University of Massachusetts Amherst

From the SelectedWorks of Ludmilla D Pavlova

July, 2014

Sustaining Learning Places

Ludmilla D. Pavlova-Gillham, University of Massachusetts - Amherst

Available at: https://works.bepress.com/ludmilla_pavlova-gillham/2/
ESRI EduC: SUSTAINING LEARNING PLACES

Ludmilla Pavlova, AIA, LEED AP
Senior Facilities Planner, Campus Planning

Jonathan Contract
Lukasz Czarniecki
Mohamad Farzinmoghadam
Niels LaCour
Nariman Mostafavi
Alexander Stepanov
Dennis Swinford

Facilities & Campus Services
UMASS
AMHERST
UMASS AMHERST – 150 YEARS OF ENVIRONMENTAL AWARENESS
Earth Systems

Ecosystems

Nutrient systems

Climate systems

Oceanic Systems

Water systems
Earth Systems & Climate Change impacts

- Species extinction
- Climate disturbance
- Build up of toxins
- Ozone depletion, air pollution
- Rising sea levels
- Soil quality depletion
- Water pollution
- Mineral and resource pollution
- Desertification, land pollution
- Fisheries depletion
Education Institution Systems (UMA)

- **Material supply & disposal**: 7,000 tons of waste (56% recycled) annually
- **Food Supply**: 40,000 meals/day
- **Energy supply & delivery**: $26M and 2 trillion BTU’s in 2013
- **Finance/Accounting Structures**: $1.03B Revenues, $1.01B Expenditures
- **Decision Making Processes**: Flagship of System, BOT, 3 unions & public procurement laws
- **Human Resources**: About 30,000 individuals and 12,000 beds
- **Academic Planning**: 200+ degree programs, 7,000 course sections/year, 400 classrooms
- **Building Operation & Maint.**: 12.5M GSF in 388 bldgs (50 heritage)
  - 4,278 acres in MA
  - 19 mi roads
  - 24 mi steam
  - 10 mi electricity
- **Campus Planning**: 200+ degree programs, 7,000 course sections/year, 400 classrooms
  - $25M on new construction, DM, renovation & IT

- **Injected Content**:
  - Academic Planning
  - Building Operation & Maint.
  - Human Resources
  - Decision Making Processes
  - Finance/Accounting Structures
  - Energy supply & delivery
  - Food Supply
  - Material supply & disposal
  - Campus Planning
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GIS Brings it All Together

CityEngine

Base Scene

Rules

Derived 3D Scene

WebViewer

WebGL WebScene

ESRI ArcGIS Server

WebServices

Campus Explorer

Geo-Database

Layers

Attributes

AUX

Rotation
Shift
Scaling
Colors
Ref to Assets

3D Assets/Textures

ETL 1

GIS FileGeoDB
Personal GeoDB
ShapeFiles

ETL 2

CAD

Georef.

ETL 3

FloorPlans

CAD

ETL 4

BIM

ETL 5

Microsoft

SQL Server

ETL 6

XML

ETL N

PeopleSoft
Schedule25

ETL N

Legacy
Data

25LIVE
Challenge: Connect Earth and Education Systems and Drivers
Make hidden upstream & downstream environmental impacts known

Align finance & accounting systems to support long term health

Reduce consumption

Shift to renewable energy & materials

Enhance ecosystem health in campus design

Closed loop system

Create a relationship between Earth + Institution

Mission alignment between teaching, research and operations

Develop learning organization capacities
Make hidden upstream & downstream environmental impacts known

Create a relationship between Earth + Institution

- Enhance ecosystem health in campus design
- Shift to renewable energy & materials
- Reduce consumption
- Align finance & accounting systems to support long term health
- Mission alignment between teaching, research and operations
- Develop learning organization capacities
- Closed loop system
CO2 emissions (metric tons per capita)

data.worldbank.org
Make hidden upstream & downstream environmental impacts known

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## Sustainability is Complex:

<table>
<thead>
<tr>
<th>Multifaceted Problem</th>
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<tbody>
<tr>
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<td>Organizational Limitations</td>
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Adapted from Leith Sharp
<table>
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<th>Multifaceted Problem</th>
<th>Multifaceted, Systemic Change</th>
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<td>Systems Thinking</td>
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<tr>
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<td>Education and Training</td>
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<tr>
<td>Technology and Design</td>
<td>Expertise in green building, energy, transportation, etc.</td>
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<tr>
<td>Time and Money</td>
<td>Business Development, Finance and Accounting</td>
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<tr>
<td>Knowledge and Attention</td>
<td>Advocacy</td>
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<tr>
<td>Politics and Power</td>
<td>Leadership and Organizational Culture</td>
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<td>Social Marketing Techniques</td>
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UMass has over 300 Sustainability Related Courses

- New Faculty Fellows program launched:
  - 11 Fellows for 2013/14
  - Partners: E&R + CFT + Library
- Research: $31M Annually
  - Almost $1 in every $4 of total research expenditures.
Sustaining UMass Amherst - Timeline

2004-07
- President Wilson signs ACUPCC (2007)

2008-09
- Interim Chancellor Cole creates Environmental Performance Advisory Committee
- Eco Rep Program launched
- Campus hires first part-time sustainability coordinator
- Green Building Guidelines Published
- Commitment to certify at LEED Silver or better

2010 - 11
- 2010 EPAC publishes campus’s inaugural Climate Action Plan
- 2011 UMass Amherst Achieves STARS Gold Rating – 66 pts
- Permaculture garden begins winning award
- Campus hires full-time sustainability manager

2012
- Campus Sustainability Manager initiates strategic planning process
- EPAC Publishes CAP 2.0
- EPAC restructured to CSC
- Green visibility plan approved and funded
- UMass wins the White House Champions of Change award
- UMass Achieves STARS v1.2 Gold -71 (top 8)
- GHG Scope 1, 2 & 3
- Princeton Review Honor Roll

2013
- Sustainability Communications Manager
- UMass.edu/green website goes live
- Chancellor commits to Real Food Challenge
- Sustainability Innovation & Engagement Fund
- UMass Achieves STARS v1.2 Gold -71 (top 8)
- GHG Scope 1, 2 & 3
- Princeton Review Honor Roll

Town of Amherst Climate Action Plan 2005
Sustainability Organization

Executive Team

Chancellor’s Sustainability Committee

Executive Director, Residential Life - Eddie Hull

Executive Director, Auxiliary Enterprises - Ken Toong

Director, Physical Plant - Ray Jackson

Director, Design & Construction Management - Tom Shaw

Budget Director - Andy Mangels

Dean, College of Natural Sciences - Steve Goodwin

Rotating Dean Seat - Christine McCormick

Faculty Senate Rep - Stephen Schreiber

Director, Campus Planning - Dennis Swinford

UMASS AMHERST
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Applying GIS Tools to Sustainability Challenges

ESRI City Engine
ArcGIS Desktop
ArcGIS Online Geocoding Service
ArcGIS Online Routing Services
ArcGIS Online Web-Services
FME workbench
ArcGIS Online Web-Services

Create an integrative map that locates campus sustainability efforts and features
Campus Sustainability Explorer
Campus Energy Benchmarking Explorer
Campus Energy Benchmarking Explorer

ArcGIS Online Web-Services
FME Workbench

Create an integrative map for tracking and benchmarking energy utilization in buildings
Campus Energy Benchmarking Explorer
Visualizing Building Energy Utilization and Space Allocation

ESRI City Engine
FME Workbench

Create a visualization tool for understanding space allocation patterns and energy utilization
Visualizing Building Energy Utilization and Space Allocation
Campus Scope 3 Emissions
Calculating Indirect Emissions (Scope 3)

ArcGIS Online Geocoding Services
ArcGIS Online routing Services
FME Workbench

Create a methodology for calculating Annual Vehicle Miles Traveled and resulting emissions from commuters who park in campus
Calculating Indirect Emissions (Scope 3) - Methodology

UMASS PARKING
- Personnel ID
- Home Address
- Lot Number
- Car Type

UMASS HR
- Personnel ID
- Personnel Type

DATABASE
- Personnel ID
- Personnel Type
- Home Address
- Lot Number
- Car Type

GEODATABASE
- ADDRESS LOCATORS
- PARKING LOT LOCATION

FME
- ArcGIS Online Geocoding Service
- ArcGIS online Routing Services

DATABASE
- Personnel ID
- Personnel Type
- Home Address
- Lot Number
- Car Type
- X,Y HOME
- X,Y PARKING
**Annual VMT**

- **Median Annual VMT:** 4,066 Miles
- **Average Annual VMT:** 5,400 Miles
- **Max Annual VMT:** 36,770 Miles
- **Min Annual VMT:** 22 Miles
- **Total Annual VMT:** 24,179,160 Miles

**Employees**

**Employees' Annual VMT Distribution**
Annual VMT

Median Annual VMT: 303 Miles
Average Ann VMT: 1,877 Miles
Max Ann VMT: 18,253 Miles
Min Ann VMT: 13 Miles
Total Ann VMT: 10,872,154 Miles

Students
35,051,314 Miles = 1,407 times around the Earth
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Decade of Development

At UMass 2010-2010

1. Recreation Center

Completed 2010 - 160,419 gsf. Designed by Sasaki Associates. State of the art recreation facilities with locker rooms, several floors of fitness and weight machines, gymnasium with basketball courts, elevated indoor jogging/walking track and courtside cafe. One of the most popular buildings on campus.
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ACUPCC, AASHE & STARS, Princeton Review, Sierra Club, Mass Recycle
Thank you!

lpavlova@cp.umass.edu