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

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Executive Summary

The U.S. Department of the Treasury (Treasury) recognizes that climate change will be one of the major challenges of the 21st century. Treasury understands that certain aspects of its operations and mission could be impacted by expected changes in regional climate conditions throughout the United States. Treasury intends to take a comprehensive approach to climate change that incorporates new knowledge and changing conditions into our missions, facility operations, and programs. This approach will enhance the capacity of our operations, design, construction, planning, and maintenance to adapt to a changing climate.

Our goal is to develop practical, nationally consistent, legally justifiable, and cost effective measures, both structural and nonstructural, to reduce vulnerabilities to climate change. We are taking a collaborative approach that embodies a new attitude to partnering between agencies. This collaboration takes advantage of our different perspectives and expertise so that our progress on adaptation reflects the best available and actionable science. We are taking a phased approach that allows us to identify uncertainties, whether in climate projections or in systems responses, so that we begin adaptation in areas where uncertainties are relatively smaller and the risk of adverse or unintended consequences is lower. 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 are refining our adaptation based on the new knowledge.

This Treasury Climate Change Adaptation Plan provides the information requested by the Council on Environmental Quality in their Implementing Instructions for Federal Agency Climate Change Adaptation issued on March 4, 2011. An overarching policy statement about climate change is presented. Answers to the guiding questions posed by the Implementing Instructions about climate change impacts to Treasury strategic missions and goals support a high-level vulnerability analysis.

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

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1.1 Policy Statement for Climate Change Adaptation

I. Background:

a) 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 governing 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. However, these 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 address the consequences of climate change.

b) Adaptation planning will allow Treasury to minimize the negative impacts of climate change that are already occurring and take advantage of any new opportunities they present.

c) Through adaptation planning, Treasury will identify how climate change is likely to impact the Agency's 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.

d) 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 better ensures that taxpayer resources are invested wisely and that Treasury services and operations remain effective in current and future climate conditions.

e) 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.

II. Directive:

a) The goal of this policy is to ensure that Treasury executes its mission and operations securely, effectively, and efficiently in the face of a changing climate.

b) This policy establishes a Treasury-wide directive to integrate climate change adaptation planning and actions into Agency programs, policies, and operations.

c) 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 Agency resources, programs, policies, and operations.

d) Treasury shall develop and publish an agency-wide climate adaptation plan by June 2012 and update it regularly. 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 effectively adapt to current and future changes in the climate.
The Treasury climate change adaptation planning process will use information found in the Treasury Greenhouse Gas Inventory and the Treasury Strategic Sustainability Performance Plan.

e) 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 Agency's 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 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.

f) Treasury shall fully implement the *Federal Agency Climate Change Adaptation Planning Implementing Instructions* issued by the White House Council on Environmental Quality under Executive Order 13514, *Federal Leadership in Environmental, Energy, and Economic Performance,* and other applicable authorities.

g) 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.*

h) 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.

III. Agency Coordination and Implementation

a. The Senior Official for Climate Change Adaptation 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 Directive, the Senior Official for Climate Change Adaptation establishes the Treasury Climate Change Adaptation Work Group to oversee and coordinate agency-wide climate change adaptation planning and implementation. The Work Group is chaired by the Departmental Offices, Environmental Program Manager and will include representation from each Bureau as appropriate.

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

Nani A Coloretti

Nani Coloretti, Acting Assistant Secretary for Management

6/28/2012

Date

1.2 Introduction

Treasury's mission is to maintain a strong economy and create economic and job opportunities by promoting the 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 effectively.

Treasury's mission highlights its role as the steward of U.S. economic and financial systems, and as an influential participant in the world economy.

The Treasury Department is the executive agency responsible for promoting economic prosperity and ensuring the financial security of the United States. The Department is responsible for a wide range of activities such as advising the President on economic and financial issues, encouraging sustainable economic growth, and fostering improved governance in financial institutions. The Department of the Treasury operates and maintains systems that are critical to the nation's financial infrastructure, such as the production of coin and currency, the disbursement of payments to the American public, revenue collection, and the borrowing of funds necessary to run the federal government. The Department works with other federal agencies, foreign governments, and international financial institutions to encourage global economic growth, raise standards of living, and to the extent possible, predict and prevent economic and financial crises. The Treasury Department also performs a critical and far-reaching role in enhancing national security by implementing economic sanctions against foreign threats to the U.S., identifying and targeting the financial support networks of national security threats, and improving the safeguards of our financial systems.

The Department of the Treasury is the executive agency responsible for promoting economic prosperity and ensuring the financial security of the United States. Treasury is organized into the Departmental Offices, eight operating bureaus, and three independent inspectors general. The Departmental Offices are primarily responsible for 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 11 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 US. 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 aims 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 policies and programs; reviews regulations, 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 Financial Management Service (FMS) provides central payment services to Federal program agencies, operates the Federal Government's collections and deposit systems, provides government-wide accounting and reporting services, and manages the collection of non-tax delinquent debt owed to the Federal Government.

The Bureau of the Public Debt (BPD) borrows the money needed to operate the Federal Government through the sale of marketable, savings, and special purpose U.S. Treasury securities. In addition, it accounts for and services the public debt and provides reimbursable administrative support services to Federal agencies.

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

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.

The Treasury Department's mission is 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 maintains 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 and paying all bills of the United States;

• Producing currency and coinage;

• Managing Government accounts and the public debt;

• Supervising national banks and thrift institutions;

• Formulating domestic and international financial, economic, trade, and tax policies;

• Enforcing Federal finance and tax laws;

• Investigating and prosecuting tax evaders and assisting in the investigation of counterfeiters and forgers; and

• 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.

This report presents information required by the Implementing Instructions for Federal Agency Climate Change Adaptation (CEQ 2011) issued jointly on March 4, 2011 by the Executive Office of the President’s Council on Environmental Quality / Office of the Federal Environmental Executive (CEQ/OFEE) and the Office of Management and Budget. In addition to the Treasury Adaptation Policy Statement, we also address the Guiding Questions (Appendix A), and present a plan to assess vulnerability to climate change, and adaptation planning and implementation.

1.3 Challenges

Treasury considers global changes that result in local impacts and responses as a major challenge of this century.

Climate change is but one challenge; the others include demographic shifts and related land use/land cover, world population, aging infrastructure, persistent conflict, declining biodiversity, globalization, and changing social values and economic conditions (USACE 2011). These global changes can interact and combine in unpredictable ways, resulting in potentially surprising or abrupt changes that threaten public health and safety.

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

2 Guiding Questions for High Level Vulnerability Assessment

2.1 Treasury Mission and Strategic Goals

The Treasury's mission will be achieved through five strategic goals. These goals support Treasury's efforts to strengthen the economic recovery, help ensure that our Nation is on a strong fiscal footing, and use all tools at our disposal to protect Americans from terrorism and other threats to our national security.

Goal 1: Repair and Reform the Financial System and Support the Recovery of the Housing Market.

Goal 2: Enhance U.S. Competitiveness and Promote International Financial Stability and Balance Global Growth.

Goal 3: Protect our National Security through Targeted Financial Actions.

Goal 4: Pursue Comprehensive Tax and Fiscal Reform.

Goal 5: Manage the Government's Finances in a Fiscally Responsible Manner.

2.2 Guiding Questions: Strategic Objectives and Goals

For the purpose of this submittal, CEQ requests information on three to five areas.

Our high-level assessment of climate change impacts and vulnerabilities for this submittal addresses the following three strategic objectives:

•*Cash Resources are Available to Operate the Government* – Intended outcomes related to this objective include:

On-time revenue collection through a fair and uniform application of the law
Timely and accurate payments at the lowest possible cost
Government financing at the lowest possible cost over time
Effective cash management
Production of accurate, timely, useful, transparent and accessible financial information

•*Trust and Confidence in U.S. Currency Worldwide* –The intended outcome of this objective is to enable commerce through safe, secure, U.S. notes and coins.

•*An Enabled and Effective Treasury Department* – Intended outcomes related to this objective include:

A citizen-centered, results-oriented and strategically aligned organization
Exceptional accountability and transparency

2.3 Guiding Questions: Climate Change Impacts to Strategic Missions and Goals

We believe that by understanding the drivers and impacts associated with climate and other global changes, and their impacts to our strategic mission and goals, Treasury will increase its ability to endure and remain productive over time. Next we consider major climate change impacts that may significantly impact our ability to meet the requirements of the three selected objectives listed above. Assessments of vulnerability to climate change often use the framework driver-impact response or adaptation to describe the big picture. We need to keep in mind that it is not so much the change in the physical effects drivers (temperature, precipitation), but the impacts to our mission, operations, programs, and projects associated with these changes that will guide our responses and adaptation.

2.3.1 Drivers

The primary drivers of climate change impacts are changing temperature and precipitation regimes, increasing global sea level, and associated physical processes (Brekke et al. 2009).

Changing temperatures impact the form of precipitation, evapotranspiration, and sea-surface temperatures. Changes from snow to rain, or from rain on snow to rain on frozen ground, can affect the origin and timing of runoff. 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.

2.3.2 Impacts

Potential impacts include changing water availability, variability, 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 high-level vulnerability assessment, 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 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 vectorborne, 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
	Increased storm waves, surges, tides	E
	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 the following paragraphs. (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.

Substantial changes to the water cycle are expected as the planet warms because the movement of water in the atmosphere and oceans is one of the primary mechanisms for the redistribution of heat around the world. Evidence is mounting that human-induced climate change is already altering many of the existing patterns of precipitation in the United States, including when, where, how much, and what kind of precipitation falls.

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. Thus, human-caused changes in temperature are expected to alter precipitation patterns.

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. This increase in atmospheric water vapor has been observed from satellites, and is primarily due to human influences.

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. This may be partially offset by more efficient use of water by plants due to rising atmospheric carbon dioxide. 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.

Floods

Heavy downpours have increased in recent decades and are projected to increase further as the world continues to warm. In the United States, the amount of precipitation falling in the heaviest 1 percent of rain events increased by 20 percent in the past century, while total precipitation increased by 7 percent. Over the last century, there was a 50 percent increase in the frequency of days with precipitation over 4 inches in the upper Midwest. Other regions, notably the South, have also seen strong increases in heavy downpours, with most of these coming in the warm season and almost all of the increase coming in the last few decades.

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. Increases in hurricane intensity are likely to cause further disruptions to oil and gas operations in the Gulf, like those experienced in 2005 with Hurricane Katrina and in 2008 with Hurricane Ike. 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 and limited water supplies 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 are becoming more frequent throughout the nation.

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 such as the Safe Drinking Water Act 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.

2.4 Guiding Questions: 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).

We are taking a collaborative approach. This has required a new attitude to partnering between agencies that recognizes the value of our different perspectives and expertise so that guidance reflects the best available – and actionable – science, and in turn, the science is guided to support our needs. We are developing and implementing plans, policies, and infrastructure adaptation in parallel, rather than sequentially, so that adaptation begins soon in areas that are most vulnerable.

We are taking a phased approach that allows us to identify uncertainties, so that we begin adaptation in areas where uncertainties are relatively smaller. Thus, risk of adverse consequences is lower.

So we need 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. In keeping with the questions-based approach of the flexible framework, Table 2 contains some of the priority questions we faced as we began to manage climate change impacts.

2.5 Guiding Questions: Agencies with Similar Climate Change Impacts and Management Challenges

Within Treasury, the Mint and Bureau of Engraving and Printing (BEP) face similar climate change impacts and management challenges. The BEP and Mint have a similar overarching mission. That is to supply the United States with adequate coins and currency for commerce. To accomplish this goal, both bureaus operate facilities that produce their respective products. Consequently, each bureau will face similar challenges (energy and water supplies) and opportunities from climate change in the coming years.

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 move due to extreme weather events.

Treasury administrative and policy offices would face similar issues as other Federal agencies with similar functions to include; USDA, Rural Development; Housing and Urban Development (HUD); Small Business Administration (SBA) and others. Since these agencies operate primarily from office buildings, they would encounter 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.

2.6 Guiding Questions: Existing Federal Agency Collaboration and Coordination

Current Treasury collaborations are ongoing within the IRS. The Center for Disease Control and Prevention (CDC) distributes 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.

2.7 Guiding Questions: New or Additional Collaborative Opportunities

Treasury has identified areas of shared activities where possible collaboration could occur in the future. They include the IRS working on criminal investigations related to tax fraud with the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF), and the Federal Bureau of Investigation (FBI). The Mint could work with the Federal Reserve Board of Governors to build resilience to climate change impacts in the coin distribution system.

Treasury has numerous mission critical 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.

3 Treasury Climate Change Adaptation Planning and Implementation

3.1 Treasury Accomplishments Supporting Effective Climate Change Adaptation Planning and Implementation

Treasury Bureaus have taken steps to help manage the effects of climate change in certain areas. Some of their efforts are listed here.

•Duplication of key IRS resources in several locations throughout the United States
•Emergency electricity generators and back up batteries to power key installations in the event of power outages
•Refinement of incident command and continuity of operations plans
•Increased use of telework and flexible workspace
•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

Additionally, 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. Finally, 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.

3.2 Integrating Adaptation and Mitigation

The global change threats facing Treasury facilities and programs are by their nature integrated and often reinforcing. The projected increases in mean global and continental temperatures resulting from past and continued greenhouse gas (GHG) emissions, for

example, may reduce water availability and increase energy needs. But these adaptation efforts have to be planned, executed, and evaluated in concert with both the more general resource conservation measures and the more specific GHG emissions reductions and other climate change mitigation measures required of Treasury and its public partners.

Carbon dioxide emissions are a primary focus of mitigation strategies. These include improving energy efficiency, using energy sources that do not produce carbon dioxide or produce less of it, capturing and storing carbon dioxide from fossil fuel use, and so on. Choices made about emissions reductions now and over the next few decades will have far reaching consequences for climate-change impacts.

3.3 FY13 Priorities

Based on Treasury Bureau responses to the Guiding Questions, the near-term priorities can be summarized in the table below.

Table 2. Treasury Climate Change Adaptation Priority Actions for FY2013

Action	Scale (National, Regional or Local)	Completion Date	Collaborating Agencies (if applicable)
Site Assessment 1. Identification of Treasury locations that may be particularly vulnerable to climate change impacts. 2. Educate Treasury staff about Climate Change 3. Identify Treasury sites with little/no alternate federal or state resources to concentrate additional program funds	National	December 2012	Identify neighboring federal and state agencies such as state/local water authorities, DOE and EPA field offices, etc. Inquire about resources that could be shared or serve as back-up.
Emergency Preparedness 1. Review emergency preparedness materials to determine which may need updating and possible inclusion of climate change into the message. 2. Develop exercise scenarios using identified vulnerabilities to test mitigating actions	Regional	March 2013	Regional/Local emergency preparedness offices. Initiate MOUs with other agencies

Continuity of Operations 1. Assess and enhance continuity of operations plans/telework policies and agreements 2. Run select mitigation exercises	Regional	September 2013	Bureau human resources and emergency preparedness offices.

3.3.1 Risk-Informed Decision-Making For Climate Change

Treasury is exploring ways to incorporate climate change uncertainties into decision making. One method being considered is a single risk management framework currently being developed by the US Army Corps of Engineers. 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. The framework 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.

3.3.2 More Refined Vulnerability Assessments

This report contains the preliminary high-level vulnerability assessment required by CEQ in the form of answers to the guiding questions. The Treasury plans to conduct a high level nationwide screening-level vulnerability assessment at a scale that can help identify the most vulnerable facilities, prioritize adaptation measures, and guide overarching policy development. These assessments can be considered top-down assessments, which are typically hazard-or scenario-based (e.g., Füssel 2008). The top-down, or large-scale vulnerability assessment approach for future climate impacts is a scaled approach that arrives at vulnerability assessments from global (e.g., socio-economic and climate projections) to local scale (physical vulnerabilities).

3.3.3 Metrics and Endpoints

Appropriate metrics and endpoints for the assessment of the productivity and efficiency of climate change adaptation activities are critical to achieve our desired results: to develop practical, nationally consistent, legally justifiable, and cost effective measures,

both structural and nonstructural, to reduce vulnerabilities and improve the resilience of our facilities infrastructure impacted by climate change. The wrong choice of measures and endpoints will hinder our ability to develop truly sustainable adaptation measures.

As a result, developing metrics and endpoints for climate change adaptation is a high priority activity for FY13. Federal metrics are still under discussion at this time, so our approach is based on the National Research Council (2005) discussion of metrics for the Climate Change Science Program (now US Global Change Research Program). They describe process, input, and outcome measures that could provide the basis for our own. http://www.nap.edu/catalog.php?record_id=11292

Following their approach, Treasury could consider process metrics like those that measure the actions required to achieve the goal of mainstreaming adaptation. These could include establishing leadership with authority to allocate resources, direct efforts, and facilitate progress; implementing a strategy for setting priorities and allocating resources; encouraging collaborative efforts and the use of common tools where appropriate; and putting procedures in place to enable or facilitate the use or understanding of adaptation measures by others, internal and external to Treasury.

Input measures are more describable and (qualitatively) countable than outcome metrics, but should be approached with care so that the quantification is not the focus. If we consider input metrics to be those that measure the tangible inputs required to achieve the goal mainstreaming climate change adaptation, we could devise a phased approach to be sure that new knowledge is incorporated in Treasury missions, operations, programs, and projects.

Outcome metrics can be used to measure the use of climate change adaptation planning and implementation outputs. Finally, impact metrics may be used to measure the long-term consequences of the mainstreaming climate change adaptation. For Treasury, important impacts to measure might be how climate change adaptation planning has informed policy and improved decision-making, enhanced economic vitality, promoted environmental and infrastructure sustainability, and reduced vulnerability.

4 Summary

This report presents the climate change adaptation policy statement, progress on climate change challenges, efforts to-date, and adaptation planning priorities of the Department of the Treasury as of June 2012. The guiding questions posed by the White House Council on Environmental Quality in its Implementing Instructions about how climate change impacts Treasury mission and strategic goals, and how we are coordinating and collaborating to better manage climate change adaptation, form the basis of a high-level vulnerability assessment to climate change.

Our progress to date has been primarily in the areas of climate change awareness and identification of facilities at risk, as well as assessing areas of potential collaboration with external agencies.

Treasury is working to integrate adaptation and mitigation activities, and providing resources to achieve our highest priorities for FY13. These priorities include: adopting and implementing a framework for risk informed decision-making for climate change, and developing metrics and endpoints to measure adaptation effectiveness.

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

Füssel, H.-M. (2008) "Adaptation planning for climate change: concepts, assessment approaches, and key lessons." *Sustain Science* 2:265–275.

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
Guiding Questions

1. **How is climate change likely to affect the ability of your agency to achieve its mission and strategic goals?**
    a) To focus your response, identify at least three of your agency's strategic goals or objectives to evaluate.

    The agency strategic goals or objectives selected for this exercise are:
    Goal/Objective 1:

    Goal/Objective 2:

    Goal/Objective 3:

    b) For each goal or objective listed above, identify major climate change impacts that may significantly impact your agency's ability to meet the goal or objective. Briefly describe how these impacts affect your selected goals or objectives.

    c) What steps, if any, has your agency taken to manage the effects of climate change on the selected goals or objectives?

2. **How can your agency coordinate and collaborate with other agencies to better manage the effects of climate change?**

a) Identify Federal agencies that are likely to face similar climate change impacts and management challenges to your agency. Describe how their management challenges are similar to yours.

Agency	How Climate Change Management Challenges are Similar

b) Is your agency already collaborating with other agencies to develop strategies to adapt to climate change impacts that cut across agency mission and operations? If so, identify the agencies and briefly describe the collaboration or project? If your agency is engaged in many collaboration activities, select a few of the most significant.

Agency	Existing Collaboration/Project

c) Identify and describe opportunities for new or additional collaboration activities with

other agencies to leverage resources and develop consistent adaptation strategies.

Agency	Potential Collaboration/Project