Sustainable Operations & Maintenance Programs

APPA Institute
Nashville, TN
9/9/19

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University of Colorado **Boulder**

Housekeeping

- Welcome!

- Break

- AIA Continuing Education Credits

- Session Evaluations
  - Please add written comments
    - Did the course offer a good balance btwn. concepts and examples?
    - If not, what would you like to see more of?

Credit(s) earned on completion of this course will be reported to American Institute of Architects (AIA) Continuing Education Session (CES) for AIA members.

Certificates of Completion for both AIA members and non-AIA members are available upon request.

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Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

Course Description

This course will provide an overview of O&M programs that are striving to be sustainable. This interactive session will explore what sustainability means to facilities managers, review the many questions and challenges presented by sustainability, as well as share practical success stories from around the country. Topics will include how campuses are structuring their sustainable O&M programs, current trends & new initiatives in waste management, water & energy conservation, tree & turf care, green cleaning, pest control, and more. The session will also look at developing appropriate metrics and how to effectively use them in related outreach programs.

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Learning Objectives

1. Explore what sustainability means to facility managers

2. Review the questions and challenges presented by sustainability

3. Learn the current trends and initiatives in waste management, water and energy conservation, tree & turf care, and more

4. Share practical stories from around the country.

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Personal Introduction

- Division of Infrastructure & Sustainability

- Sustainability & Resiliency Program Manager as of 1/1/17

- Formerly the Assistant Director for Environmental Operations

- Oversaw various programs
  - In-house waste collection & processing
    - Recycling, composting, solid waste, autoclave
    - On campus recycling facility
    - Service contracts
  - Integrated Pest Management
  - Wildlife management

- 24 years in campus operations including project management, green building, energy conservation, grounds maintenance, and custodial services

Course Goals

- Explore the definition of 'Sustainability'
- Link sustainability to accepted / existing practices
- Share examples of initiatives striving for sustainability
- Explore challenges and pitfalls
- Review role of certification programs
- Link metrics to outreach

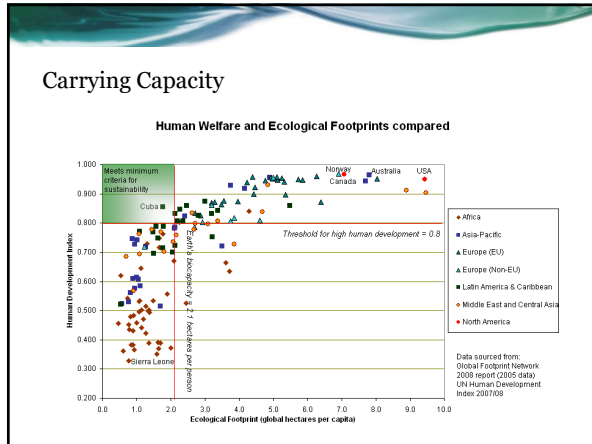## Why is Sustainability important?
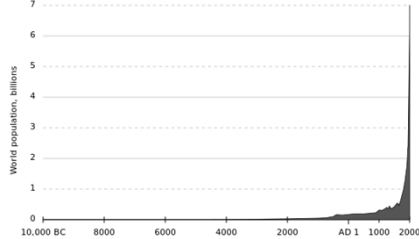
It is estimated that the population of the world reached one billion for the first time in **1804**. It would be another 123 years before it reached two billion in **1927**, but it took only 33 years to rise by another billion people, reaching three billion in **1960.**

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1 Billion more people roughly every 14 yrs.

- 1B – 1804
- 2B – 1927 (+123 years)
- 3B – 1959 (+32)
- 4B – 1974 (+15)
- 5B – 1987 (+13)
- 6B – 1999 (+12)
- 7B – 2012 (+13)
- 8B – 2026 (+14)
- 9B – 2042 (+16)

Carrying Capacity

Human Welfare and Ecological Footprints compared

Legend:
- Africa
- Asia-Pacific
- Europe (EU)
- Europe (Non-EU)
- Latin America & Caribbean
- Middle East and Central Asia
- North America

Meets minimum criteria for sustainability

Threshold for high human development = 0.8

Earth's biocapacity = 2.1 hectares per person

Norway, Canada, Australia, USA, Cuba, Sierra Leone

Human Development Index (y-axis): 0.200 – 1.000
Ecological Footprint (global hectares per capita) (x-axis): 0.0 – 10.0

Data sourced from:
Global Footprint Network
2008 report (2005 data)
UN Human Development
Index 2007/08

Definition of Sustainability?

Compliance vs. Sustainability
~ Compliance with established rules & regulations - mandatory
~ Sustainability addresses impacts and issues beyond required compliance

Sustainability Initiatives vs. Sustainable Initiatives
~ Few programs can be considered 'sustainable' at this time
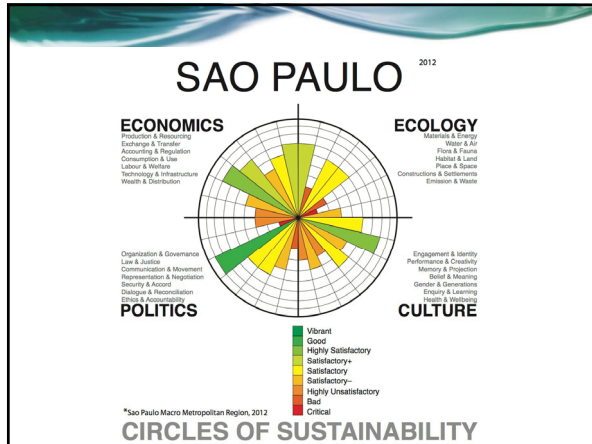~ Many programs are striving for sustainability

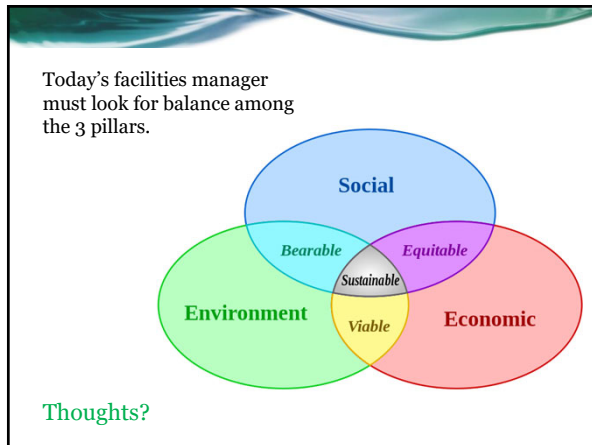True Sustainability difficult to achieve

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Easier to Define than to Achieve

7th Generation Principle

The "7th generation" principle taught by Native Americans says that in **every decision**, be it personal, governmental or corporate, we must **consider how it will affect our descendants** seven generations into the future.

Generally speaking:
Meeting your needs without causing immediate harm or impacting the ability of others to do the same (in the future)

SAO PAULO [2012]

ECONOMICS
Production & Resourcing
Exchange & Transfer
Accounting & Regulation
Consumption & Use
Labour & Welfare
Technology & Infrastructure
Wealth & Distribution

ECOLOGY
Materials & Energy
Water & Air
Flora & Fauna
Habitat & Land
Place & Space
Constructions & Settlements
Emission & Waste

Organization & Governance
Law & Justice
Communication & Movement
Representation & Negotiation
Security & Accord
Dialogue & Reconciliation
Ethics & Accountability
POLITICS

Engagement & Identity
Performance & Creativity
Memory & Projection
Belief & Meaning
Gender & Generations
Enquiry & Learning
Health & Wellbeing
CULTURE

Vibrant
Good
Highly Satisfactory
Satisfactory+
Satisfactory
Satisfactory−
Highly Unsatisfactory
Bad
Critical

*Sao Paulo Macro Metropolitan Region, 2012

CIRCLES OF SUSTAINABILITY

Today's facilities manager must look for balance among the 3 pillars.

Social

Bearable

Equitable

Sustainable

Environment

Viable

Economic

Thoughts?

Sustainability as it relates to accepted and applied Terms & Practices

- Total Quality Management (TQM)

- Continuous Improvement (CI)

- Data Driven Decision Making (DDDM)
  - Renewed focus within APPA
  - Used by NACUBO

- Total Cost of Ownership (TCO)
  - HIGHLY relevant to sustainability
    - Incorporates concept of 'Externalities'
      – examples?
    - Goes beyond compliance

Continuous Improvement as a driver of Sustainability

- Notion can be daunting
  - Will it ever end?!

- However, affords a certain freedom and flexibility
  - Can't achieve everything at once
  - Will always be a next phase or second chance of sorts
  - "Under promise and over deliver"

Drivers of Continuous Improvement

- Change
- Time
- Wear & tear
- Changing waste profile
- Cost of utilities
- Scarcity of resource
- Changing climate

- Campus Goals / Initiatives

'Zero Waste' Epiphany

- Zero Waste defined as a minimum of 90% landfill diversion
- Athletic Dept. & Chancellor fixated on the last 10%
  - "What will we do with athletic tape?"

- New approach: equated ZW goal to that of a 'Zero Accidents' program on a construction site
  - Becomes part of the daily planning and process

- Zero Waste goals became the driver for Continuous Improvement

Getting Started – aim high but start 'small'

<u>Win – Win – Win</u>
- Financial
- Environmental
- Social
  - Housekeepers
  - Laundry staff

Sustainability Initiatives

- Integrated Landscape Management
- Wildlife Management
- Zero Waste Events
- Energy Management
- M&O Waste / C&D waste

Integrated Landscape Management

<u>Elm Bark Beetle example</u>
- Campus lost hundreds of mature (80+ yrs) American Elms in 1980's

- Only 34 remain

- Annual (preventive) spraying of all trees during spring break (regardless of need)

Solution / Results

- Sanitation pruning
  - Dead & dying wood

- Annual inspection (students)
  - Is treatment needed?

- Soil injections instead of broadcast sprays

Soil Injections

Elm Bark Beetle approach Sustainable?

- No loss of trees (due to EBB) since implementation
- Exposure to insecticide drastically reduced
- Volume of insecticide used reduced
- Annual treatment costs reduced

Potential pitfalls
- Application method as effective?
  - Risk of losing high value trees
  - Could ruin credibility
- New method and product potential for impacting groundwater

Potential solution
- Move to trunk injections

Wildlife Management

Research ponds example

- Beavers damming up pond connectors
- Flooding adjacent areas
- Mature trees lost
- Repeated relocations
- Costly

Solution / Results

- 'Beaver Deceivers' installed
- Water level stabilized
- Mature trees wrapped and protected
- Relocation unnecessary
- Resource limits regulate population

Sustainable?

Zero Waste Athletic Events

Folsom Stadium example (Pre 2008)
- Recycling only (no composting) outside gates and tailgate lots for decades
- Disposables used throughout stadium
- Significant waste produced each game
- Unserved food thrown away
- Sourcing of products not a concern
- Sponsors and vendors not particularly 'green'

Solution / Results

- Everything inside security perimeter now 'Zero Waste'
- Established recycling & composting stations; eliminated public trash cans
- Converted most landfill items (low value plastics) to compostable ware
- Expanded use of reusable serving ware
- Contract, sponsor and vendor reform
  - Esp. those selling/serving or giving anything away
- Improved sourcing
  - Food, paper (publications), shirts for volunteers
- Landfill diversion rate more than doubled
  - <40% (2007) to >90% (2014)

RALPHIE'S GREEN STAMPEDE

- *Numerous other energy, water, and transportation initiatives*

Sustainable?

- Disposable approach
  - High resource use
  - Recycling & composting not benign processes
  - Sourcing
- Large carbon footprint
- Tailgate lots relatively unchanged
- Many other aspects of game day operations untouched

Sustainable?

Energy Management Saw-tooth

Life Cycle Value of Automated Commissioning (ACx)
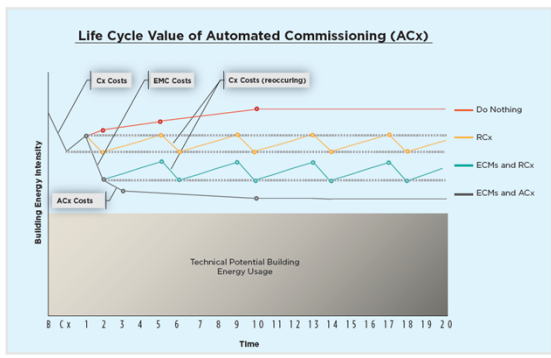
Energy Production
Heartland BioGas Facility

Montana State University M&O

Residence Hall Upgrades
- Replacing ~900 platform beds with 'loftable' beds
- Voluminous waste destined for landfill
- Work to commence on graduation day
- Student supported effort

Solution / Results

- Reduced disposal costs
- 100% of metal lofts recycled (15,000 lbs)
- 78% of wood from beds repurposed.
- ~700 mattresses recycled
- Collaborative effort
- Meaningful student involvement
- Leveraged event to collect other items (food, electronics)
- Potential to help underserved community – temporary housing for homeless

Creative Solutions to Everyday Challenges

Summary

Your Shop / Trade / Operation doesn't have to have a specific focus on sustainability to implement sustainable practices...
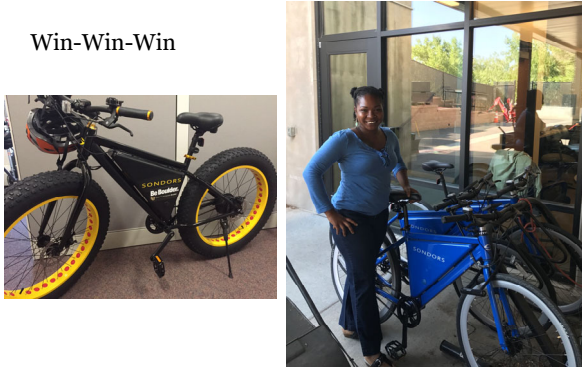
- Recycling as a "Gateway Drug"
  – Aggressive recycling, reuse, repurposing
  – Paint cans, carboys, scrap metal, electronics, pallets
- Purchasing
  – Office supplies, food, M&O supplies
- Use of less toxic chemicals
  – Cleaning supplies
  – Adhesives
  – Finishes
  – Carpet, composite materials
- Pesticide use reduction
  – Request IPM
  – IPM design standards

Other Opportunities

- Green Office:
  - Energy use
  - Re-usables use
  - Paper use

- Vehicle / Fleet
  - Use of E-bikes
  - EVs, PHEVs, Hybrids
  - Bio-diesel, CNG

- Travel
  - Bus, shuttle, rideshare, train
  - Carbon offsets

- Water conservation

Win-Win-Win

Elevator and Fire Suppression Technicians

Sourcing is one of the most impactful ways to make strides on the **Social** leg of the sustainability stool.

~ Applies to both services and purchasing

~ Look at both contract and vendor reforms

- Support of small & medium sized (local) businesses
- Green manufacturing practices
  - Local protection of resources
  - Chemical use
  - Renewable energy use
- Packaging – redux, take-backs
- High performance certifications – i.e., EPA Energy Star ®
- Country of origin – many health & environmental implications

Role of Certification Programs…not to be confused with competitions or challenges

Third-Party Sustainability Frameworks

- STARS (Gold 2010 & 2014)
  - Academics/Research
  - **Operations**
  - Planning & Administration
  - Engagement
- LEED
  - Sustainable Sites
  - Water Efficiency
  - Energy and Atmosphere
  - Materials and Resources
  - Indoor Environmental Quality
  - Innovation/ Regional Priority

Pros & Cons of 3rd party Certifications

Pros	Cons
• Formal commitment	• Formal commitment
• Upfront expenses part of institution's promotions efforts	• Cost of certifications
• Establishes credible baseline	• Too rigorous / Not rigorous enough
• Increased accountability	• Poor performance known to others
• System of tracking	
• Demonstrate compliance w/ State requirements	
• Certification = recognition	

The Sustainability Tracking, Assessment & Rating System™ (STARS®)

A transparent, self-reporting framework for colleges and universities to measure their sustainability performance.

STARS is designed to:
- Provide a framework for understanding sustainability in all sectors of higher education.
- Enable meaningful comparisons over time and across institutions using a common set of measurements.
- Create incentives for continual improvement toward sustainability.
- Facilitate information sharing about higher education sustainability practices and performance.
- Build a stronger, more diverse campus sustainability community

** Provides a Roadmap **

LEED

Leadership in Energy and Environmental Design (LEED) is a third-party certification program and the nationally accepted benchmark for the design, construction and operation of high performance green buildings.

Sustainable Site

Water Efficiency

Energy & Atmosphere

Materials & Resources

IEQ

Innovation / Regional

Images from USGBC

If not participating in Certification

- Set formal policy (ideal) or guidelines

- Mirror certification program w/o formally adopting them
  - Keep pace w/ revisions/updates
  - I.e., City of Boulder
    - Internal standards
    - Green Points program

Metrics 101

Pie chart:
- Paper 27%
- Glass 4.5%
- Metals 9.1%
- Plastics 12.8%
- Rubber, leather & textiles 9%
- Wood 6.2%
- Yard trimmings 13.5%
- Food 14.6%
- Other 3.3%
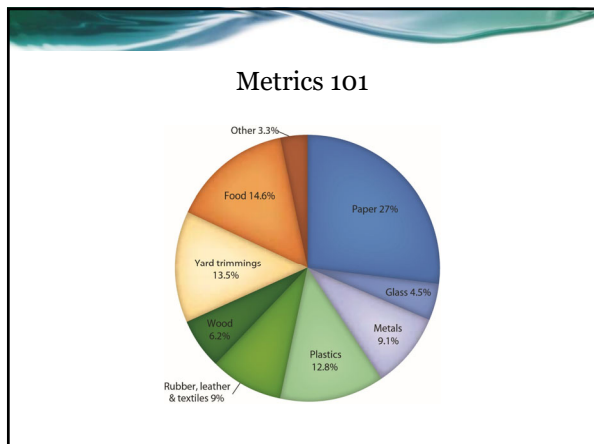
Foundational Metrics

- Begin with the end in mind
  - Have a vision for your metrics
    - What do you hope to demonstrate?
  - Build room for expansion, evolution

- Establish minimum data collection needs in the core areas:
  - Environmental
  - Social
  - Fiscal

- **Good metrics will provide clarity, confidence, and justification in decision making**
  - **Examples?**

Key Facilities Metrics
THAT EVERY BUSINESS OFFICER SHOULD KNOW

Continuous Improvement of Metrics

- Accuracy
  - Actuals vs. projections?
    - Metered?
    - Certified scales?
  - Inclusive?

- Diversity
  - Weight vs. volume
  - Percent vs. actual
  - Timeframe
  - Baseline
  - Benchmarking
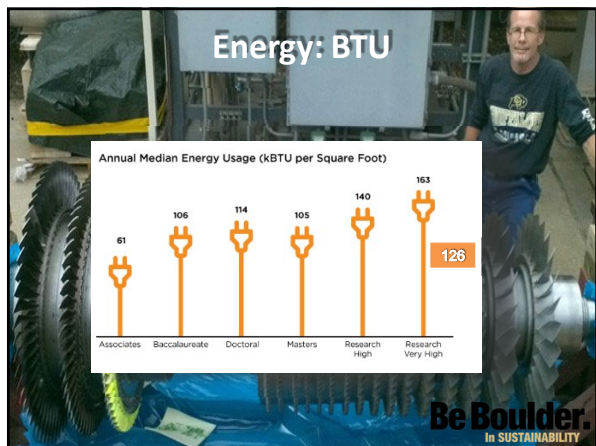
- Transparency

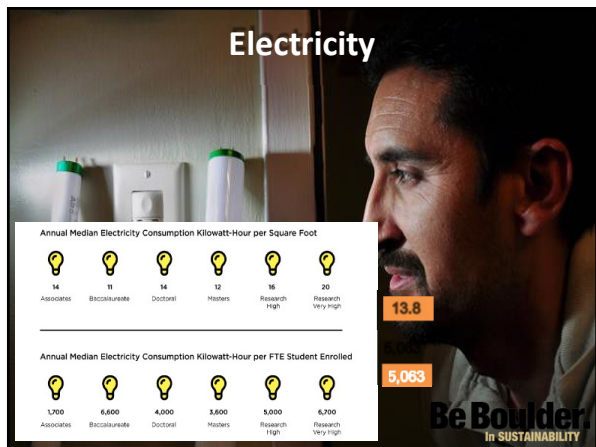## Marriott – Kudos for Transparency

As part of our <u>annual review process</u>, we identified a single calculation error in the 2007 global water intensity baseline that resulted in an <u>overstatement of progress</u> toward our goal. Our 2014 global water intensity reduction has been restated to 9%.

Error potentially made 8 years ago....was it worth correcting?

Metrics as a driver of Sustainability & Engagement

- Can provide another alternative to formal certifications
  - Must be robust, consistent, and credible

- Benchmark against peer institutions
  - Use as basis for your plan

- Tailor outreach & education programs to focus on deficiencies
  - Acknowledge you are not perfect

Energy: BTU

Electricity

Carbon Footprint

APPA Resources

Key Facilities Metrics
o In partnership w/ NACUBO
o appa.org/research/nacubo.cfm

Green Revolving Investment Tracking System
o **GRITS** is a project-management web tool that allows users to track and analyze the energy, financial, and carbon savings data from their energy- and resource-efficiency projects.
o appa.org/grits.cfm

Kelly Fox, CU-Boulder CFO, Presents this to @NACUBO

July 2015

Landfill Diversion Rate Example

Lbs. of Diverted Materials
(Recycled, Composted, Re-used / Donated)

―――――――――――――――――――

Lbs. of Diversion + Lbs. of Landfill   X 100
(Total Waste Generated)

Avoiding Inconsistencies in your Metrics

1. Diversion Rate: add to numerator but not denominator
   1. Construction waste, e.g.
2. Diversion Rate: exclude portions of data entirely
   1. Restrooms in Stadium
   2. Trash roll-offs in competition
3. Diversion Rate: Mix data types / categories
   1. Scale / meter based vs. estimates / projections
   2. Include oranges in with apples (HDS single stream, e.g.)
4. Diversion Rate: Total waste vs. Per capita
5. Energy use: Total use vs. 'Per square foot' (EUI)

Honesty, Integrity, Accountability

- Honesty vs. Integrity
  - Only people to truly understand the details / history of your data is you, the generator.

   Hold yourself to a higher standard

   I.e., Pilot conversion to single stream recycling

   Other examples?

Survival Tips

- Own your plan
  - FM has many responsibilities and needs
  - Be upfront about your concerns, challenges, and limitations

- Strong Planning
  - Begin with the end in mind
  - Identify potential obstacles

- Forge internal partnerships (w/o isolating yourselves)
  - Utilities, custodial, grounds, trades, surplus property
  - Once partnered in operations, coordinate on outreach & promotions

- Don't promote too early

Takeaways

- Make the business case

- Think outside the box

- Shoot for the moon but take small steps (Hotel Linens, i.e.)
  - Low-lying fruit
  - Small risk / Big impact

- Learn from failures

- Build off each success

- Collaborate

- Consistent & credible metrics and communication

THANK YOU!

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