Title: California Academy of Sciences Climate Action Plan

Data Year: Fiscal Year 2011-2012

Author: Ari Harding, PE

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Table of Contents:

1. Introduction

The oldest scientific research institution in the Western United States, the California Academy of Sciences ("The Academy") is the world's greenest museum, and the only institution in the world with a natural history museum, aquarium, and planetarium under one roof. Founded in 1853 by seven scientists and physicians with a passion to discover and protect the flora, fauna, and natural environments of California, today's Academy pursues its mission to explore, explain, and sustain life through global research, exhibitions, and educational engagement. The Academy has welcomed more than 7 million visitors since opening its new facility in late 2008, and is projected to serve 1.3 million visitors annually. The Academy has completed LEED Platinum certifications for New Construction and for Operations and Maintenance.

2. Departmental Profile

The mission of The California Academy of Sciences is to explore, explain, and sustain life.

The City of San Francisco's contribution to the California Academy of Sciences FY11-12 budget was approximately 4.0 million dollars.

The California Academy of Sciences non-profit corporation employs 360 full-time staff members, 250 part-time staff (including hourly/on call staff). 10 stationary engineers are employees of the City and County of San Francisco.

Facilities

Located at 55 Music Concourse Drive, The California Academy of Sciences is a 5 story building with a 120,000 square foot footprint, and a total building square footage of 450,000. The Academy features the Steinhart Aquarium, a digital planetarium, a natural history museum, and rotating exhibits from around the word. Sustainable features of the facility include a 2.5 acre living roof, solar panel array, significant use of natural ventilation, radiant floor heating, and extensive access to daylight.

The main public floor is naturally ventilated using a system of automated windows, vents and skylights. All other areas of the facility are mechanically ventilated using conventional HVAC systems, though most office spaces have access to manually operated windows for additional ventilation.

The research facility includes extensive collections of marine life, insects, mounted birds and mammals, geological samples, and anthropological specimens and artifacts. The Academy also houses laboratory facilities used for sample preparation and investigation.

The Steinhart Aquarium maintains a collection of over 30,000 live animals, including marine life, snakes, lizards, birds, and butterflies. The aquarium management emphasizes sustainable collection management and captive breeding programs.

The Academy owns and operates four gasoline-powered vehicles: A Ford F-250 truck, a Ford E-150 van, a Toyota Tacoma, and a Honda Odyssey

Departmental Contact Information

Ari Harding, PE is the Director of Building Systems, and is the Climate Action Plan coordinator.

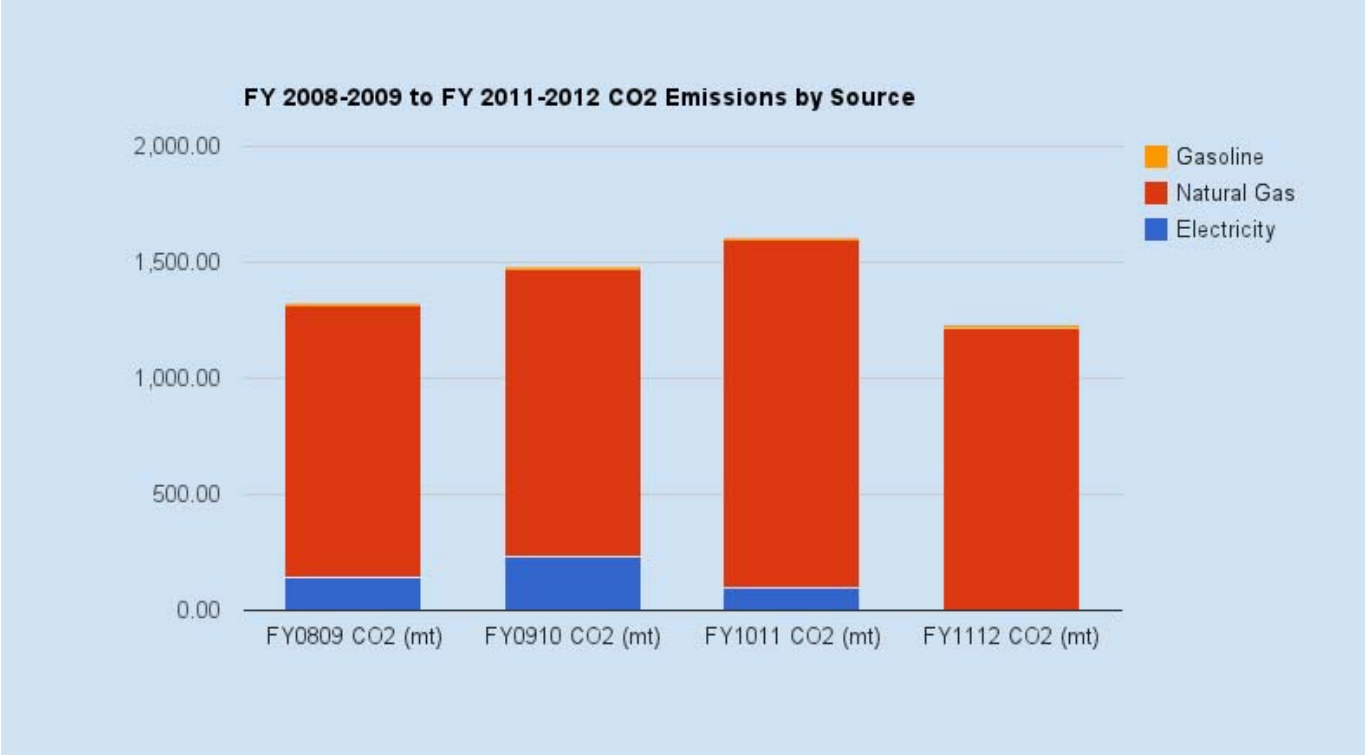
Kevin Manalili is the Director of Building Operations.

Allan Madison is the Zero-Waste coordinator.

3. Carbon Footprint

Over-all energy use at the Academy is driven by the extensive life-support, environmental management, and lighting of the living exhibits, which provide the core of our visitor's educational experience.

Carbon sources include electrical energy from the Hetch-Hetchey power system, natural gas, and gasoline vehicle fuel. CO2 generation was reduce by 79 metric tons from FY2008-2009.



3a. Building Energy

The list of facilities used by SF Environment to calculate the FY 2011-2012 Departmental carbon footprint has been verified by The California Academy of Sciences to be accurate and complete.

GHG Emissions from Electricity in Fiscal Year 2011-2012: 12,933,205 kWh consumed, 0 Metric Tons of CO2

GHG Emissions from Natural Gas in Fiscal Year 2011-2012s: 229,473 therms consumed, 1,217.59 Metric Tons of CO2

The California Academy of Sciences does not use steam.

Electrical energy was reduced slightly from FY 2008-2009, primarily due to operational efficiency improvements during our LEED O+M project. Natural gas use increased slightly from FY2008-2009, but varies year to year depending on weather.

3a1. Energy Efficiency

ENERGY EFFICIENCY & RETROFIT PROJECTS

Start Stop Time Optimization: SSTO was implemented for the office and lab spaces of the Academy, along with optimized air handling unit scheduling. SSTO is an advanced control algorithm that starts and stops an air handling unit earlier or later than programmed schedule based on learned thermal performance.

Sun tracking shade control: A sun-tracking system was designed and built to control the exterior shades on our South, East, and West façades. The system measures sun direction and elevation, and automatically compensates for overcast conditions, fog, rain, and wind. Exterior shades are controlled on a zone by zone and floor by floor basis to reduce glare and manage solar heat loading, while

allowing as much natural light as possible to enter the building. Local shade controls are also available to office occupants when automatic control is not required by environmental conditions.

COMPLIANCE WITH THE EXISTING COMMERCIAL BUILDINGS ENERGY PERFORMANCE ORDINANCE

In order to comply with the Existing Commercial Buildings Energy Performance Ordinance (Ord 17-11, SF Environment Code Chapter 20), the California Academy of Sciences assisted the SFPUC in producing the 2011 Energy Benchmarking Report for San Francisco Municipal Buildings by:

- Verifying the department's list of facilities.
- Verifying the existing data for each facility (such as street address, year built, gross square footage, and building type).
- Providing data specific to the primary EPA ENERGY STAR building category (such as weekly operating hours, number of workers on main shift, and if applicable, additional information on the facility, subspaces, and parking areas).

The 2011 Energy Benchmarking Report is available at
http://www.sfwater.org/modules/showdocument.aspx?documentid=2938

The California Academy of Sciences is not eligible for an EnergyStar rating score, but did calculate a site energy use index (EUI) of 167.5 kBtu/sq.ft.

COMPLIANCE WITH THE COMMERCIAL LIGHTING EFFICIENCY ORDINANCE

The California Academy of Sciences is compliant with the requirements outlined in the Commercial Lighting Efficiency Ordinance (SF Building Code Chapter 13D)

INFORMATION TECHNOLOGY

All desktop computers, notebooks and monitors purchased must have an Energy Star efficiency rating. All IT recommended laptop and desktop configurations must be Energy Star rated and all users must be guided towards these configurations when making purchases. If a user needs a non-standard configuration to meet a specific need, every attempt is made to find an Energy Star rated configuration that meets the user's need.

Sleep mode configuration is controlled by central server for all department systems which are not required to be on 24/7, such as life support and critical building management systems. Sleep mode is configured to engage after 20 minutes away from the machine, and employees are encouraged to turn off computers and monitors when unused. IT also configures, by default, double-sided printing for computers on the network.

Virtualization to blade servers project: the overall power reduction moving from physical servers, 2 Unit rack or 5 unit rack type servers, to blade servers resulted in a 70% power savings. Heat load was also reduced by 50%. This allows us to have over 100 servers on 4 blade servers - a reduction of 8 racks to 1 rack.

3a2. Renewable Energy

The Academy facility includes a 171 KW (nominal) solar panel array. The system design includes 720 glass laminates each of which will contain 77 PV cells. The PV cells are specified as 125 mm single crystalline as manufactured by Sunpower Corp. of Sunnyvale, California and designated as model A-300. These cells are rated for 3.1 Watts of power each, at 20% minimum efficiency.

3a3. Green Building

The California Academy of Sciences has achieved two LEED Platinum Certifications: LEED for New Construction in 2008 and LEED for Existing Buildings Operations and Maintenance in 2011.

3b. Water

FY2011-2012 Water Consumption

Total gallons consumed:	13,873,156
Total gallons discharged:	12,485,840

Water use is impacted by approximately 1.3 million visitors annually, in addition to water used for aquarium management. All public and private urinals are zero-water systems, saving 1500 gallons of water per day on average.

All of the aquarium systems are designed as re-circulating systems with advanced filtration and biological controls systems to reduce water consumption. Water consumption has decreased from FY2009-2010 by approximately 2 million gallons per year, primarily due to operational improvements in aquarium water quality.

The Academy uses ground water supplied by the Parks and Recreation department to water the grounds and Living Roof when available. An automated system switches between municipal water and ground water to maintain water availability for the Living Roof, with ground water as the default source.

3c. Transportation & Fuel

The Academy owns and operates four vehicles for maintenance and education needs. In order to reduce the total number of vehicles required for daily needs, Academy staff also use the City Car Share Program for Academy business. Total gasoline usage was 1534 gallons for FY 2011-2012.

Ford F250	617 gallons
Ford E150	184 gallons
Toyota Tacoma	328 gallons
Honda Odyssey	406 gallons

FISCAL YEAR 2011-2012 CARBON FOOTPRINT FROM MOBILE COMBUSTION OF FUEL

1534 gallons of gasoline = 13.6 metric tons of carbon dioxide equivalents.

3c1. Commuter Incentive Program

The Academy encourages all staff members to access the Academy by walking, bicycling, using public transportation, or through participating in a private or organized van or car-pool. This will relieve parking congestion at the Academy, and will relieve pollution and general traffic congestion through reducing the number of cars on the roads.
The Incentive program is an Academy specific program whereas the regular Commuter Benefit program is a federally regulated (IRS code 132f) program which offers $115 pretax for transit passes or $220 pretax for parking fees (increased from $110/215 as of 1/1/2008!).

There are three variations to the Academy's Incentive Program:
$20 subsidy for transit passes: eligible employees can receive a $20.00 subsidy for using alternative transportation modes and purchasing their pre-tax passes through WageWorks, Inc. our current transit pass provider.

OR

$1.00 per day for each day (up to 20 days) the employee commutes to work by vanpool, car-pool, walking or bicycling.

OR

Receive .25 vacation days per month for a total of 3 days per year additional vacation for commuting to work by foot, bicycle, public transit, van or car-pool for ten days or more.

3c2. Transportation Survey

This year, the City conducted its biannual survey of City employee commuting and at-work travel behavior. The 2012 CCSF Transportation Survey was administered through the Department of Environment's CommuteSmart team and distributed through Climate Liaisons and others to each department and division. The California Academy of Sciences distributed the survey to al City and non-profit staff members. The survey ran in December of 2012 with a response rate of 53.7%. Surveys were distributed via email.

From the data results specific to the Academy, there were three interesting observations:

- 73% of commuter trips were made using alternative to driving alone, including walking, bicycling, public transit, and carpools.
- Of those who drive alone to work, 20% said they have to make frequent stops for errands and pick up/drop offs.
- Another 18% said that public transit does not match their routes or schedules.

4. Other Sustainable Practices

The Academy operates in compliance with best practices detailed in LEED for Operations and Maintenance 2009, and has certified at a platinum level in 2011.

4a. Zero Waste

The Academy considers a high diversion rate a priority. The average diversion rate over FY12 (July 2011 – June 2012) was 74%, and has leveled off at 75% into FY13.

In order to ensure the best diversion rate possible - a challenge in a public building with approximately 1.3 million visitors a year originating from a wide range of communities and all having varying degrees of understanding about waste management and San Francisco's standards - the Academy has taken a number of steps:

• Appointment of permanent loading dock monitors, responsible for auditing and sorting *all* trash coming from the public floor
• Establishment of a "Waste Team" composed of Operations, Green Team, and Sustainability staff to spearhead diversion improvement
• Custom signage at all waste stations to help educate visitors and staff on proper diversion
• Removal of individual staff trash bins in favor of centralized waste stations in each wing
• Close cooperation with Store and Café managers to ensure best practices
• A loading dock waste area configuration designed to ensure maximum compliance
• Styrofoam is now recycled into surfboards

4b. Green Purchasing

The California Academy of Sciences has a green purchasing policy in place, and encourages its staff members to purchase locally sourced materials with high levels of post-consumer content whenever possible. All copier paper is 100% post-consumer recycled content, as are all branded office supplies, such as letterhead, business cards, and mailing labels.

The majority of the food purchased for the Café and restaurant is locally sourced, seasonal and/or organic.

Food purchased for animal diets is locally sourced, seasonal and/or organic. Sustainably farmed shrimp is used as a primary fish food source.

Academy staff equipment, such as microwaves and refrigerators, must be ENERGY STAR rated.

4c. Carbon Sequestration / Urban Forest

Overview

The California Academy of Sciences manages 4.5 acres of landscaped grounds and 2.5 acres of green roof within San Francisco's Golden Gate Park. These grounds are home to 331 mature and recently planted trees. 75% of these trees are species native to California. The rate of attrition from natural causes and intentional removal has been matched closely by new plantings, leaving out year-over-year inventory stable.

Under the umbrella of the City of San Francisco Department of the Environment regulations for pest management in city parks, we practice chemical-free pest management and use low-impact fertilizers and soil amendments. 90% of the plant nutrition products we apply to our landscape are OMRI certified for use in organic horticulture.

Irrigation was originally handled by overhead sprinklers as well as bubblers, but we have gradually moved to bubblers as the most efficient and effective way of irrigating trees. We have a staged program to transition to 100% tree bubblers by the end of 2012.

Care of mature specimen trees

The Academy's Landscape Exhibits Department has worked with certified arborists to establish an annual inspection and pruning program for our mature trees. The majority of the mature trees (75 years or older) are the species typical to established plantings within the park: Blue Gum (*Eucalyptus globulus*), Monterey Cypress (*Cupressus macrocarpa*) and Monterey Pine (*Pinus radiata*).

Most individuals of these latter two species are nearing the senescent stage of their life cycle, and require annual safety pruning to avoid windfall during the winter storm season. This is particularly true of the Monterey Cypress. We have established significant underplantings of replacement Monterey Cypress, in preparation for their eventual removal s they pass from senescence to structural failure over the next 25 to 50 years.

Most older Monterey Pine specimens in the park are severely affected by Fusarium pitch canker. Five infected Monterey Pines were removed in 2011. Our remaining Monterey Pines are infected but do not currently pose a safety hazard, and will remain in place as long as possible. In the absence of effective controls for the pitch canker disease, there is no program in place to renovate these stands, but there are abundant volunteer seedlings in the understory.

Blue Gum Eucaluyptus are long lived and, when properly pruned, sturdy. There are 3 very large specimens in our care, estimated to be more than 100 years old; these trees may live to three times that age. There is no program in place to cultivate new Eucalyptus on the grounds, but safety pruning is carried out as needed.

Care of palms

As part of the landscaping for the new Academy building, more than 50 exotic palm specimens were planted. We manage five large (40' tall) Canary Island Date Palms and 47 Kentia Palms. We work with a specialist palm consultant to monitor the health of these trees. The majority of these trees are in good health, despite the fact that they are far outside of their native range. Fungal disease is the major challenge we face when caring for palms in relatively warm, wet winter conditions. Close monitoring of our plant nutrition and watering, along with regular inspections and hand cleaning, have created optimum growing conditions and healthy palms over the past three years.

Introduction of additional native species

In order to provide greater habitat value and a model of native gardening for the public, we have increased the species diversity of our tree inventory with the gradual addition of previously unrepresented species. Blue Elderberry, California Madrone, Black Oak, Oregon Oak, Pacific

Crabapple, Big Leaf Maple, Catalina Ironwood and Oregon Ash are all new introductions added over the past two years.

Future plans

Our tree care program has provided us with positive results, and our efforts will continue to focus on the maintenance of a healthy urban forest based on an increasingly diverse list of native species. The cornerstones of our approach will continue to be roper irrigation, proper soil management through organic compost and organic soil amendments and proper seasonal pruning for structure and plant health.

5. Community Wide Impact

TEACHER INSTITUTE ON SCIENCE AND SUSTAINABILITY

The Teacher Institute on Science and Sustainability is a two-year, hands-on program designed to provide 3rd, 4th, and 5th grade teachers with the critical tools and knowledge to inspire future generations to protect our most precious resource: the planet Earth. Sixty teachers from two cohorts participate each year.

During this two-year professional development program, teachers become leading educators of science and sustainability. The program includes two intensive summer sessions, ongoing professional development during the school year, mentorship by Academy staff, and access to Academy educational resources. The Institute provides teachers with adult-level content and classroom-ready activities on topics such as energy, the carbon cycle, green buildings, waste, and water issues. Teachers meet with scientists and other experts, engage in science labs and educational activities, use science notebooks, and reflect on science and sustainability integration in their classrooms.

For a complete and up-to-date list of teacher and educational resources and workshops, please visit our website:
http://www.calacademy.org/teachers/

6. Summary & Goals

This year, the Academy has reduced electrical and water use and has continued to meet high standards of landfill diversion. The Academy also implemented a program to recycle Styrofoam used for animal transportation into surfboard blanks.

The Academy also recently created the "Institute for Biodiversity Science and Sustainability" and a professional search is currently underway to hire a Chief of Science and Sustainability. The new institute would include all of the current research and collections staff and activities and also would have an expanded portfolio of activities that include leadership of the Academy's sustainability initiatives, the integration of Academy Fellows more closely into the life of this institution, and engagement of Academy scientists in new and creative programs of public outreach.

The new Chief of Science and Sustainability will be critical to developing sustainability and outreach goals for the Academy as a whole. However, we are currently working on improving our outreach to biodiversity hot spots in the Philippines, Madagascar, and Borneo, and have an upcoming expedition to Cameroon planned for June.