of data).

Additionally, as climate change increases the risk of severe weather events across the country, IRS anticipates an increase in the rate of office damage, impacts to building operations, and temporary closures, both in the large campuses and smaller posts of duty (PODs). This could include droughts, severe storms, hurricanes, floods, and extreme heat events.

- Droughts: Impact on facility maintenance, including landscaping at leased facilities where IRS has operations and maintenance authority.
- Severe storms, hurricanes, and floods: Potential for building damage, closure, and power loss resulting from flooding or wind. Also the potential for storms to impact roads/public transportation systems, impacting employees' ability to get to work.
- Extreme heat: Most facilities can operate at 100 degrees outside temperature, assuming continuity of power and air conditioning. Unknown if this could continue over several weeks. Telecomm equipment endurance above 90 degrees inside the building is questionable.

In the long-term, IRS anticipates a greater potential for more sustained damage to facilities due to increases in frequency of the events described above, as well as the potential for sea-level rise to impact some facilities. IRS Real Estate & Facilities Management staff is also building an internal contact network including employees from other business divisions, and is considering internal communications strategies.

The Bureau of Engraving and Printing maintains its manufacturing/production facilities in Washington, DC and Fort Worth, Texas, with a warehouse in Landover, MD. Risks and possible mitigation to climate change effects include:

- BEP has assessed the risk of climate change to its facilities using a qualitative risk assessment tool provided by the Department of the Treasury that looks at both near term and longer term vulnerabilities from climate change.
- BEP personnel participate on the Department of the Treasury Climate Change Adaptation Working Group and EPA's Federal Adaptation Community of Practice, as well as information sharing events that focus on climate change impacts and adaptation. These provide BEP with information to help ensure that regional and local vulnerabilities that have the potential to affect the Bureau's mission are identified, and to build capacity among Bureau personnel through education and awareness training.

The Bureau of Fiscal Services' DC (Liberty Center) and Hyattsville facilities will experience impacts to operations and programs similar to all agencies operating in the DC area. The Hyattsville and Liberty Center facilities are equipped with backup generators and secondary sources of power. Staffing issues could be problematic if transportation infrastructure has been affected. Telework-ready employees could telework on a short-term basis.

Anticipated risks from climate change related impacts and mitigation activities at other Fiscal facilities are listed below:

- Parkersburg - The threat of high water could create issues with transportation of staff due to numerous rivers and streams in the surrounding areas. The Third Street data center is on a back-up generator and uninterruptible power supply (UPS). The main building has two independent power feeds. The Avery Street building has no backup power. Telework-ready employees could telework on a short-term basis.
- Birmingham - New construction is underway that will provide a stand-alone facility that will have UPS and generator coverage. Telework-ready employees could telework on a short-term basis. Concrete construction provides some protection against hurricanes, tropical storms, and tornadoes.
- Austin - The facility has a generator in place. Telework-ready employees could telework on a short-term basis.
- Kansas City - The facility is used primarily to print and mail checks. The power supply is backed up by a generator and UPS. Concrete construction provides protection against F3-4 tornadoes. There is discussion taking place to increase

protection and harden facility by adding an exterior concrete shell and roof. Telework-ready employees could telework short-term.
- Philadelphia - has low risk of severe storms or disruption. The facility is collocated and has a generator. Telework-ready employees could telework on a short-term basis.

Identified risks at Departmental Offices include:

- Possible failure of data center servers in a high temperature situation.
- Possible telecommunication failure due to high temperatures.
- Exposure of at or below grade electrical infrastructure to flooding or water infiltration.
- Interruption of water used for cooling tower make up purposes (largest user of water)- this is sourced from the municipal water system.
- Events that affect employee transportation.
  - Subway inaccessible due to flooding or buckled rails.
  - Rail travel not possible due to buckled rails or power outages.
  - Homes damaged by flooding or storms.
  - Increased cases of vector or water-borne illness.

The Bureau of Engraving and Printing maintains its manufacturing/production facilities in Washington, DC and Fort Worth, Texas with a warehouse in Landover, MD. Risks and possible mitigation to climate change effects include:

- BEP has assessed the risk of climate change to its facilities using a qualitative risk assessment tool provided by the Department of the Treasury that looks at both near term and longer term vulnerabilities from climate change.
- BEP personnel participate on the Department of the Treasury Climate Change Adaptation Working Group and EPA's Federal Adaptation Community of Practice, as well as information sharing events that focus on climate change impacts and adaptation. These provides BEP with information to helps ensure that regional and local vulnerabilities that have the potential to affect the Bureau's mission are identified, and to build capacity among Bureau personnel through education and awareness training.

# 4 Summary

Treasury's Climate Change Adaptation Plan details our progress thus far in understanding our risk, identifying near term mitigation plans, establishing partnerships to increase our understanding and knowledge, and begin to create a process by which we can prioritize risk.

Climate change adaptation planning is in its early stages. As more experience and information is gained by collaborating and sharing information with other agencies, we expect to gain additional clarity on how Treasury will respond to the threats from climate change. Using best available science, strategically to prioritize actions and execute on initiatives, we will continue to work toward ensuring the continuation of our mission.

# References


Brekke, L., J.E. Kiang, J.R. Olsen, D.R. Pulwarty, D. Raff, D.P. Turnipseed, R.S. Webb, and K.D. White (2009) "Climate change and water resources management: A federal perspective". USGS Circular 1331. Available at http://pubs.usgs.gov/circ/1331/.

Council on Environmental Quality (2010) "Progress Report of the Interagency Climate Change Adaptation Task Force: Recommended Actions in Support of a National Climate Change Adaptation Strategy: October 5, 2010". White House Council on Environmental Quality: Washington, DC. Available at http://www.whitehouse.gov/sites/default/files/microsites/ceq/Interagency-Climate-Change-Adaptation-Progress-Report.pdf

Krewe, Brew, (2008) U.S. Army Corps of Engineers, "Risk Management Framework", Version 2.0.

U.S. Army Corps of Engineers (2011) "U.S. Army Corps of Engineers (USACE) Climate Change Adaptation Plan and Report 2011".

Stockton, S.L., and K.D. White (2011) "US Army Corps of Engineers Collaborative approach to 21st Century Challenges posed by global changes." IN Climate Change: Global Change and Local Adaptation. Springer.

# Appendix A- Areas of Potential Climate Change and their Effects

(adapted from *Global Climate Change Impacts, 2009 Report*, U.S. Global Change Research Program)

**Air**

Global average surface air temperature has increased substantially since 1970. The estimated change in the average temperature of Earth's surface is based on measurements from thousands of weather stations, ships, and buoys around the world, as well as from satellites. These measurements are independently compiled, analyzed, and processed by different research groups. There are a number of important steps in the data processing. These include identifying and adjusting for the effects of changes in the instruments used to measure temperature, the measurement times and locations, the local environment around the measuring site, and such factors as satellite orbital drift. For instance, the growth of cities can cause localized "urban heat island" effects.

**Water**

The impacts of climate change include too little water in some places, too much water in other places, and degraded water quality. Some locations are expected to be subject to all of these conditions during different times of the year. Water cycle changes are expected to continue and to adversely affect energy production and use, human health, transportation, agriculture, and ecosystems.

*Changes in water quality*

Increased air temperatures lead to higher water temperatures, which have already been detected in many streams, especially during low-flow periods. In lakes and reservoirs, higher water temperatures lead to longer periods of summer stratification (when surface and bottom waters do not mix).

Dissolved oxygen is reduced in lakes, reservoirs, and rivers at higher temperatures. Oxygen is an essential resource for many living things, and its availability is reduced at higher temperatures both because the amount that can be dissolved in water is lower and because respiration rates of living things are higher. Low oxygen stresses aquatic animals such as coldwater fish and the insects and crustaceans on which they feed. Lower oxygen levels also decrease the self-purification capabilities of rivers.

The negative effects of water pollution, including sediments, nitrogen from agriculture, disease pathogens, pesticides, herbicides, salt, and thermal pollution, will be amplified by observed and projected increases in precipitation intensity and longer periods when streamflows are low. The U.S. Environmental Protection Agency expects the number of waterways considered "impaired" by water pollution to increase. Heavy downpours lead to increased sediment in runoff and outbreaks of waterborne diseases. Increases in pollution carried to lakes, estuaries, and the coastal ocean, especially when coupled with increased temperature, can result in blooms of harmful algae and bacteria. However,

pollution has the potential of being diluted in regions that experience increased streamflow.

*Precipitation patterns are changing*
Precipitation is not distributed evenly over the globe. Its average distribution is governed primarily by atmospheric circulation patterns, the availability of moisture, and surface terrain effects. The first two of these factors are influenced by temperature. Observations show that such shifts are occurring. Changes have been observed in the amount, intensity, frequency, and type of precipitation. Pronounced increases in precipitation over the past 100 years have been observed in eastern North America, southern South America, and northern Europe. Decreases have been seen in the Mediterranean, most of Africa, and southern Asia. Changes in the geographical distribution of droughts and flooding have been complex. In some regions, there have been increases in the occurrences of both droughts and floods. As the world warms, northern regions and mountainous areas are experiencing more precipitation falling as rain rather than snow. Widespread increases in heavy precipitation events have occurred, even in places where total rain amounts have decreased. These changes are associated with the fact that warmer air holds more water vapor evaporating from the world's oceans and land surface.

*Salt-water intrusion*
Sea-level rise is expected to increase saltwater intrusion into coastal freshwater aquifers, making some unusable without desalination. Increased evaporation or reduced recharge into coastal aquifers exacerbates saltwater intrusion. Shallow groundwater aquifers that exchange water with streams are likely to be the most sensitive part of the groundwater system to climate change. Small reductions in groundwater levels can lead to large reductions in streamflow and increases in groundwater levels can increase streamflow.

*Changing water demands*
Water demands are expected to change with increased temperatures. Evaporation is projected to increase over most of the United States as temperatures rise. Higher temperatures and longer dry periods are expected to lead to increased water demand for irrigation. Higher temperatures are projected to increase cooling water withdrawals by electrical generating stations. In addition, greater cooling requirements in summer will increase electricity use, which in turn will require more cooling water for power plants. Industrial and municipal demands are expected to increase slightly.

Water and energy are tightly interconnected; water systems use large amounts of energy, and energy systems use large amounts of water. Both are expected to be under increasing pressure in the future and both will be affected by a changing climate. In the energy sector, water is used directly for hydropower, and cooling water is critical for nearly all other forms of electrical power generation. Withdrawals of freshwater used to cool power plants that use heat to generate electricity are very large, nearly equaling the water withdrawn for irrigation. Water consumption by power plants is about 20 percent of all non-agricultural uses, or half that of all domestic use.

**Sea Level Rise**
More than 8 million people live in areas at risk of coastal flooding. Along the U.S. Atlantic Coast alone, almost 60 percent of the land that is within a meter of sea level is planned for further development, with inadequate information on the potential rates and amount of sea level rise.

Global sea level rise has been a persistent trend for decades. It is expected to continue beyond the end of this century, which will cause significant impacts in the United States. Scientists have very high confidence (greater than 90% chance) that global mean sea level will rise at least 8 inches (0.2 meter) and no more than 6.6 feet (2.0 meters) by 2100. Many of the nation's assets related to military readiness, energy, commerce, and ecosystems that support resource-dependent economies are already located at or near the ocean, thus exposing them to risks associated with sea level rise.

**Floods**
Major flood types include flash, urban, riverine, and coastal flooding:
*Flash floods* occur in small and steep watersheds and waterways and can be caused by short-duration intense precipitation, dam or levee failure, or collapse of debris and ice jams. Snow cover and frozen ground conditions can exacerbate flash flooding during winter and early spring by increasing the fraction of precipitation that runs off. Flash floods develop within minutes or hours of the causative event, and can result in severe damage and loss of life due to high water velocity, heavy debris load, and limited warning. Most flood-related deaths in the U.S. are associated with flash floods.

*Urban flooding* can be caused by short-duration very heavy precipitation. Urbanization creates large areas of impervious surfaces (such as roads, pavement, parking lots, and buildings) and increases immediate runoff. Stormwater drainage removes excess surface water as quickly as possible, but heavy downpours can exceed the capacity of drains and cause urban flooding.

Flash floods and urban flooding are directly linked to heavy precipitation and are expected to increase as a result of projected increases in heavy precipitation events. In mountainous watersheds, such in-creases may be partially offset in winter and spring due to projected snowpack reduction.

*Riverine flooding* occurs when surface water drains from a watershed into a stream or a river exceeds channel capacity, overflows the banks, and inundates adjacent low lying areas. Riverine flooding is commonly associated with large watersheds and rivers, while flash and urban flooding occurs in smaller natural or urban watersheds. Because heavy precipitation is often localized, riverine flooding typically results from multiple heavy precipitation events over periods of several days, weeks, or even months. In large basins, existing soil moisture conditions and evapotranspiration rates also influence the onset and severity of flooding, as runoff increases with wetter soil and/or lower evapotranspiration conditions. Snow cover and frozen ground conditions can also exacerbate riverine flooding during winter and spring by increasing runoff associated with rain-on-snow events and by snowmelt, although these effects may diminish in the long term as snow

accumulation decreases due to warming. Since riverine flooding depends on precipitation as well as many other factors, projections about changes in frequency or intensity are more uncertain than with flash and urban flooding.

*Coastal flooding* is predominantly caused by storm surges that accompany hurricanes and other storms. Low storm pressure creates strong winds that create and push large sea water domes, often many miles across, toward the shore. The approaching domes can raise the water surface above normal tide levels (storm surge) by more than 25 feet, depending on various storm and shoreline factors. Inundation, battering waves, and floating debris associated with storm surge can cause deaths, widespread infrastructure damage (to buildings, roads, bridges, marinas, piers, boardwalks, and sea walls), and severe beach erosion. Storm-related rainfall can also cause inland flooding (flash, urban, or riverine) if, after landfall, the storm moves slowly or stalls over an area. Inland flooding can occur close to the shore or hundreds of miles away and is responsible for more than half of the deaths associated with tropical storms. Climate change affects coastal flooding through sea level rise and storm surge, increases in heavy rainfall during hurricanes and other storms, and related increases in flooding in coastal rivers.

Heavy rains can lead to flooding, which can cause health impacts including direct injuries as well as increased incidence of waterborne diseases due to pathogens such as Cryptosporidium and Giardia. Downpours can trigger sewage overflows, contaminating drinking water and endangering beachgoers. The consequences will be particularly severe in the roughly 770 U.S. cities and towns, including New York, Chicago, Washington DC, Milwaukee, and Philadelphia, that have "combined sewer systems;" an older design that carries storm water and sewage in the same pipes. During heavy rains, these systems often cannot handle the volume, and raw sewage spills into lakes or waterways, including drinking-water supplies and places where people swim.

**Energy**

Warming will be accompanied by decreases in demand for heating energy and increases in demand for cooling energy. The latter will result in significant increases in electricity use and higher peak demand in most regions.

Many of the effects of climate change on energy production and use in the United States are not well studied. Some of the effects of climate change, however, have clear implications for energy production and use. For instance, rising temperatures are expected to increase energy requirements for cooling and reduce energy requirements for heating. Changes in precipitation have the potential to affect prospects for hydropower, positively or negatively. Concerns about climate change impacts will almost certainly alter perceptions and valuations of energy technology alternatives. These effects are very likely to be relevant for energy policies, decisions, and institutions in the United States, affecting courses of action and appropriate strategies for risk management.

Studies project that temperature increases due to global warming are very likely to increase peak demand for electricity in most regions of the country. An increase in peak demand can lead to a disproportionate increase in energy infrastructure investment.

Since nearly all of the cooling of buildings is provided by electricity use, whereas the vast majority of the heating of buildings is provided by natural gas and fuel oil, the projected Energy Supply and Use changes imply increased demands for electricity. This is especially the case where climate change would result in significant increases in the heat index in summer, and where relatively little space cooling has been needed in the past, but demands are likely to increase in the future.

The increase in electricity demand is likely to be accelerated by population movements in the South and Southwest, which are regions of especially high per capita electricity use, due to demands for cooling in commercial buildings and households. Because nearly half of the nation's electricity is currently generated from coal, these factors have the potential to increase total national carbon dioxide emissions in the absence of improved energy efficiency, development of non-carbon energy sources, and/or carbon capture and storage.

Energy production is likely to be constrained by rising temperatures, limited water supplies, and a reduction in the number of power generation plants in many regions. In some regions, reductions in water supply due to decreases in precipitation and/or water from melting snowpack are likely to be significant, increasing the competition for water among various sectors including energy production.

The production of energy from fossil fuels (coal, oil, and natural gas) is inextricably linked to the availability of adequate and sustainable supplies of water. While providing the United States with the majority of its annual energy needs, fossil fuels also place a high demand on the nation's water resources in terms of both quantity and quality impacts. Generation of electricity in thermal power plants (coal, nuclear, gas, or oil) is water intensive. Power plants rank only slightly behind irrigation in terms of freshwater withdrawals in the United States.

There is a high likelihood that water shortages will limit power plant electricity production in many regions. Future water constraints on electricity production in thermal power plants are projected for Arizona, Utah, Texas, Louisiana, Georgia, Alabama, Florida, California, Oregon, and Washington state by 2025. Additional parts of the United States could face similar constraints as a result of drought, growing populations, and increasing demand for water for various uses, at least seasonally. Situations where the development of new power plants is being slowed down or halted due to inadequate cooling water, and regulatory constraints[1] are becoming more frequent throughout the nation.

[1] U.S. Senate Committee on Energy & Natural Resources, White Paper, February 11, 2014, Page 12, "The Challenge" Click here for report.

**Ecosystems**
One consequence of a longer, warmer growing season and less extreme cold in winter is that opportunities are created for many insect pests and disease pathogens to flourish. Accumulating evidence links the spread of disease pathogens to a warming climate. Diseases that affect wildlife and the living things that carry these diseases have been expanding their geographic ranges as climate heats up. Depending on their specific adaptations to current climate, many parasites, and the insects, spiders, and scorpions that carry and transmit diseases, die or fail to develop below threshold temperatures. Therefore, as temperatures rise, more of these disease-carrying creatures survive. For some species, rates of reproduction, population growth, and aggression, tend to increase with higher temperatures, up to a limit. Some parasites' development rates and infectivity periods also increase with temperature.

**Human Population**
Increases in the risk of illness and death related to extreme heat and heat waves are very likely. Some reduction in the risk of death related to extreme cold is expected.

Temperatures are rising and the probability of severe heat waves is increasing. Analyses suggest that currently rare extreme heat waves will become much more common in the future. At the same time, the aging U.S. population is potentially becoming more vulnerable to hot weather and heat waves. The percentage of the U.S. population over age 65 is currently 12 percent and is projected to be 21 percent by 2050 (over 86 million people). Diabetics are also at greater risk of heat-related death, and the prevalence of obesity and diabetes is increasing. Heat-related illnesses range from heat exhaustion to kidney stones.

**Pathogens**
Some diseases transmitted by food, water, and insects are likely to increase. A number of important disease-causing agents (pathogens) commonly transmitted by food, water, or animals are susceptible to changes in replication, survival, persistence, habitat range, and transmission as a result of changing climatic conditions such as increasing temperature, precipitation, and extreme weather events.

• Cases of food poisoning due to Salmonella and other bacteria peak within one to six weeks of the highest reported ambient temperatures.

• Cases of waterborne Cryptosporidium and Giardia increase following heavy downpours. These parasites can be transmitted in drinking water and through recreational water use.

• Climate change affects the life cycle and distribution of the mosquitoes, ticks, and rodents that carry West Nile virus, equine encephalitis, Lyme disease, and hantavirus. However, moderating factors such as housing quality, land use patterns, pest control programs, and a robust public health infrastructure are likely to prevent the large-scale spread of these diseases in the United States.

• As temperatures rise, tick populations that carry Rocky Mountain spotted fever are projected to shift from south to north.

• Heavy rain and flooding can contaminate certain food crops with feces from nearby livestock or wild animals, increasing the likelihood of food-borne disease associated with fresh produce.

• The introduction of disease-causing agents from other regions of the world is an additional threat.

While the United States has programs that help protect against some of these problems, climate change will present new challenges.

**Society**

Climate change will affect different segments of society differently because of their varying exposures and adaptive capacities. The impacts of climate change also do not affect society in isolation. Rather, impacts can be exacerbated when climate change occurs in combination with the effects of an aging and growing population, pollution, poverty, and natural environmental fluctuations. Unequal adaptive capacity in the world as a whole also will pose challenges to the United States. Poorer countries are projected to be disproportionately affected by the impacts of climate change and the United States is strongly connected to the world beyond its borders through markets, trade, investments, shared resources, migrating species, health, travel and tourism, environmental refugees (those fleeing deteriorating environmental conditions), and security.

Population shifts and development choices are making more Americans vulnerable to the expected impacts of climate change. Climate is one of the key factors in Americans' choices of where to live. As the U.S. population grows, ages, and becomes further concentrated in cities and coastal areas, society is faced with additional challenges. Climate change is likely to exacerbate these challenges as changes in temperature, precipitation, sea levels, and extreme weather events increasingly affect homes, communities, water supplies, land resources, transportation, urban infrastructure, and regional characteristics that people have come to value and depend on.