



INTERAGENCY SUSTAINABLE WORKING GROUP

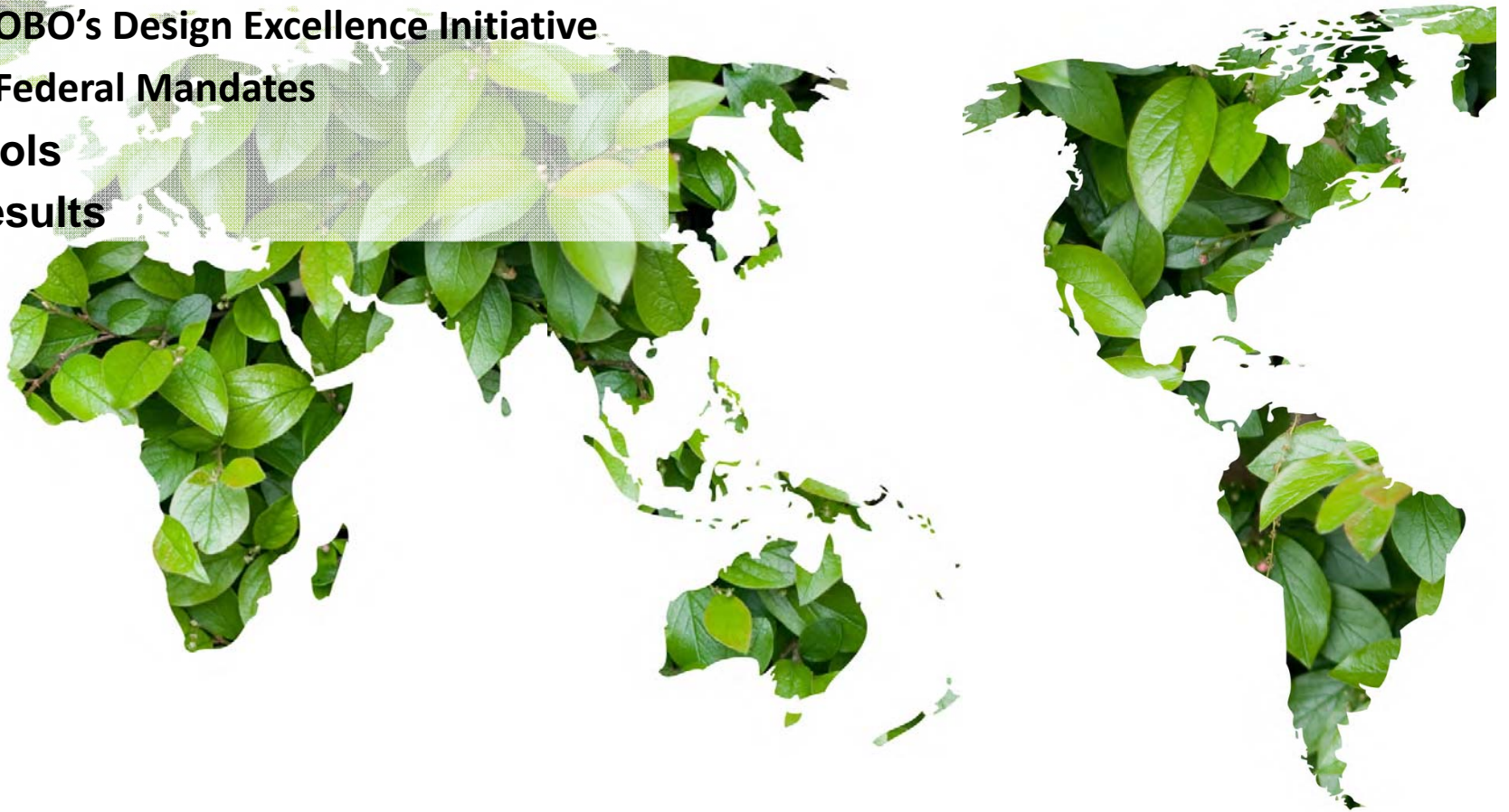
MAY 22, 2014

SUSTAINABILITY
GLOBAL PORTFOLIO PERFORMANCE

U.S. DEPARTMENT OF STATE
BUREAU OF OVERSEAS BUILDINGS OPERATIONS

AGENDA

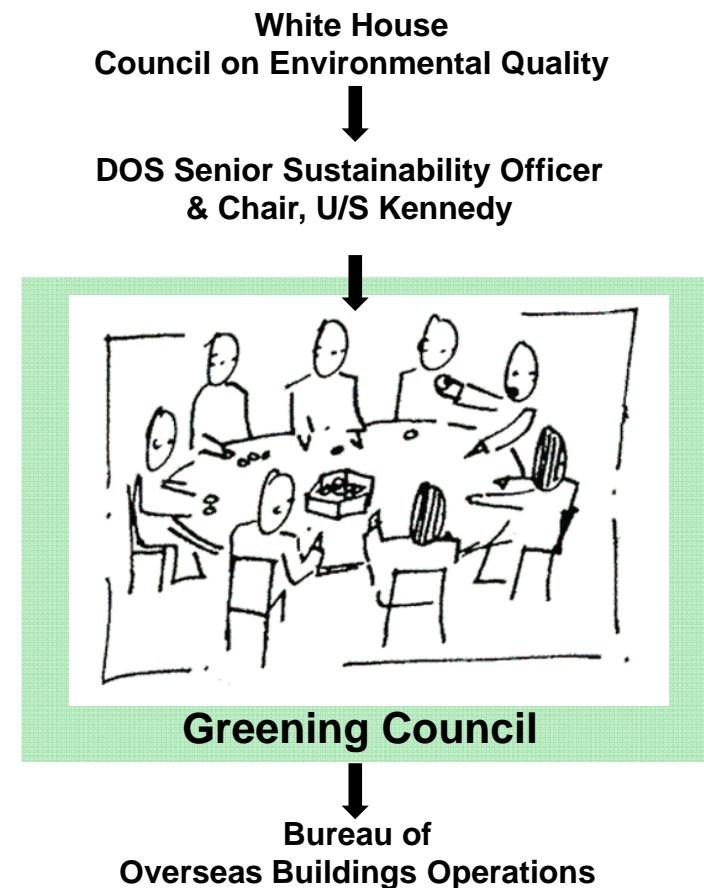
- **Opportunity & Challenge**
 - **Greening Council**
 - **Eco-Diplomacy**
 - **Overseas Portfolio**
 - **OBO's Design Excellence Initiative**
 - **Federal Mandates**
- **Tools**
- **Results**



OPPORTUNITY US DEPARTMENT OF STATE'S GREENING COUNCIL

- **Greening Council**

Mission: to improve the Department's environmental footprint and increase efficiencies, by harnessing expertise in policy, management, and public diplomacy from grassroots to senior management, in order to cultivate and institutionalize sustainability efforts, measure and report progress and challenge others by fulfilling our environmental commitments and highlighting our successes.



OPPORTUNITY **ECO - DIPLOMACY**

- **Eco-Diplomacy Pillars**

- Policy
- Green Buildings
- Results



Eco-diplomacy is the practice of conducting international relations by facilitating and advancing a shared commitment to conserving natural resources through sustainable operations and responsible environmental stewardship.

OPPORTUNITY **ECO - DIPLOMACY**

- Eco-Diplomacy:**



FEATURED IN THE APRIL 2014 ISSUE OF THE FOREIGN SERVICE JOURNAL

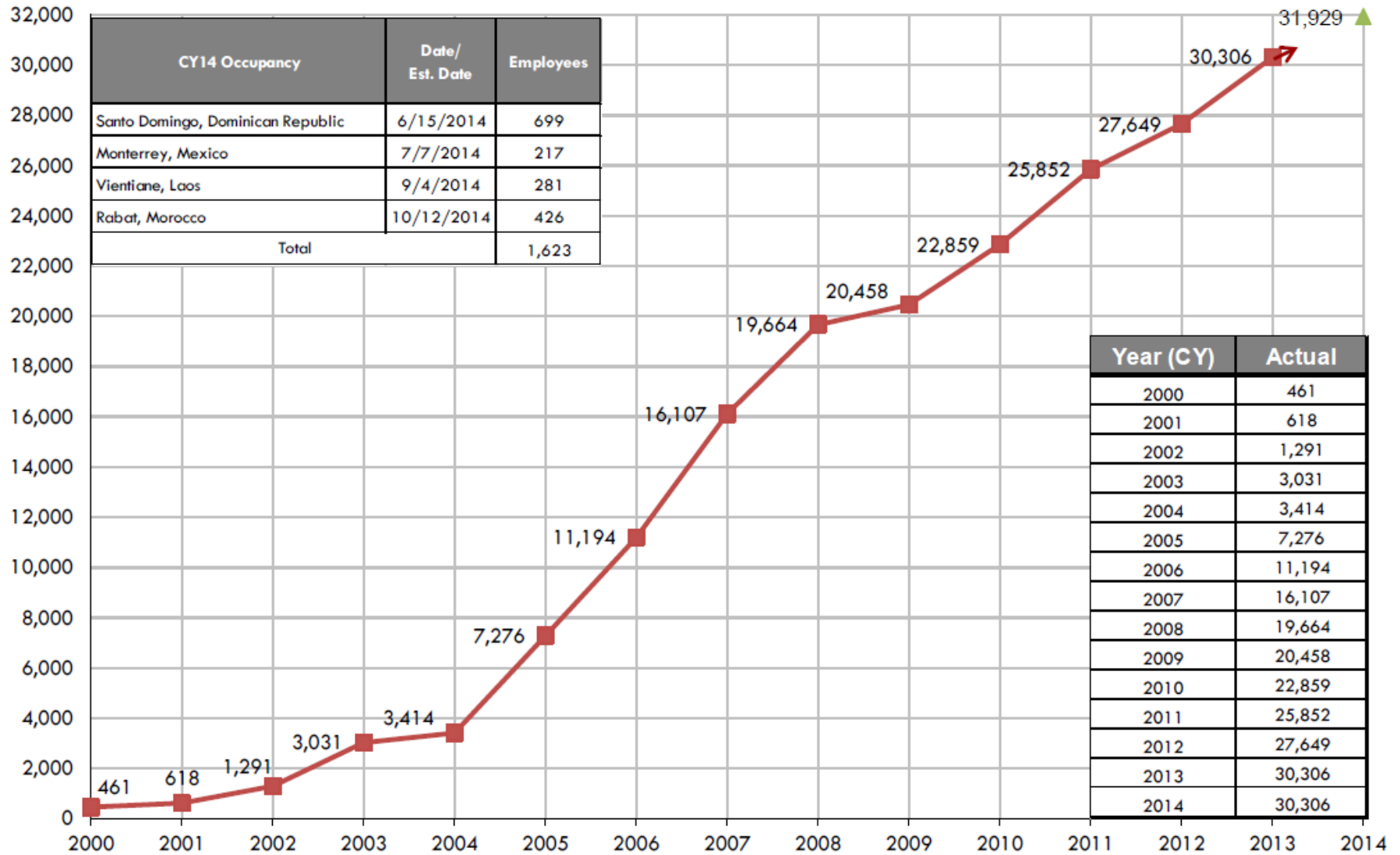


FEATURED IN THE APRIL 2014 ISSUE OF STATE MAGAZINE



OPPORTUNITY CONSTRUCTION BOOM

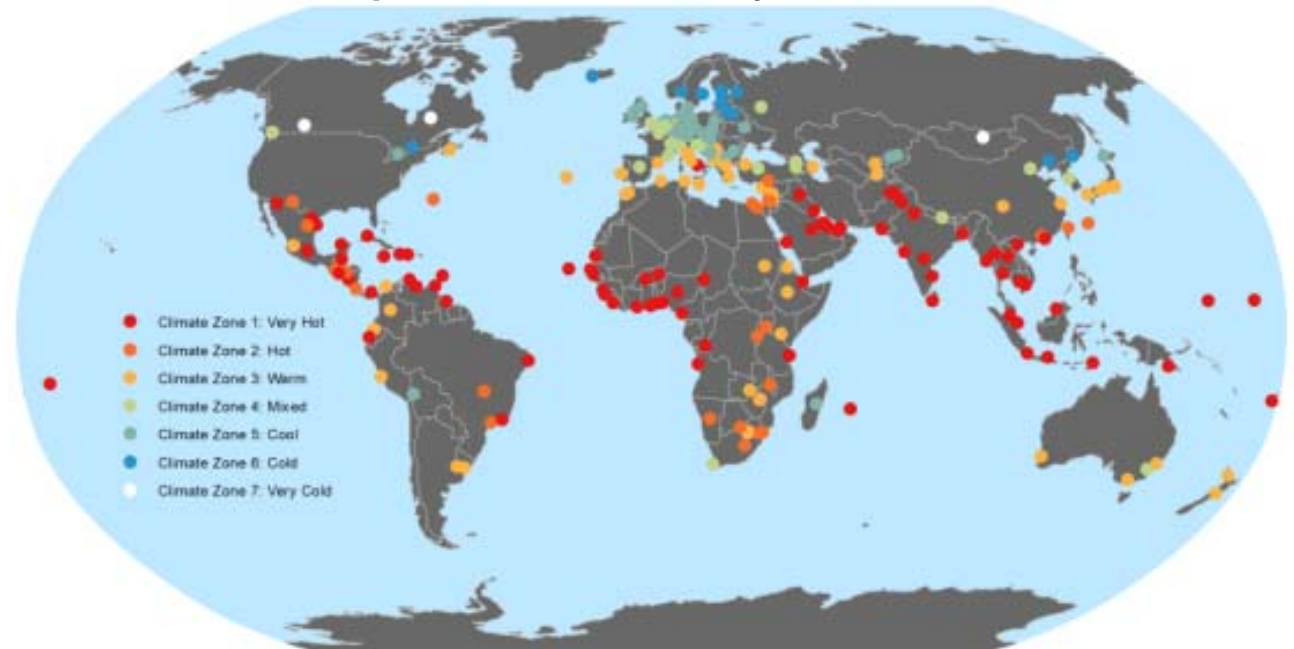
■ Moving Staff to Safer Facilities



OPPORTUNITY OVERSEAS PORTFOLIO

- **The Department operates 275 missions**
 - 88,000,000 square feet
 - \$44B real property assets
 - 12,200 culturally significant assets
 - \$5.8B currently under design and construction

U.S. Diplomatic Missions by Climate Zone

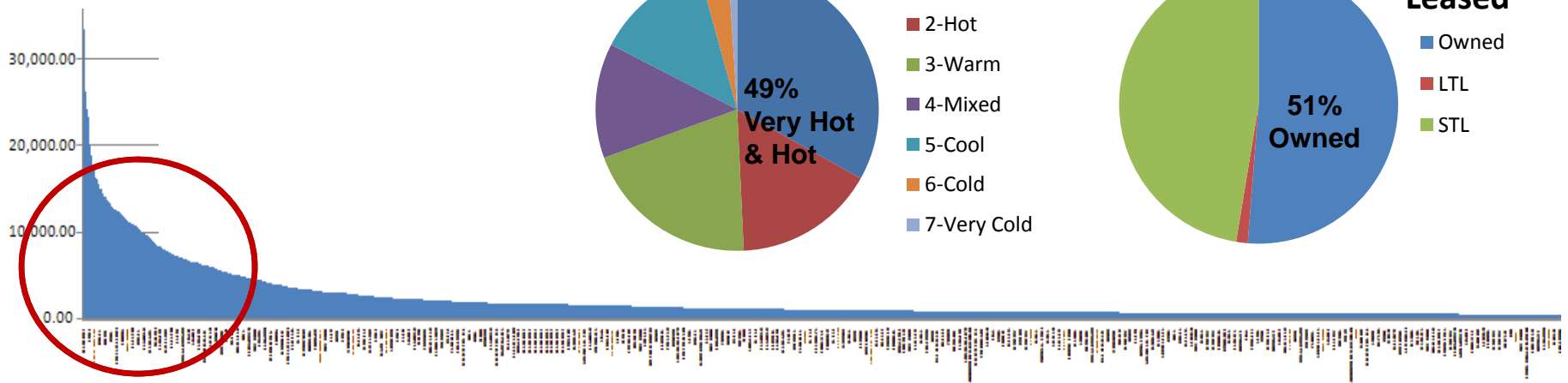
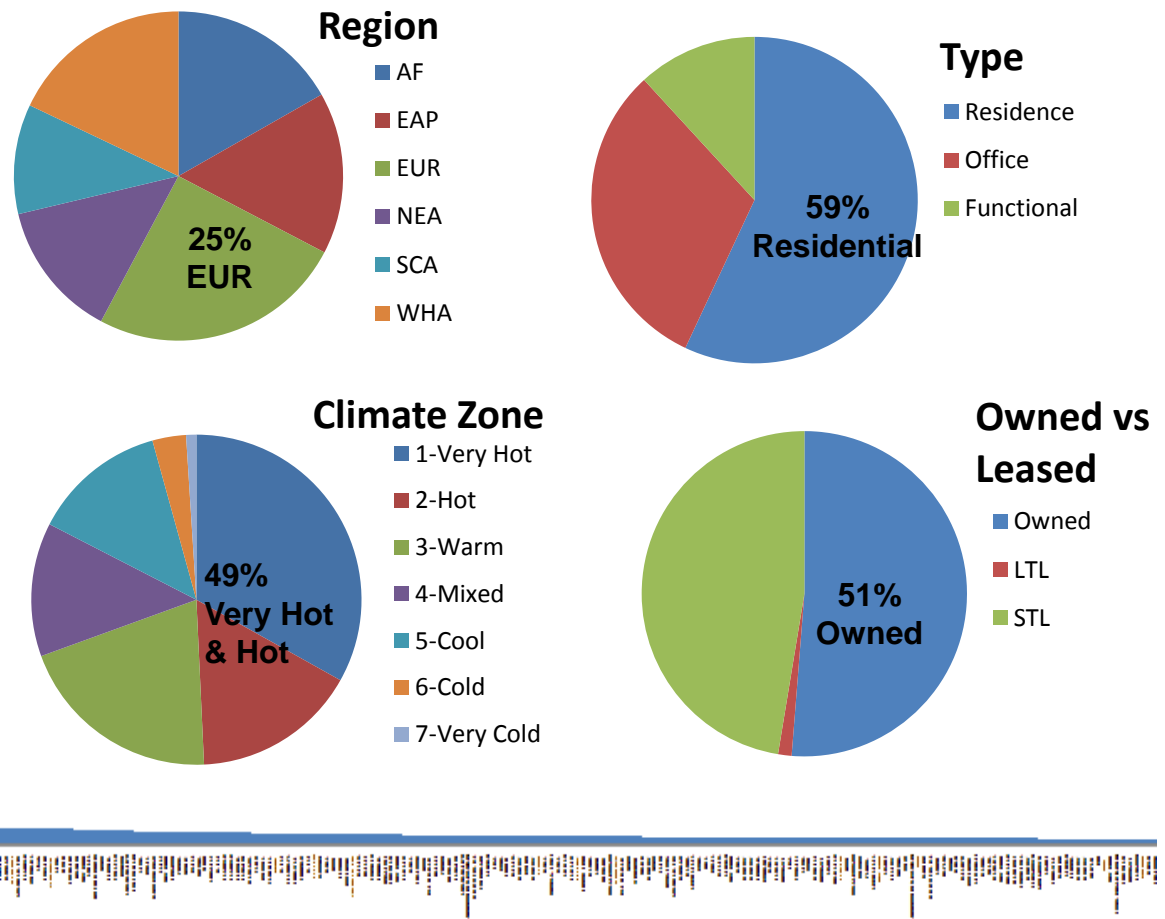


SOURCE: U.S. Department of State :: 2014

OPPORTUNITY OVERSEAS PORTFOLIO

- DOS Oversees ~23,000 Properties Overseas**
 - Owned vs. Leased = 3,860 owned vs. 15,375 leased
 - Large vs. Small = 2,200 over 464m² (5,000gsf)

Building Area By:



CHALLENGE SUSTAINABILITY

■ 2012 - Excellence in Diplomatic Facilities

- Guiding Principles:
 - ✓ Purpose & Function
 - ✓ Site
 - ✓ Design & Engineering
 - ✓ Safety & Security
 - ✓ Sustainability
 - ✓ Architecture
 - ✓ Construction
 - ✓ Operations & Maintenance
 - ✓ Art
 - ✓ Historic Preservation



U.S. EMBASSY BANDAR SERI BEGAWAN, BRUNEI :: 2012



U.S. EMBASSY ANNEX MOSCOW, RUSSIA:: 2013

CHALLENGE SUSTAINABILITY

- **OBO Design Standards:**
 - Comprehensive Sustainability Study
 - Stretch Goals = Net-Zero:
 - ✓ Energy
 - ✓ Carbon
 - ✓ Water
 - ✓ Waste
 - LEED® Platinum

2013 OBO DESIGN STANDARDS
Sensitive But Unclassified (SBU)

U.S. DEPARTMENT OF STATE
BUREAU OF OVERSEAS BUILDINGS OPERATIONS

NAVIGATION

- A01 Guiding Principles for Design Excellence
- A02 Design Goals
- A03 Codes & Regulations
- A04 A/E Services
- A05 Design Submittal Standards
- A06 Terms & Abbreviations

GUIDING PRINCIPLES FOR DESIGN EXCELLENCE

A01
Home • Design Policies • Guiding Principles for Design Excellence
Last Updated: 1/11/2017

OVERVIEW

Concerned that the caliber of federal design and construction was declining, President Kennedy in 1962 convened an ad hoc committee to ensure that Federal Architecture continued to embody the American ideals of dignity, stability and vigor to utmost design quality of its time. That ad hoc committee set forth Guiding Principles for Federal Architecture, authored by Daniel Patrick Moynihan.

Those guiding principles are just as relevant today as they were in 1962, although today they would very likely be expanded to include the importance of security, sustainability, and flexibility in our resource-constrained and rapidly changing world.

GUIDING PRINCIPLES OVERVIEW

- Purpose and Function
- Site
- Design
- Engineering
- Safety and Security
- Sustainability
- Architectural and Engineering Professional Services
- Construction
- Operations and Maintenance
- Art
- Historically, Architecturally, or Culturally Significant Properties and Collections

Tangier Old Legation, Morocco

Tangier Old Legation, the first property acquired by the United States Government for a diplomatic mission, was presented in 1927 as a gift to the Moroccan people by Sultan Moulay Suliman. His generosity was inspired by the success of the Moroccan-American Treaty of Friendship. This 1786 treaty, with John Adams and Thomas Jefferson as signatories, was renegotiated by John Mulloy in 1806 and was the first in the world to officially recognize the United States of America as a country. The treaty, still in force today, is among the most durable in American history. The legation served as a diplomatic post for a record 142 years. Of special significance in the building's history is the Cape Serrat Lighthouse Treaty of 1860, which was negotiated there. The treaty is considered to be the forerunner of the League of Nations and United Nations because it speaks to broad cooperation within international law.

CHALLENGE FEDERAL MANDATES for EXISTING BUILDINGS

- **Executive Order 13514* (2009) and 13635* (2013):**

- 30% Energy reduction from 2006 levels by 2015
- 26% Building water reduction from 2007 levels by 2020
- 20% Irrigation water reduction from 2010 levels by 2020
- 50% Non-hazardous solid waste diversion by 2015
- 20% Renewable Energy by 2020
- Report Greenhouse Gas Emissions

- **Energy Policy Act (2005):**

- Building Metering by 2012

- **Executive Order 13423* (2006):**

- 15% of Agency Real Property Assets be Sustainable by 2015

REQUIRE A
PERFORMANCE
BASELINE

**Limited to domestic facilities, except as implemented overseas in accordance with the policy set forth in Section 1 of EO 13514 and EO 13423.*



U.S. EMBASSY GENEVA

CHALLENGE FEDERAL MANDATES for NEW CONSTRUCTION

- **Executive Order 13514* (2009):**
 - 30% less energy use than ASHRAE 90.1-2007 by 2015
 - 20% less building water use than EPACK 2005
 - 50% less freshwater use for irrigation
 - Divert 50% of construction waste
- **Energy Independence & Security Act (2007):**
 - Net-Zero-Energy by 2030

**Limited to domestic facilities, except as implemented overseas in accordance with the policy set forth in Section 1 of EO 13514 and EO 13423.*



U.S. EMBASSY VIENTIANE, LAOS :: 2014

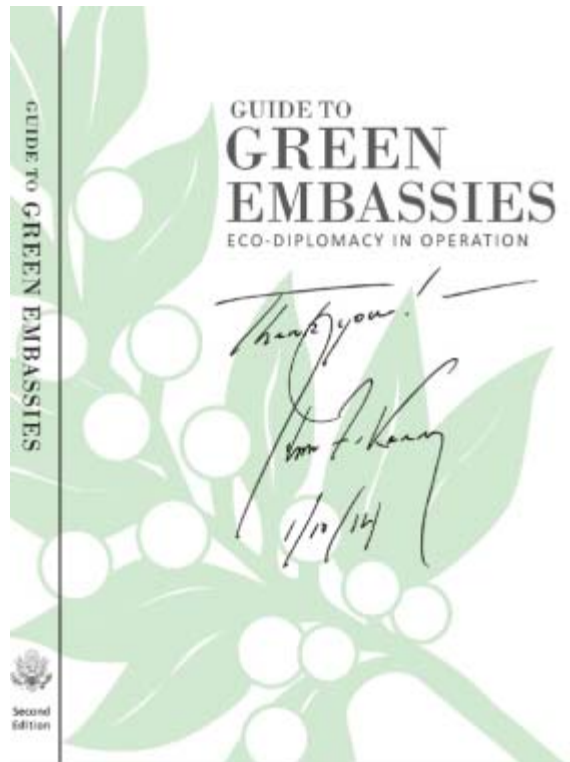
AGENDA

- **Opportunity & Challenge**
- **Tools**
 - Existing Buildings: *OBO's Guide to Green Embassies*
 - New Construction: *Sustainability Studies*
 - Energy/Water Audits
 - Utility Data Management
 - Energy Savings Performance Contracts (ESPCs)
- **Results**



TOOLS **GUIDE to GREEN EMBASSIES**

- **OBO *Guide to Green Embassies***
 - Self-Help Guide for Posts
 - Focus on Occupant Behavior



TRANSPORTATION

How can posts manage fleets, air travel, and transportation to reduce greenhouse gas (GHG) emissions?



SITE

How can posts manage, improve, and demonstrate sustainable landscape and irrigation practices to enhance biodiversity?



WATER

How can posts reduce annual water consumption and costs while managing stormwater to protect water resources?



ENERGY

How can posts reduce annual energy consumption and costs, decrease reliance on fossil fuels, and increase use of renewable sources of energy?



MATERIALS

How can posts reduce procurement impacts, reduce waste, and support local and regional business?



INDOOR ENVIRONMENT

How can posts enhance and maintain healthy and productive work environments for building occupants?



RESIDENTIAL

How can posts better manage and implement changes at residential facilities?

A Message from the Secretary

I am very pleased to endorse the second edition of the *Guide to Green Embassies: Eco-Diplomacy in Operation* (the *Guide*).

This new edition expands on the success of the initial *Guide*, continuing the environmental sustainability leadership of former Secretary of State Hillary Clinton and the efforts initiated by Under Secretary for Management Patrick Kennedy—the U.S. Department of State's Senior Sustainability Officer. Both of these inspired leaders deserve my thanks and appreciation for the foundation they established. New to this second edition is a chapter on residential strategies, as well as information throughout the *Guide* on staff engagement.

These additions are priorities that I support to build on the Department's sustainability leadership.

The *Guide* provides comprehensive and useful information for mission staff—at every level—to fully integrate into their daily practices, both on a personal and professional basis. The *Guide* is organized in a hands-on way so that mission staff can take immediate action to green their homes and offices.

This second edition will be key to achieving the Department's sustainability goals and inspiring the global community.

U.S. Secretary of State Kerry



John F. Kerry
Secretary of State

TOOLS ENERGY / WATER AUDITS

■ Over 20 Audits Cost \$2M

Audits Performed:

- | | |
|-----------------|--------------------|
| 1. Santiago | 12. Madrid |
| 2. San Salvador | 13. New Delhi |
| 3. Amman | 14. Chennai |
| 4. Buenos Aires | 15. Calcutta |
| 5. Managua | 16. Guatemala City |
| 6. Stockholm | 17. San Jose |
| 7. Munich | 18. Bamako |
| 8. Frankfurt | 19. Yaoundé |
| 9. Tokyo | 20. Sofia |
| 10. Prague | 21. Kathmandu |
| 11. Barcelona | |

~100 ECMs totaling: \$15M

Common ECMs:

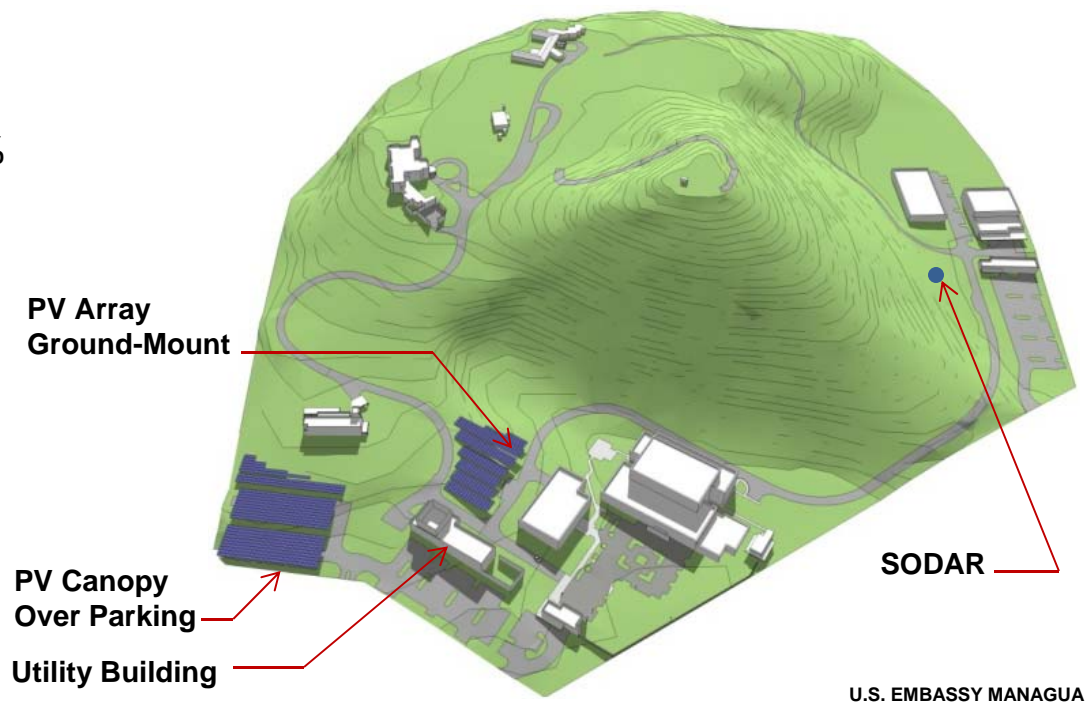
1. Lighting upgrade and controls
2. Weather-stripping
3. HVAC BAS/Set-points/Sensors
4. Low- & no-flow water fixtures
5. Solar hot water heaters
6. Pool Covers
7. Motors/Controllers
8. Chiller replacement
9. Photovoltaics
10. Wind



TOOLS **UTILITY DATA MANAGEMENT**

■ Energy Savings Performance Contract

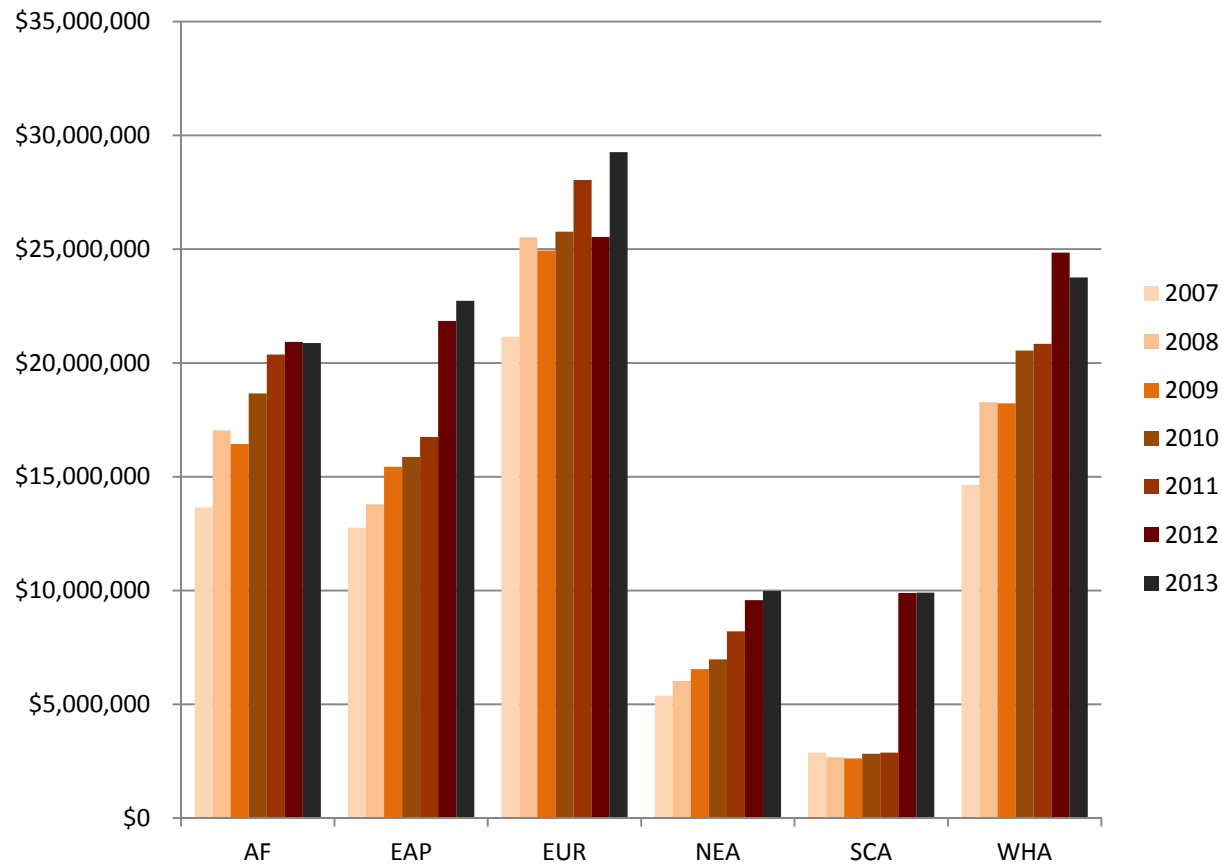
- Energy Conservation Measures:
 - ✓ 1 megawatt in PV
 - ✓ LED Site/Interior Lighting & Controls
 - ✓ Night Chiller (220 ton)
 - ✓ Wind Turbine in Phase II
- Results:
 - ✓ Investment = \$15M
 - ✓ Total savings = \$36M
 - ✓ Reduce grid purchase by 54%



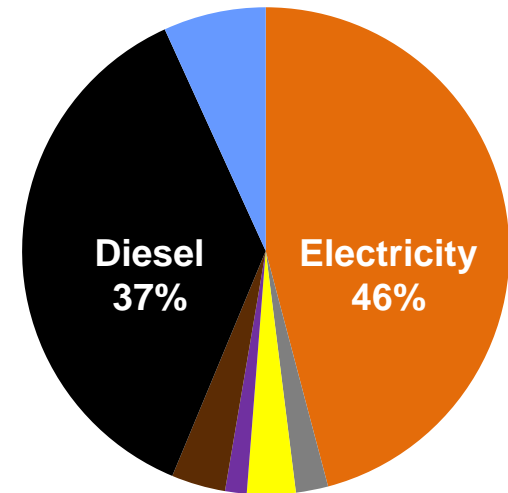
U.S. EMBASSY MANAGUA

TOOLS UTILITY DATA MANAGEMENT

- **Electricity Costs from 2007-2013 by Region**
 - Data Source GFMS



2013 Total Utility Costs = \$279 M



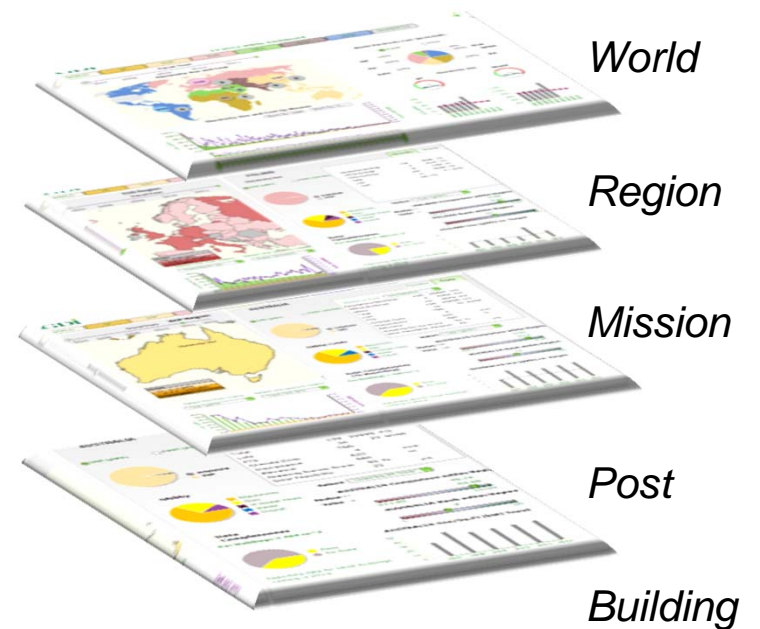
Utility	Cost
Electricity	\$128 M
N. Gas	\$9 M
Water	\$19 M
Diesel	\$103 M
D. Heat	\$4 M
Sewage	\$10 M
Trash	\$6 M

TOOLS **UTILITY DATA MANAGEMENT**

■ **Dashboard**

- Geographical Organizing Structure
- Sustainability Business Subjects
 - ✓ Utility Consumption
 - ✓ Utility Cost
 - ✓ Utility Rate
 - ✓ Building Type
 - ✓ Building Area
 - ✓ Building Age
 - ✓ Building Occupants
 - ✓ Climate Zone
 - ✓ Year on Year Trending

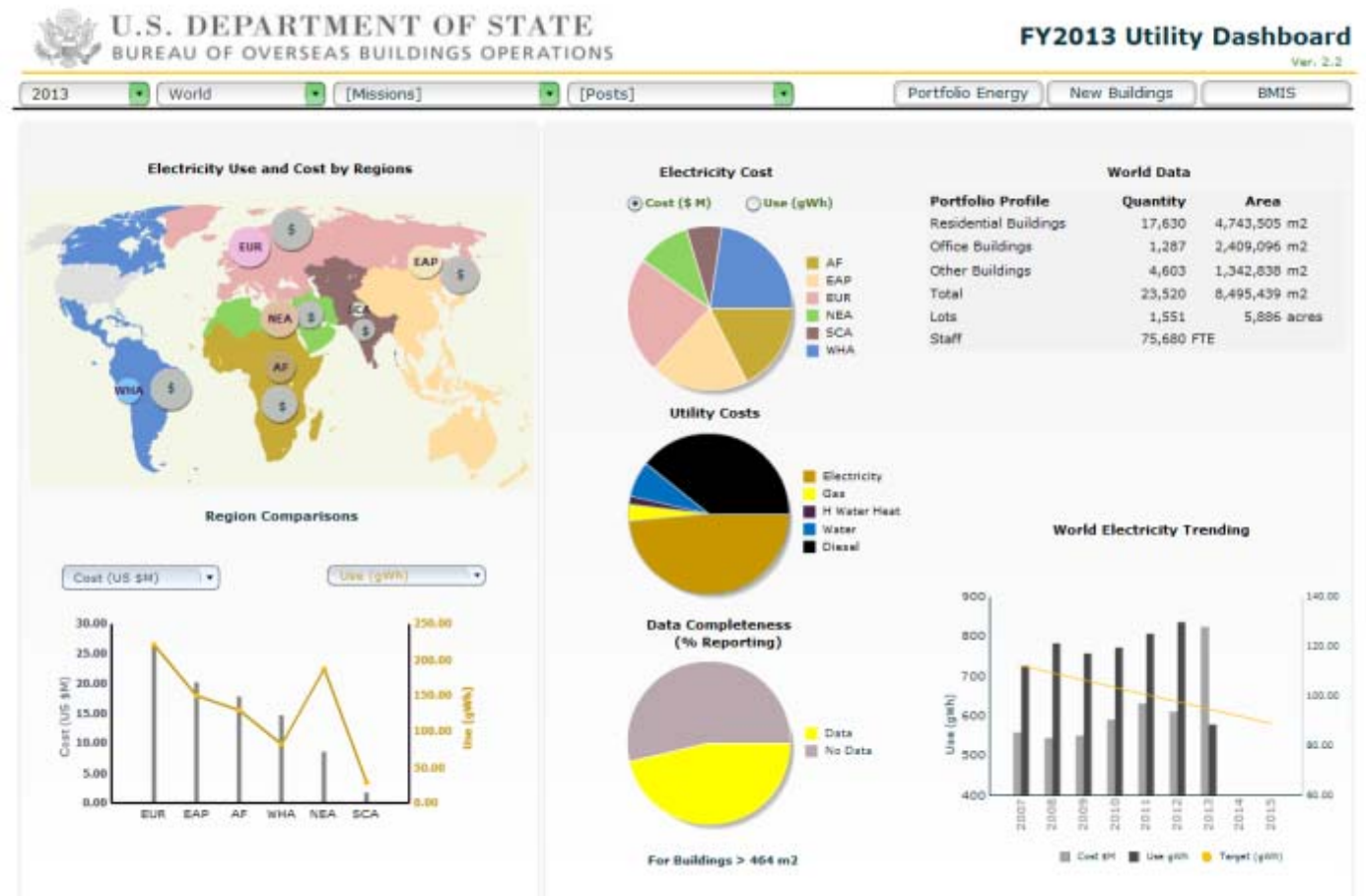
Geographical Organizing Structure



TOOLS UTILITY DATA MANAGEMENT

- **World View**
 - Use & Cost
 - Utility Rates

- **Performance**
 - Progress
 - Trends
 - Regional Comparisons



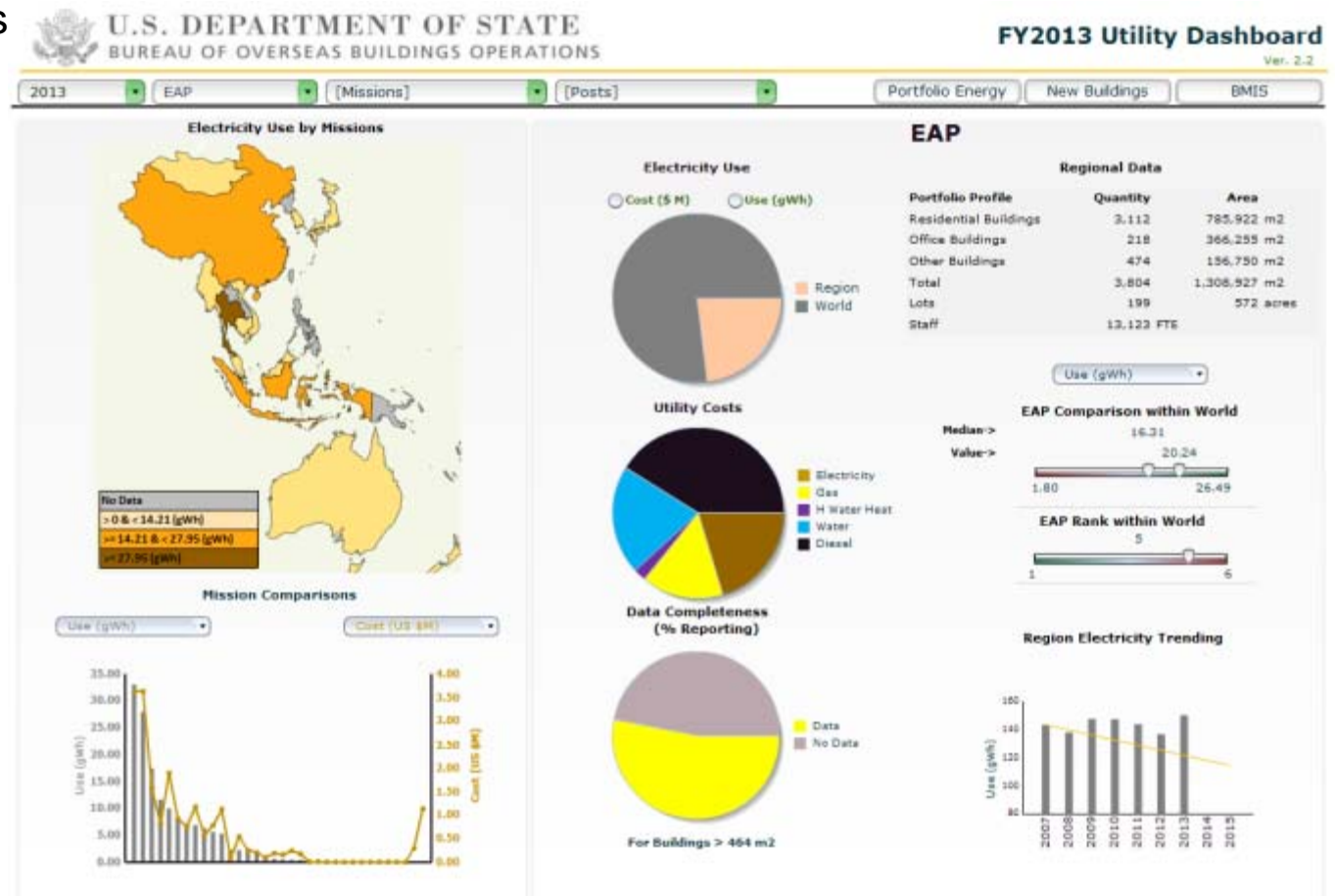
TOOLS UTILITY DATA MANAGEMENT

- **Regional View**

- Use & Cost
- Utility Rates
- Data Completeness
- Mission Metrics
- Post Metrics

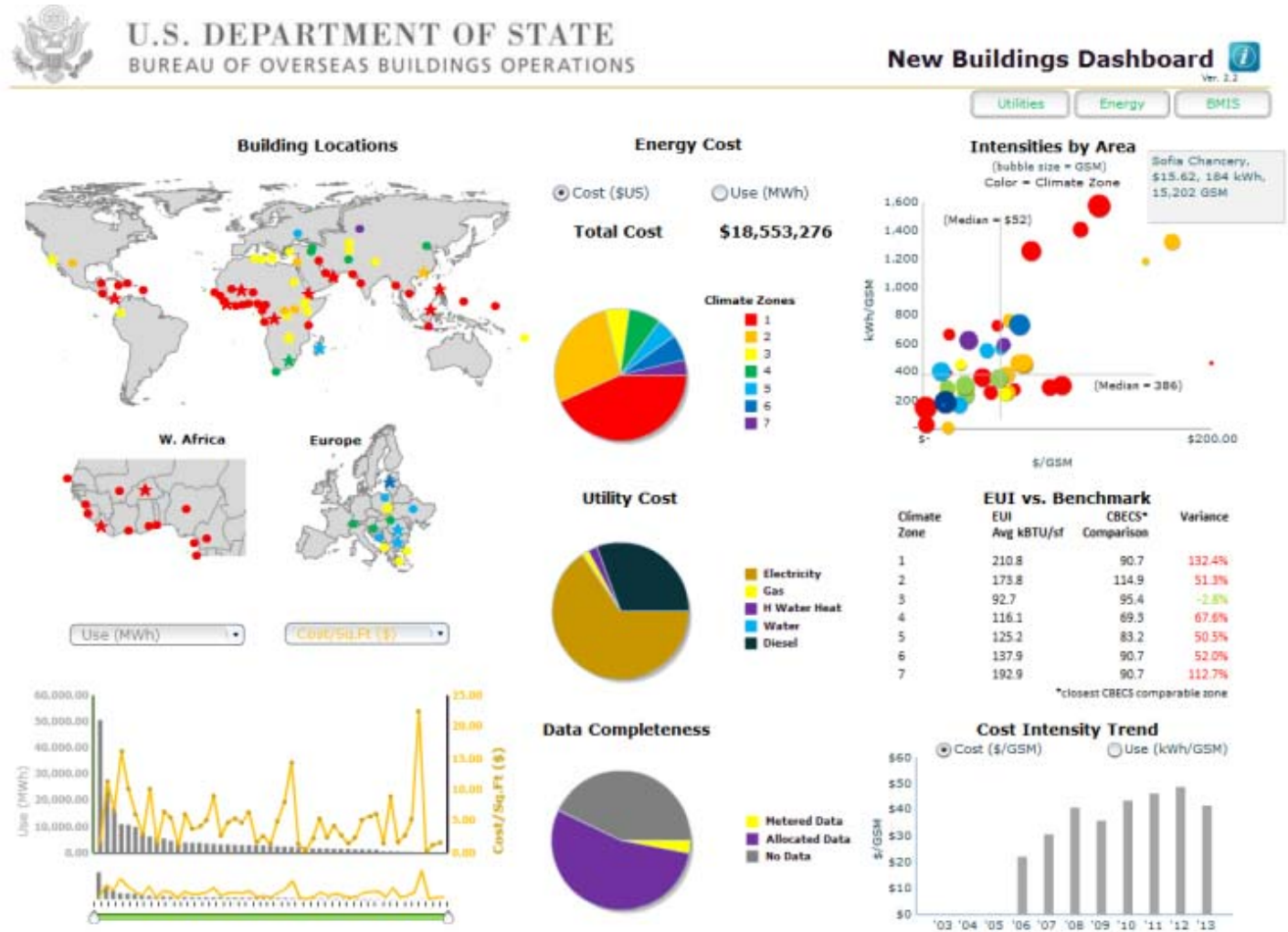
- **Performance**

- Progress
- Trends
- Mission Comparisons



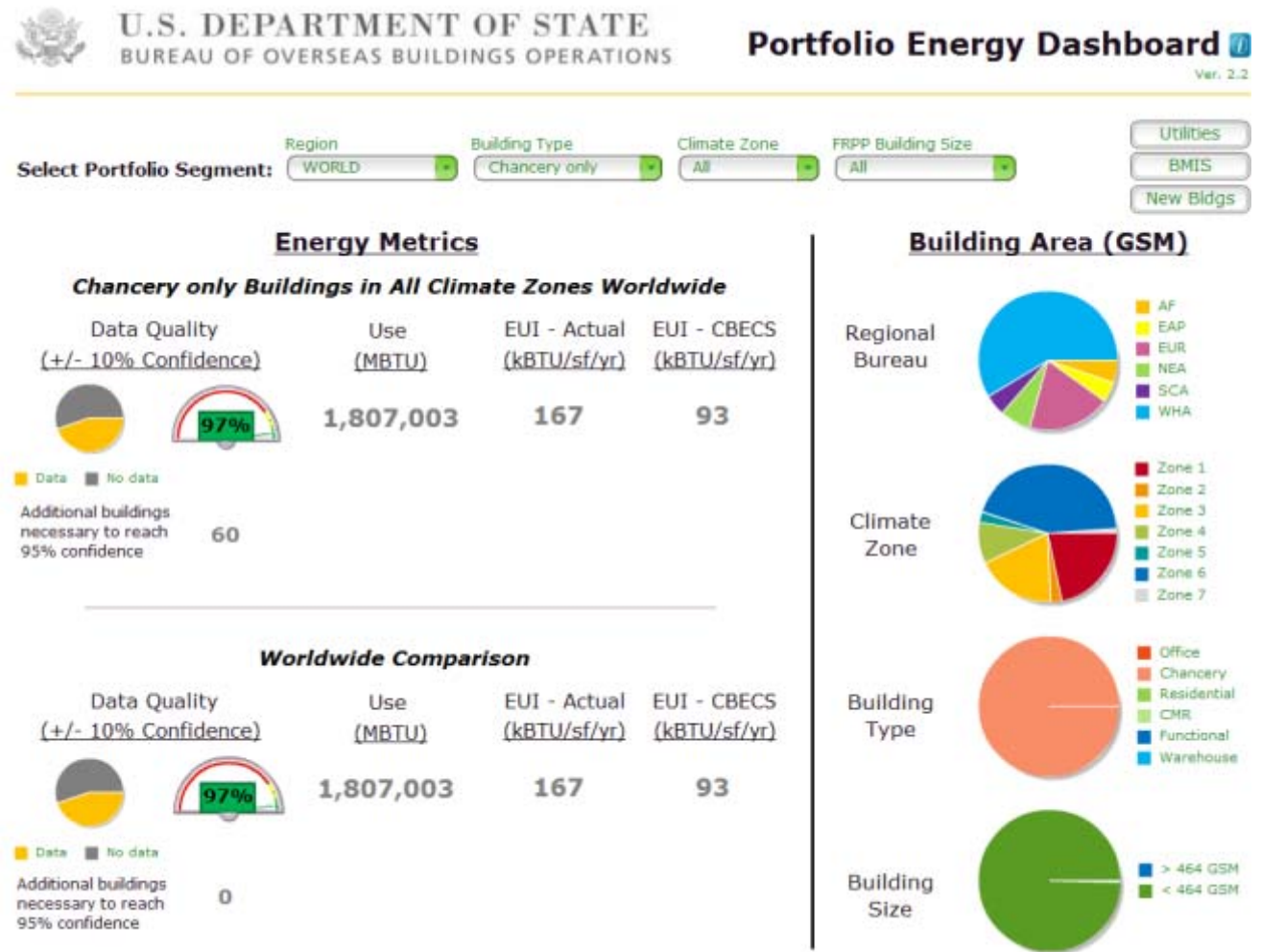
TOOLS UTILITY DATA MANAGEMENT

- **New Building Energy Performance**
 - Benchmark with Industry



TOOLS UTILITY DATA MANAGEMENT

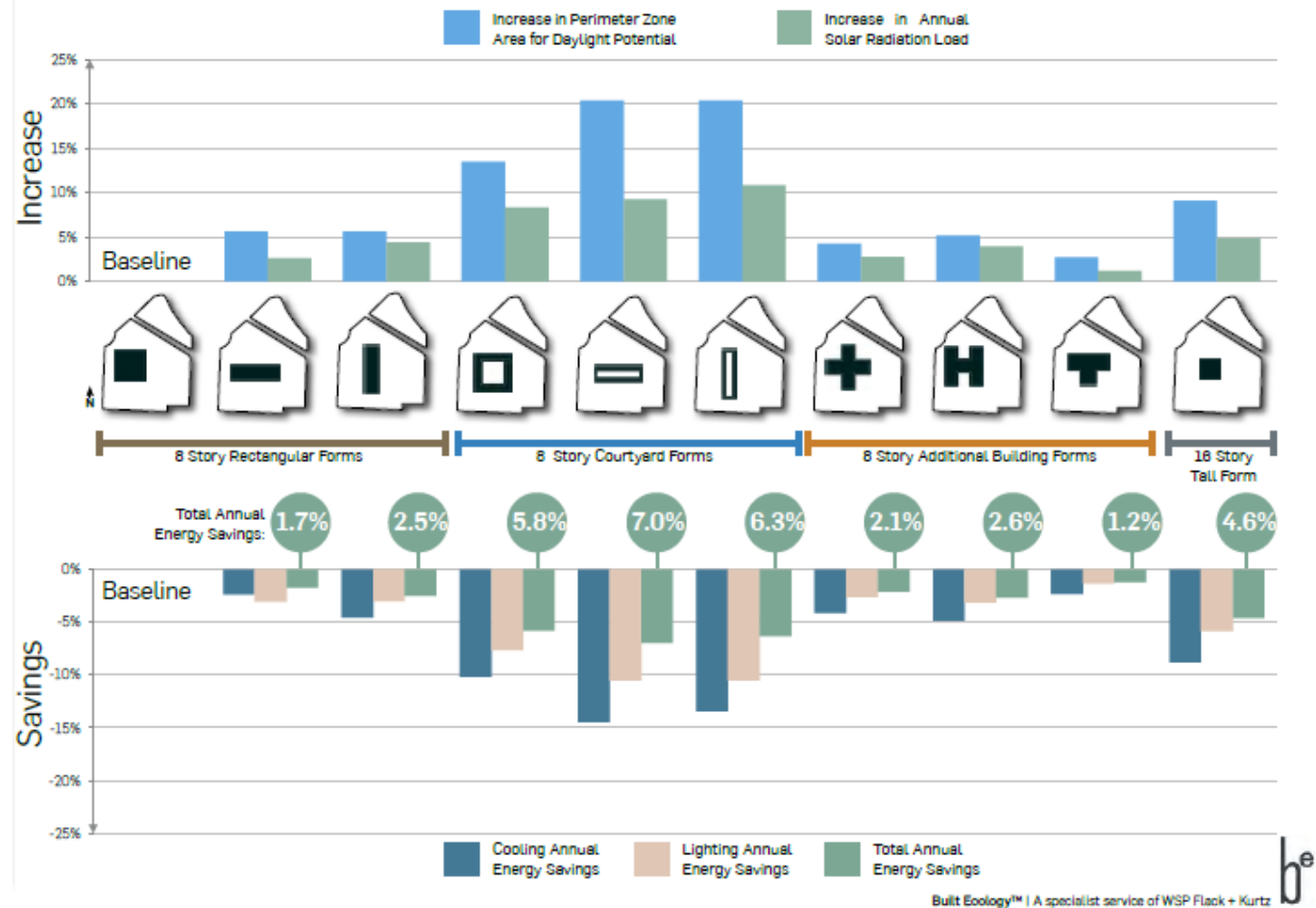
- **Energy Performance**
 - Benchmark with Industry



TOOLS SUSTAINABILITY STUDY

■ Building Form & Orientation

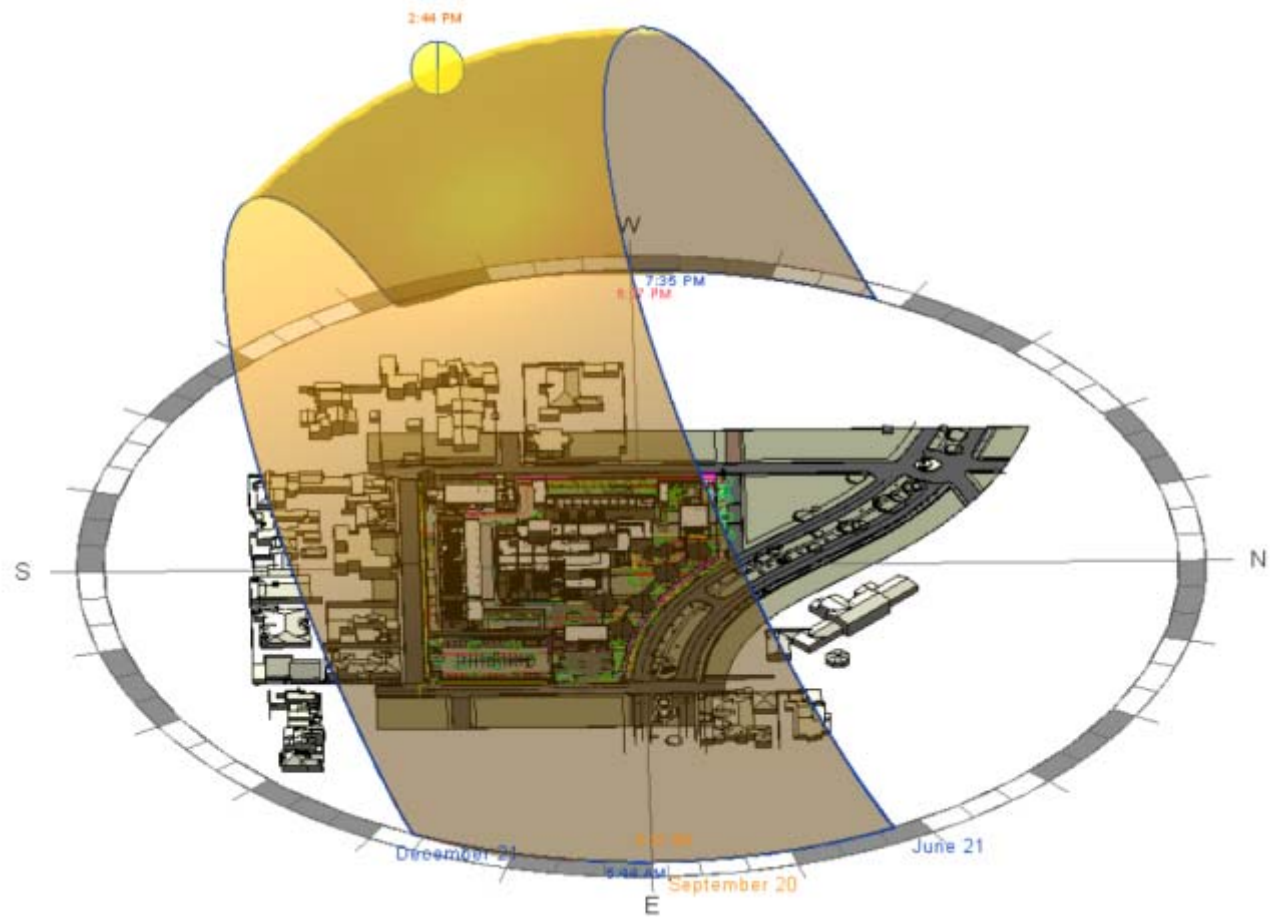
- Compare Concepts
 - ✓ Daylight Harvesting Potential
 - ✓ Solar Gain
 - ✓ Envelop Cost
 - ✓ Energy Use



TOOLS SUSTAINABILITY STUDY

■ Solar Analysis

- Annual Solar Patterns
- Direct Solar Gain
- Optimum Shading Strategies



TOOLS SUSTAINABILITY STUDY

■ Wind Feasibility Analysis

- Rose Wind Charts
- Wind Power Potential
- Prevailing Breezes
- Outdoor Thermal Comfort

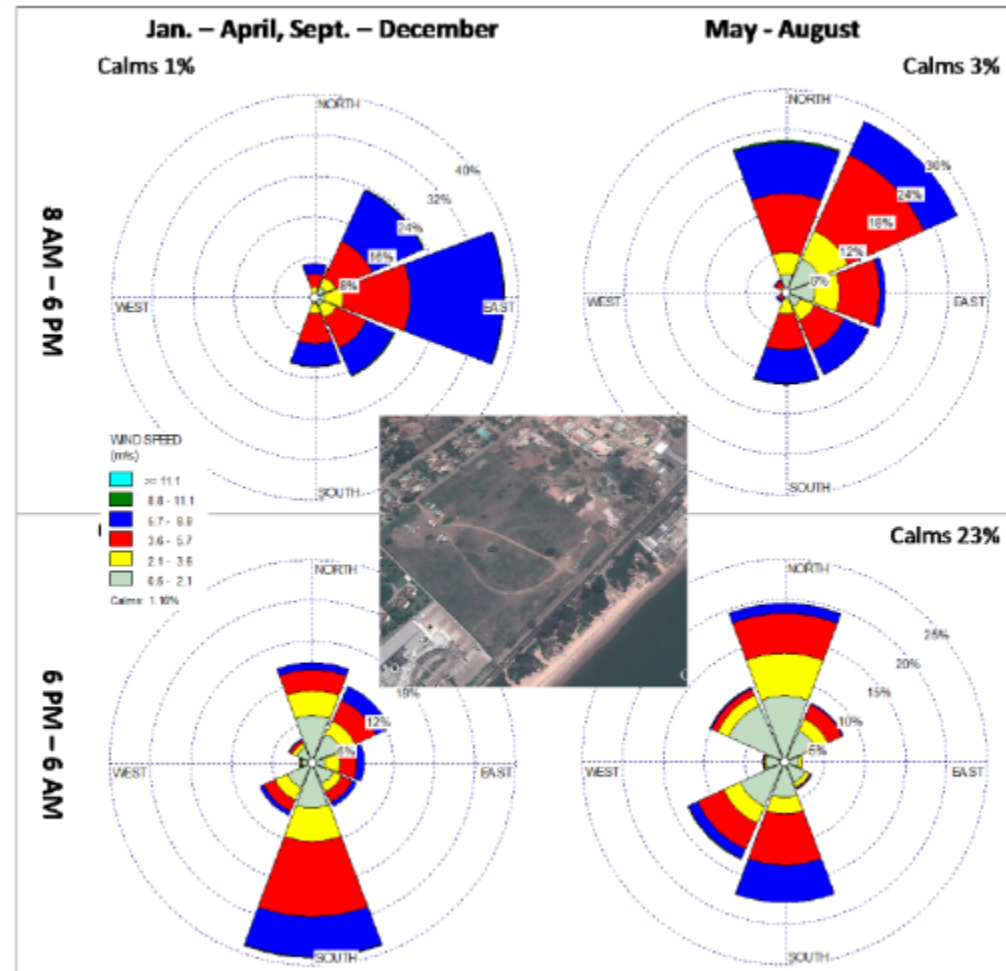


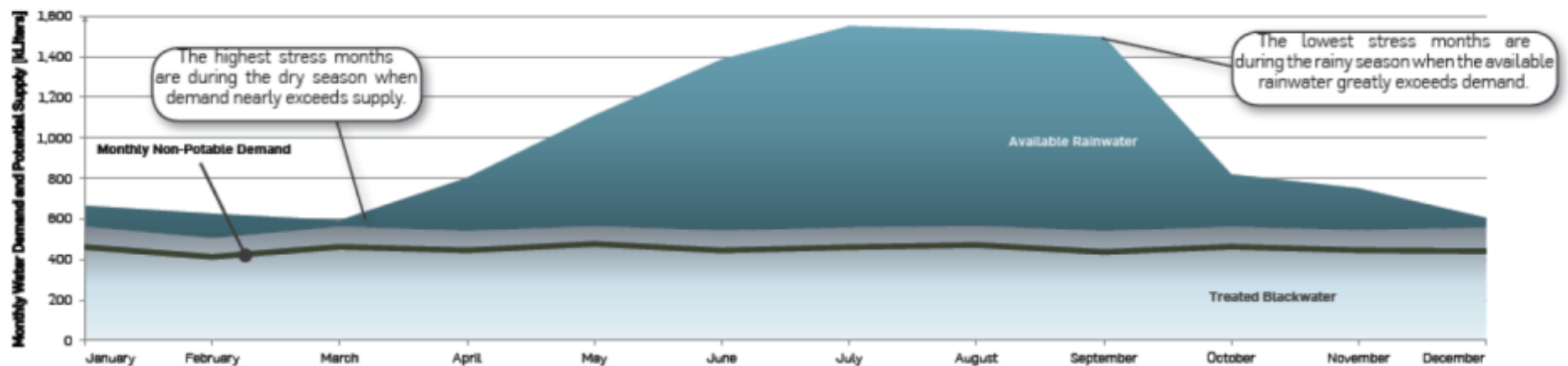
Figure 29: Wind-rose plots by season and time of day

TOOLS SUSTAINABILITY STUDY

- **Rainwater Harvesting**
 - Monthly Precipitation
 - Dry Season vs Wet Season
 - Tank Sizing

Seasonal water demand example from U.S. Embassy Mexico City, Mexico (provided by WSP Flack+Kurtz):

Monthly Non-Potable Demand and Potential Supply Sources



TOOLS SUSTAINABILITY STUDY

Water Balance Diagram

- Supply vs Demand
- Reclaimed Water
- Irrigation Budget
- Rainwater Harvesting
- Stormwater Retention

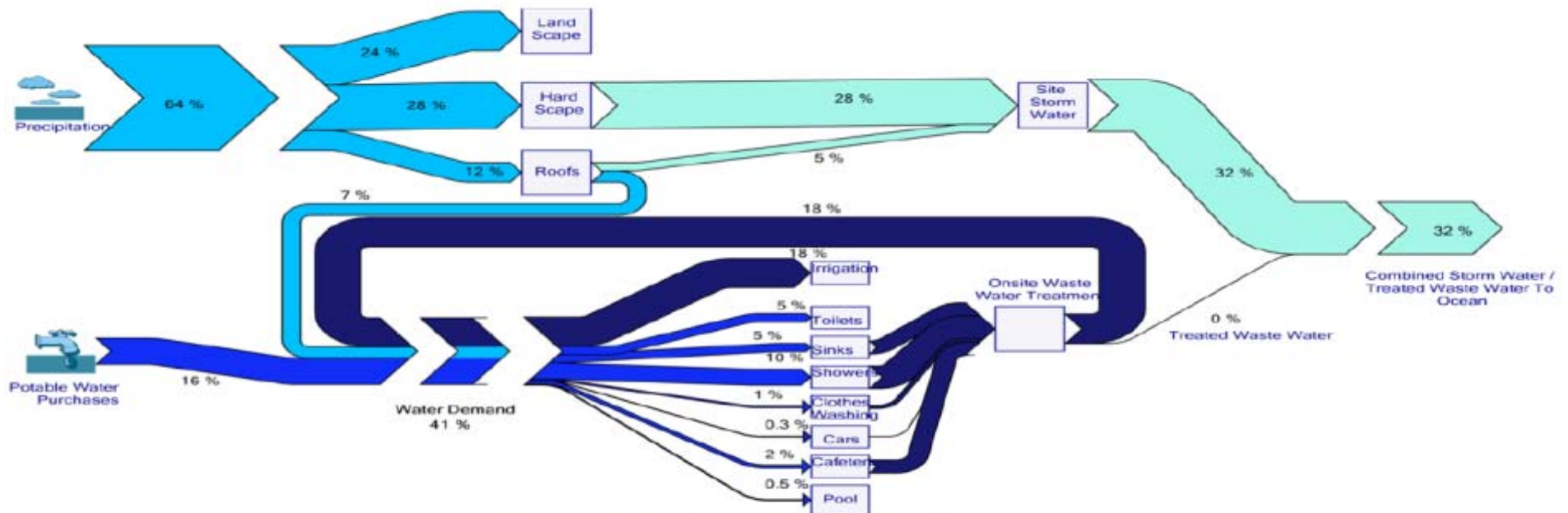


Figure 6: Design case (efficient) water balance diagram (annual flows)

TOOLS SUSTAINABILITY STUDY

■ Xeriscaping

- Irrigation Budget
- Irrigation Zones
- Reclaimed Water



FIGURE 4: IRRIGATION ZONES

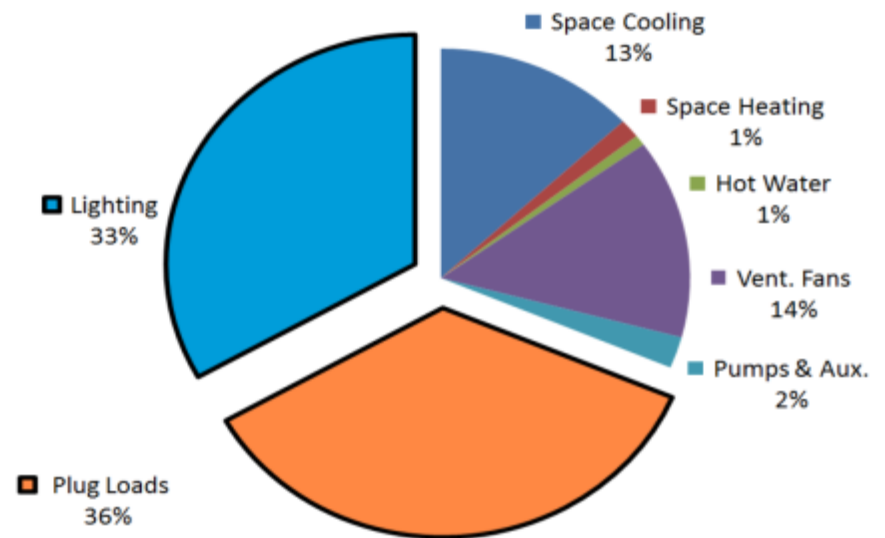
- Oasis Zone with Trees and Tropical Understory Plantings (2,878 m³/year High Irrigation)
- Oasis Zone with Trees and Xeriscape Understory Plantings (2,242 m³/year Low Irrigation)
- Sahel Zone with Native Grasses and Trees (No Irrigation)

TOOLS SUSTAINABILITY STUDY

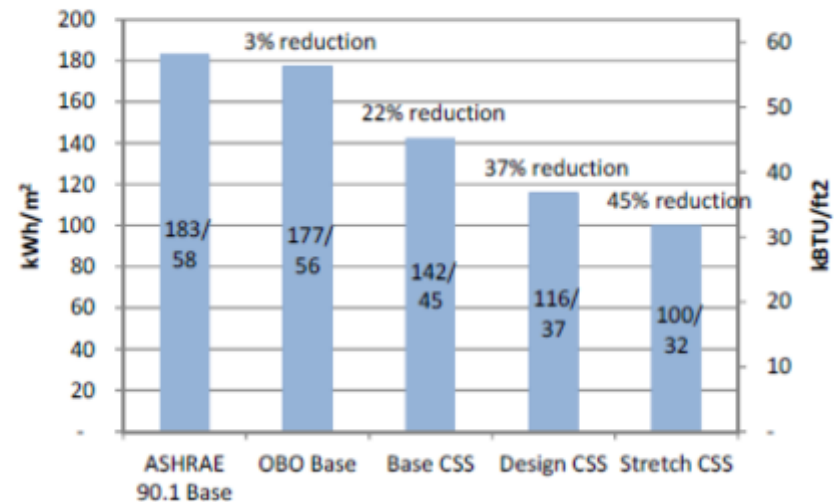
Energy Improvements Chart

- Minimum Code
- OBO Standard Base Case
- Base Case vs Design Improvements
- Stretch Goals

Base CSS energy example from U.S. Embassy Harare, Zimbabwe (provided by Paladino):



EUI comparison example from U.S. Embassy Maputo, Mozambique (provided by YGH/Cadmus):



TOOLS SUSTAINABILITY STUDY

■ Comprehensive Sustainability Strategy

- Life-Cycle-Cost-Analysis
- Bundled Strategy
- Payback

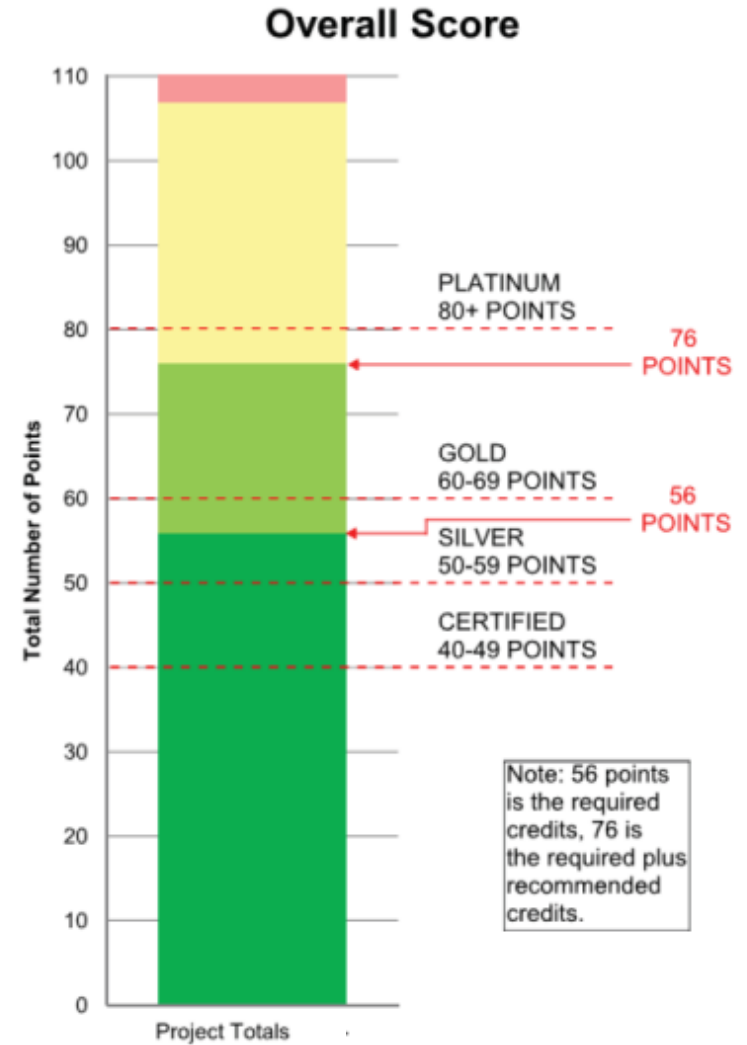
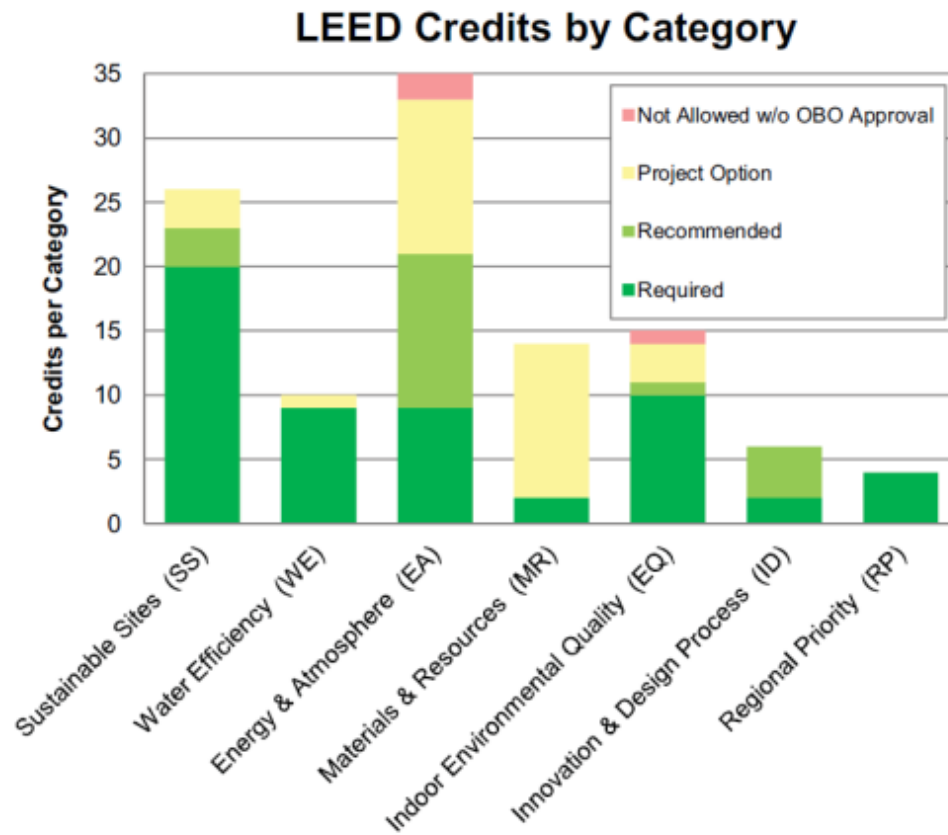
Energy Systems Combined ECMs					
Life Cycle Cost Effective ECMs					
Report Section #	ECM	First Cost Increase (Decrease) Over Baseline ¹	Total Building Energy Reduction Over Baseline		
3.1.5	Building Envelope	\$ 14,262	8.6%		
3.1.7	Exterior Paving 4	\$ (787,420)	16.8%		
3.1.9	Evaporative Cooling - Site	N/A	N/A		
3.1.10	Stack Ventilation and Wind Catchers	N/A	N/A		
3.3.3	Multistack Air-Cooled Chiller (N+1)	\$ 1,107,907	5%		
3.3.3	Modular Chiller with DOA and ERU	\$ 1,147,907	18%		
3.3.6	Solar Thermal Water Heating	\$ 170,000	5.8%		
3.4.1	Official Parking West - 129.85kW	\$ 1,167,092	10.7%		
3.4.1	WHE Roof - 174.37kW	\$ 1,567,238	14.4%		
3.4.1	Utility Building Roof - 140.98kW	\$ 1,267,128	11.6%		
3.4.3	Interior LED Lighting	\$ 45,000	1.7%		
	<i>First Cost Increase (Combined ECMs)</i>	\$ 5,699,114			
	<i>Annual Energy Cost Savings (Combined ECMs)</i>	\$ 584,683	64%		
	<i>Annual Energy Savings (Combined ECMs), kWh</i>	974,472	64%		
	<i>Simple Payback (Combined ECMs)</i>		10 years		
	<i>Expected Building Life</i>		50 years		
	<i>Payback as Percentage of Building Life</i>		19%		

¹ Baseline building is a facility constructed to the minimum requirements of OBO design criteria and International Code Supplement (2012) criteria.

TOOLS SUSTAINABILITY STUDY

- LEED® Green Building Rating System

- Backcheck Performance
- Measure Success by Industry Standard



AGENDA

- **Opportunity & Challenge**
- **Tools**
- **Results**
 - **Sustainability Projects**
 - **Solar & Wind Power**
 - **LEED® Certifications**



RESULTS SUSTAINABILITY PROJECTS



LEED® Certified
22 embassies and consulates have been certified under the internationally recognized green building rating system.



LEED® Certified Gold



LEED® Certified Silver



LEED® Certified Platinum



LEED® Certified



LEED® Registered
Over thirty more projects are registered and working towards certification.



Solar Power
6.4 megawatts of solar power in progress. Cost of power and availability of solar hours determines the cost effectiveness of the technology.



Wetlands
Constructed wetlands process wastewater on-site resulting in clean water for irrigation.



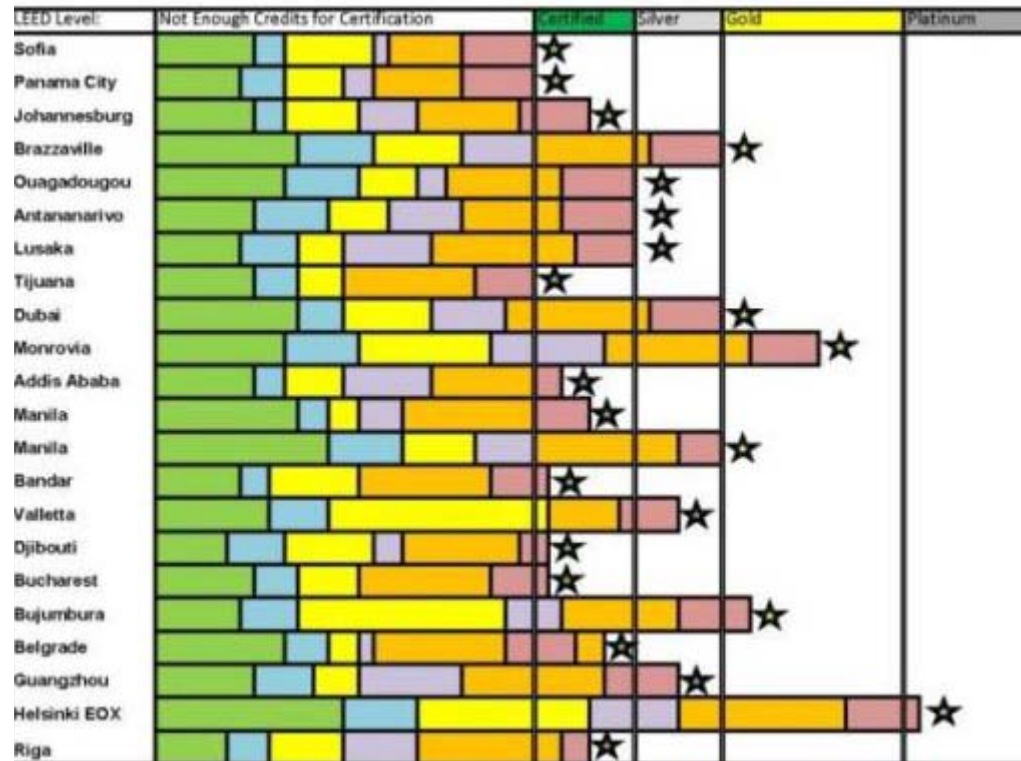
Rainwater Harvesting
Morocco uses rainwater harvesting to supply the mission needs for both potable and non-potable demands saving millions of liters per year.



Wind Power
Wind power feasibility varies considerably from site to site depending on wind speed, direction, and consistency as well as power rates.

RESULTS NEW CONSTRUCTION

- **Federal Real Property Profile Requires**
 - 15% of Agency Assets be Sustainable by 2015
- **LEED® Projects Average Performance:**
 - ✓ 25% less energy use
 - ✓ 35% less potable water use
 - ✓ 76% less irrigation water use
 - ✓ 48% less construction waste



RESULTS LEED® CERTIFIED PROJECTS

Sofia LEED Certified



- 30% better energy cost than ASHRAE standard
- 21% better water use than baseline in building
- Brownfield redevelopment
- Bicycle rack and showers
- Occupancy sensor for lights
- Ozone protection
- No chemical water treatment
- Enhanced indoor air quality
- Tree preservation
- Building as educational tool



Panama City LEED Certified



- 27% better energy cost than ASHRAE standard
- 32% better water use in building than baseline
- Ozone protection
- Erosion and sedimentation control
- Water efficient landscaping
- Regional materials
- Low-emitting materials
- Enhanced indoor air quality
- Building as educational tool
- Highly reflective hardscape



Johannesburg LEED Certified



- 22% better energy cost than ASHRAE standard
- 31% better water use than baseline in building
- Ozone protection
- Erosion and sedimentation control
- 20% recycled content
- Regional materials
- Low-emitting materials
- Enhanced indoor air quality
- Enhanced commissioning
- Pollutant source control



RESULTS LEED® SILVER PROJECTS

Ouagadougou LEED Silver



- 17% better energy cost than ASHRAE standard
- 39% Better water use than baseline in building
- Constructed wetlands on-site waste water treatment
- Water efficient landscaping
- Highly reflective hardscape and roofing
- Low-emitting materials
- 12% of base building materials contain recycled content



Lusaka LEED Silver



- 15% better energy cost than ASHRAE standard
- 31% better water use in building than baseline
- 77% reduction in potable water for irrigation
- Occupancy and daylight sensors
- Light shelves & sun shades
- Low-emitting materials
- 20% recycled content in base building materials
- Building as educational tool



Antananarivo LEED Silver



- 20% better energy cost than ASHRAE standard
- 39% better water use in building than baseline
- Reuse of treated wastewater for irrigation
- Water efficient landscaping
- 75% construction waste diverted from landfills
- Green Guard Certified furniture systems and seating



RESULTS LEED® GOLD PROJECTS

Monrovia LEED Gold



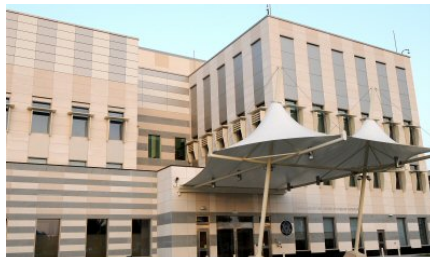
- 28% better energy cost than ASHRAE standard
- 41% better water use than baseline in building
- Highly reflective hardscape and roofing
- 75% construction waste estimated to be diverted from landfills
- Low-emitting materials
- 13% of base building materials contain recycled content



Dubai LEED Gold



- 22% better energy cost than ASHRAE standard
- 41% better water use than baseline in building
- Highly reflective hardscape and roofing
- Daylight harvesting
- 22% of materials procured regionally
- 82% construction waste diverted from landfills
- Enhanced commissioning
- Low-emitting materials



Brazzaville LEED Gold



- 32% better energy cost than ASHRAE standard
- 31% better water use than baseline in building
- Reuse of treated wastewater for irrigation
- 75% site area restored using native/adaptive plants
- 95% construction waste diverted from landfills
- Regional materials
- Enhanced indoor air quality



- Case Study
– **GUANGZHOU, CHINA**



CASE STUDY U.S. CONSULATE GENERAL GUANGZHOU, CHINA

LEED® Silver



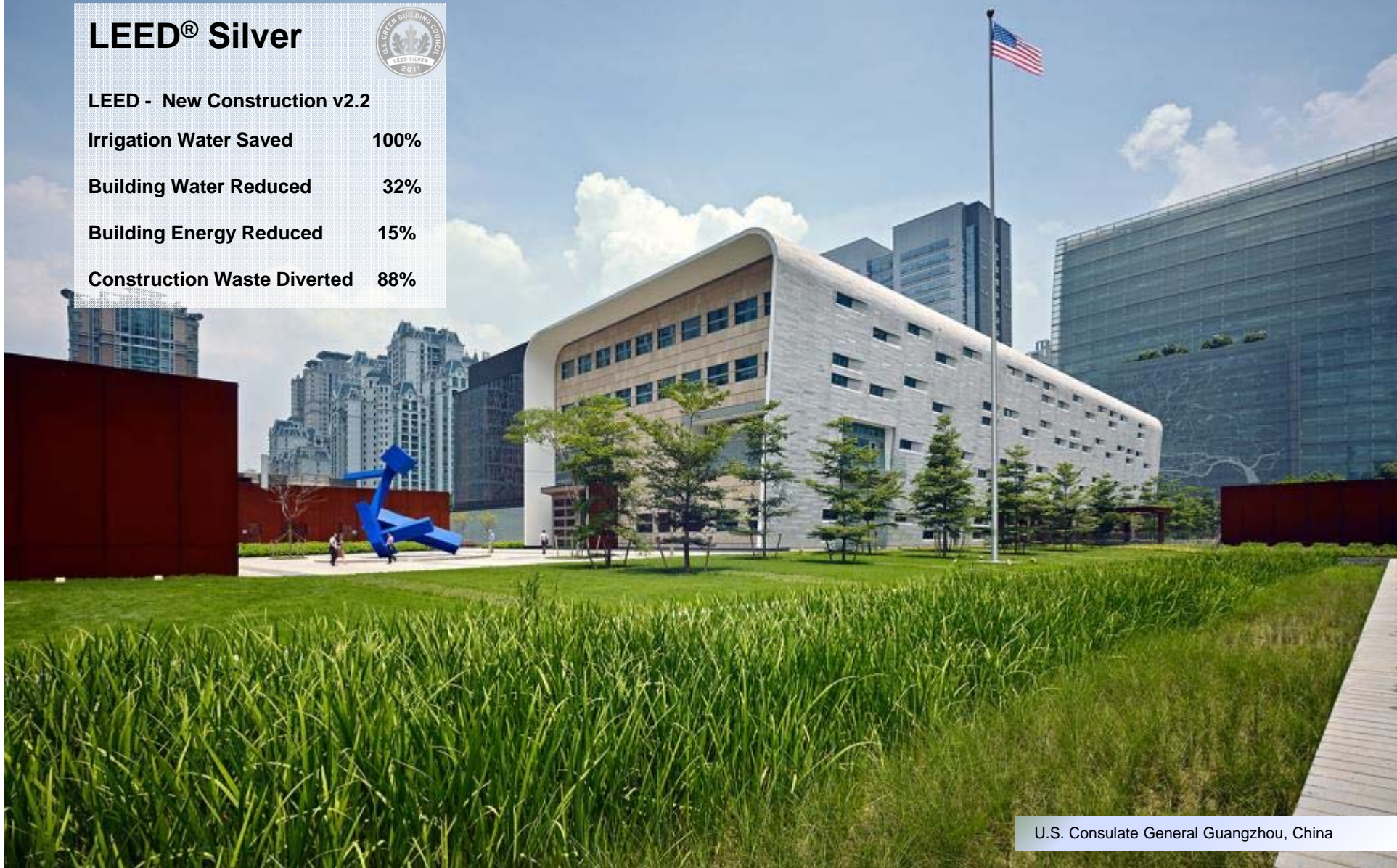
LEED - New Construction v2.2

Irrigation Water Saved 100%

Building Water Reduced 32%

Building Energy Reduced 15%

Construction Waste Diverted 88%

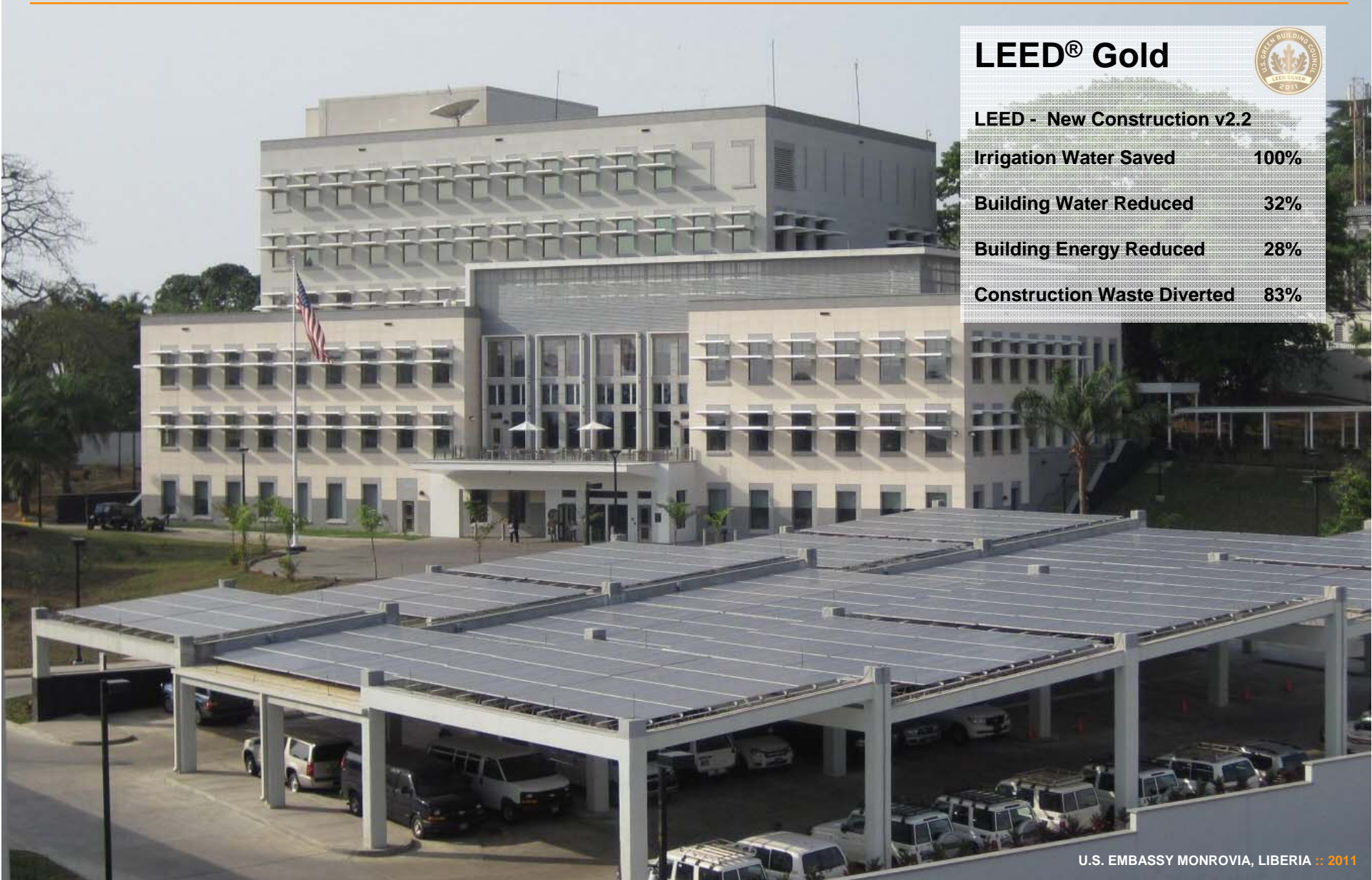


U.S. Consulate General Guangzhou, China

- Case Study
– **MONROVIA, LIBERIA**



CASE STUDY U.S. EMBASSY MONROVIA, LIBERIA



LEED® Gold



LEED - New Construction v2.2

Irrigation Water Saved	100%
Building Water Reduced	32%
Building Energy Reduced	28%
Construction Waste Diverted	83%

U.S. EMBASSY MONROVIA, LIBERIA :: 2011

- Case Study
– BUJUMBURA, BURUNDI



CASE STUDY U.S. EMBASSY BUJUMBURA, BURUNDI

LEED® Gold



LEED - New Construction v2.2

Irrigation Water Saved 100%

Building Water Reduced 39%

Building Energy Reduced 52%

Construction Waste Diverted 95%



U.S. Embassy Bujumbura, Burundi

- Case Study
– HELSINKI, FINLAND



CASE STUDY **U.S. EMBASSY HELSINKI, FINLAND**



LEED® Platinum



LEED - New Construction v2009

Irrigation Water Saved 100%

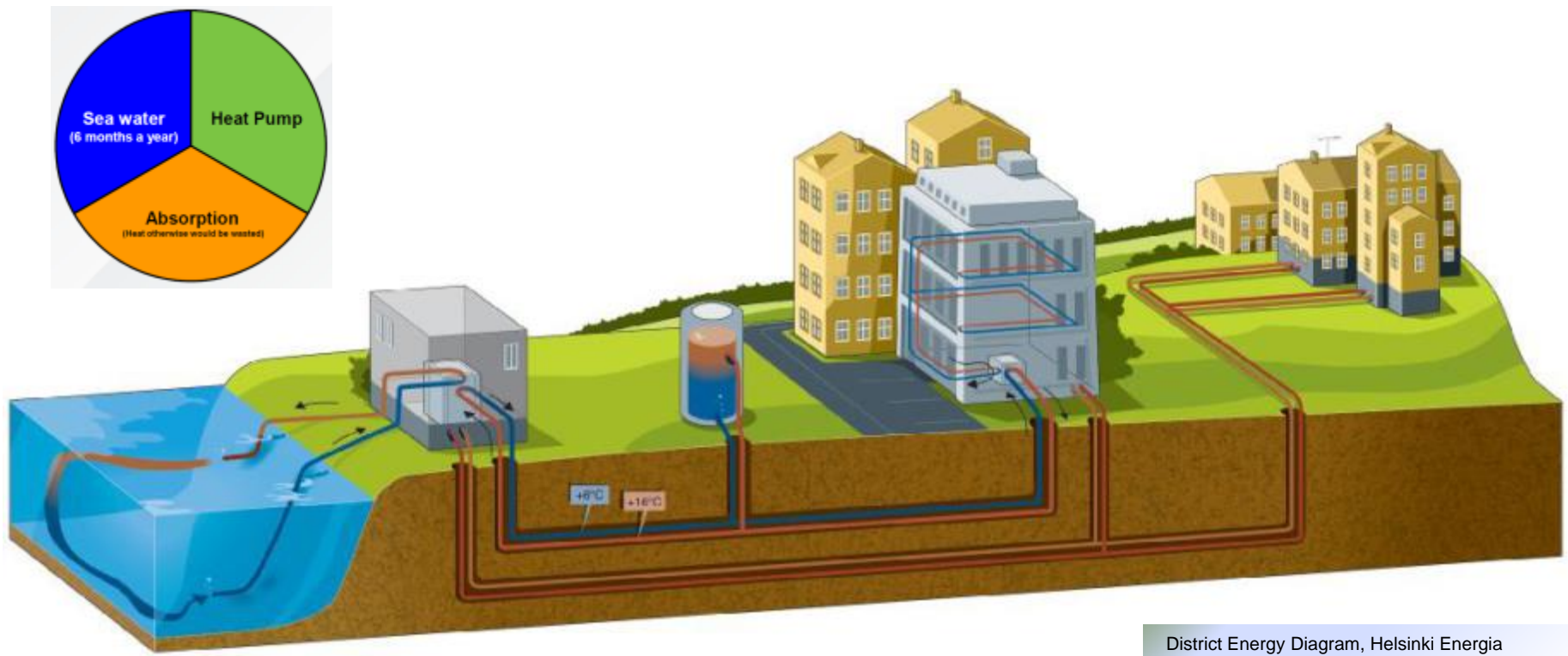
Building Water Reduced 30%

Building Energy Reduced 46%

Construction Waste Diverted 88%

CASE STUDY U.S. EMBASSY HELSINKI, FINLAND

- **Connected to District Chilled and Hot Water**
 - Third largest cooling system in Europe
 - Buildings require no chillers or large boilers
 - 1/3 of cooling comes from Gulf of Finland - emissions free
 - 1/3 of cooling comes from absorption chillers



RESULTS SOLAR POWER

- **Executive Order 13514**

- New target 20% renewable by 2020

	PV Projects	kW
COMPLETED	Geneva	119
	Abuja	100
	Kigali	251
	Athens	100
	Monrovia	183
	Bujumbura	300
	Dakar	307
	Lisbon	36
	<u>Monterrey</u>	<u>237</u>
	Santo Domingo	456
IN CONSTRUCTION	Valletta	224
	Port Moresby	100
	Nouakchott	129
	Mbabane	220
	Abuja	290
	Cotonou	200
	Vientiane	18
	<u>Managua</u>	<u>960</u>
	Istanbul	350
	New Delhi	175
IN DESIGN	Bangkok	100
	Djibouti	360
	Juba	500
	N'Djamena	445
	Taipei	100
	Total	6.2MW



GARAGE MOUNTED PV AT U.S. EMBASSY ATHENS



ROOF MOUNTED PV AT U.S. EMBASSY MONTERREY

RESULTS PHOTOVOLTAICS

- **Projected Savings (after payback) = \$171M**
 - Aggregated Payback 2025

