

The National Academies
Workshop on Urban Environmental Sustainability

Moving Towards Sustainable Cities

Mayor Jeremy Harris Ret.
Irvine, California
February 6th, 2006

State of the World Today



The Urban Challenge

We are at a defining moment in history

Global Population



- Approximately half the world's population is now urban
- Urban areas are gaining an estimated 60 million people a year – over a million a week
- Like adding another San Francisco every five days

Urbanization



Most of the increase in urbanization will occur
in less developed countries

Urbanization



Rapid urban growth results in environmental degradation, unemployment, lack of urban services and adequate shelter, and overburdening of infrastructure

Non-Sustainable Urbanization

Poor Energy Policy Creates....

Demand for primary energy in Asia will double every 12 years (world average is 28 years)

- Fossil fuels account for 80% of energy generation, coal accounts for 40%



....Overdependence on Non-renewable Energy

Global Warming



Transportation contributes
a large share of urban air pollution

Global Warming



Global carbon dioxide concentrations in the atmosphere are expected to rise from 350 ppm to over 400 ppm by 2030

Global Warming



- Disrupts weather patterns
- Impacts coastal areas
- Spreads infectious disease
- Affects agricultural production

Water Pollution



Each year roughly 450 cubic kilometers of wastewater are discharged into rivers, streams and lakes

Environmentally-Caused Disease



High population density and poor sanitation, characteristics of urbanization, promote the spread of infectious disease

Role of the Developed World



How can we help the developing world avoid making our mistakes?



How can the developing world improve its standard of living and quality of life without going through the same destructive phase of consumption and waste?₁₃

Path to a Sustainable World



It's clear that for our world to be sustainable, we have to concentrate on building sustainable cities

Future Urbanization



- Most of the urbanization that will exist in 2030 has not yet occurred. The urban pop. of developing nations will double by 2030 at which time...

60% of the world's people will be urbanites

City's Footprint

Goes well beyond city boundaries



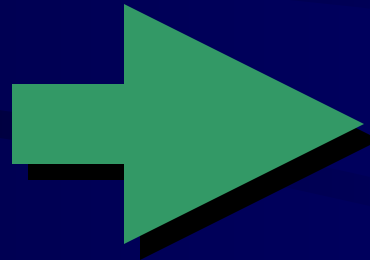
Watersheds, air-basins, drainage basins, resource base.
Regional approach needed. Multi-jurisdictional.

Changing The Paradigm

Users Not Consumers



Growing consumption
& waste generation



Minimize consumption
conservation & reuse

Path to a Sustainable World

Leapfrog – Paradigm & Technology



Leadership
Development



Technical
Resources



Financing

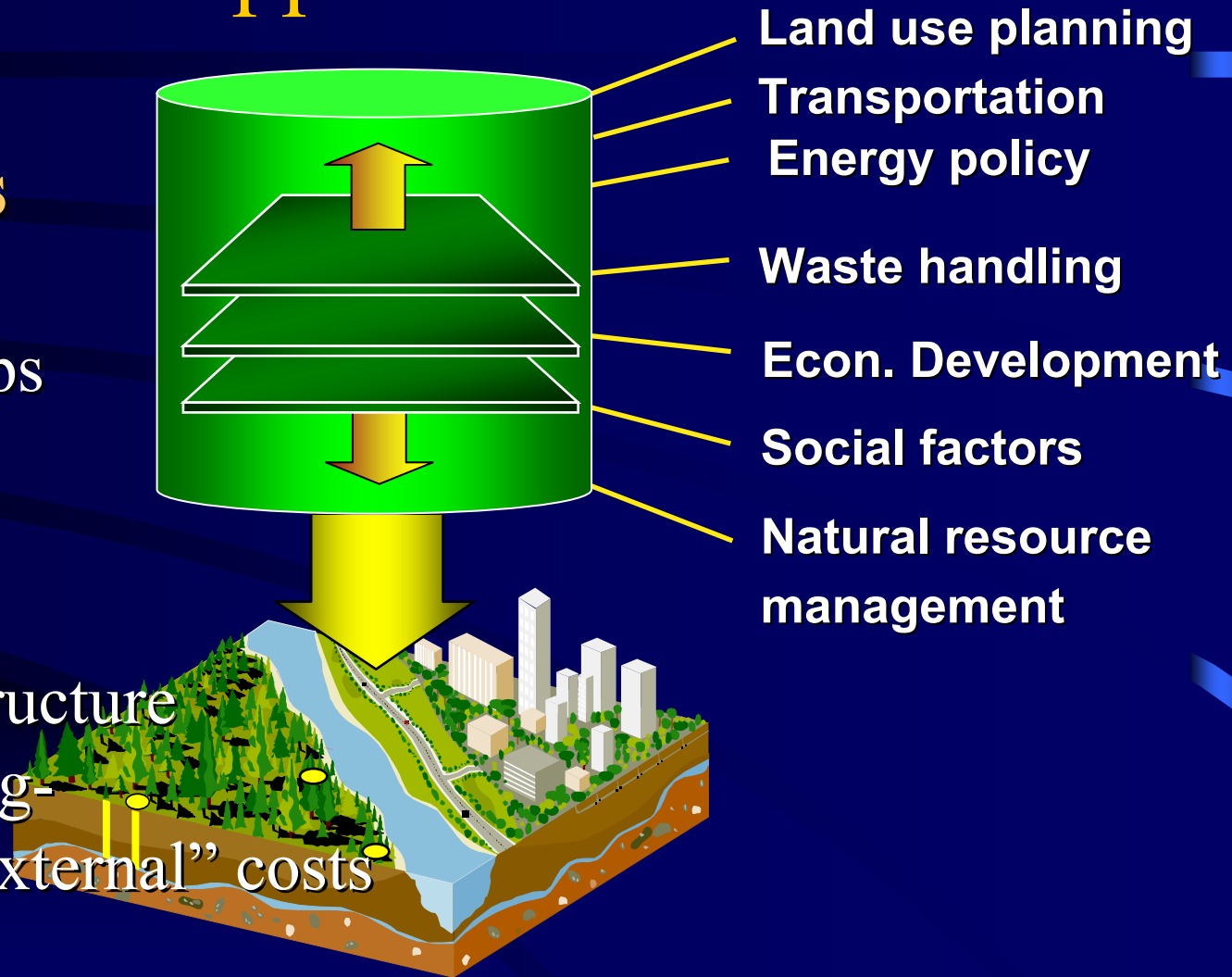
We have to provide cities with assistance in best practices to leapfrog the past mistakes of industrialization

The Sustainable City

A Systems Approach

Key Concepts

- Understanding interrelationships
- Enterprise-wide approach
- End stovepipe management structure
- Lifecycle costing-
Internalizing “external” costs



The Sustainable City

Good Environmental Policy

is

Good Economic Policy

Mayors' Asia-Pacific Environmental Summit

1. Mayors Confront Urban Realities



- Wastewater treatment
- Solid waste management
- Air and water pollution
- Energy consumption
- Urban and regional planning

The MAPES Process – An Overview

2. Share Information and Best Practices



The MAPES Process – An Overview

3. Engage in Capacity Building



The MAPES Process – An Overview

4. Form Regional Partnerships



The MAPES Process – An Overview

5. Commitments to Sustainable Practices



Asia Pacific Urban Institute

Meeting the Commitment



Capacity
Building



Training



Technology
Transfer

Commitment – Iloilo City, Philippines



- Completion of Iloilo River Development Master Plan
- Ordinance established to protect coastal fishery
- Executive order to comprehensively upgrade the city's drainage system

Commitment – Hue, Vietnam

In response to extensive flooding and deforestation ...



- Established legal framework for forest protection and management
- More than 7 million trees planted in eight provinces

Commitment – Likiep Atoll Marshall Islands

Allocated 85 percent of its national assistance funds to:

- solar energy
- potable water
- establish marine reserve



Commitment – American Samoa



Reduce per capita electricity and water consumption by 10%

Commitment – Hanoi, Vietnam



- New waste facilities
- Industrial waste landfill
- Central city drainage system

Commitment – Vadodara, India



Increased sewage treatment capacity from 25 to 100%

Commitment – Ahmedabad, India



- City to meet its 2001 commitment target of 100 percent waste water treated by 2004
- Currently pursuing commitment to improve the quality of life of slum dwellers

Commitment – Nonthaburi, Thailand



- Recycling and composting programs reduced solid waste by 21 percent in less than two years

Commitment – Honolulu



- Invest \$1 billion in wastewater upgrades
- Increase wastewater recycling to 10 MGD
- Begin construction of Bus Rapid Transit

Urban Alliances: Key to a Global Sustainable Future



Cities – the Sustainable Prescription

Land Use

Sustainability Principles

Build Cities for People Not Cars



Cities – the Sustainable Prescription

Land Use

Sustainability Principles

Utilize “Smart Growth” Design



Cities – the Sustainable Prescription

Land Use

Sustainability Principles

Preserve Ag Land & Open Space



Cities – the Sustainable Prescription

Land Use

Sustainability Principles

Utilize Good Urban Design



Land Use



Curbing Urban Sprawl

Car First Priority - A Failed Paradigm



Land use should drive transportation, instead of allowing transportation to drive land use.

Sustainable Community Plans

KO'OLAU LOA SUSTAINABLE COMMUNITIES PLAN



DEPARTMENT OF PLANNING AND PERMITTING
CITY AND COUNTY OF HONOLULU

DECEMBER 1999

NORTH SHORE SUSTAINABLE COMMUNITIES PLAN

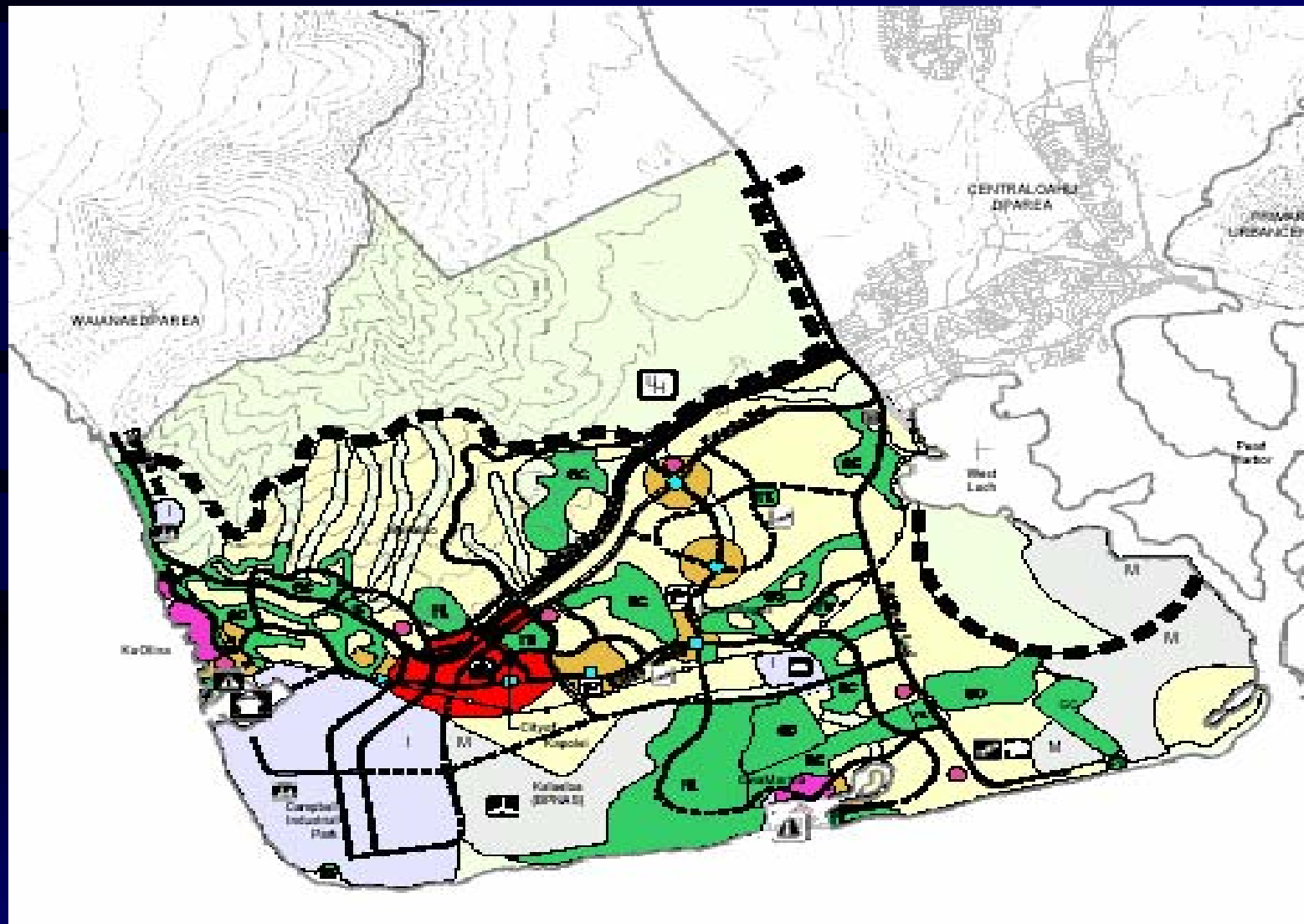


DEPARTMENT OF PLANNING AND PERMITTING
CITY AND COUNTY OF HONOLULU

JULY 2000



Urban Growth Boundaries



Sustainable Design
Smart Growth

Town-Centered
Development



Sustainable Design
Smart Growth

Pedestrian Friendly



Sustainable Design
Smart Growth

Livable Communities



Sustainable Design
Smart Growth

Mixed Residential,
Retail & Commercial



Sustainable Design
Smart Growth

Sense of Place



Curitiba – Preserving City Greenspace



Curitiba – Sound Environmental Planning



Sustainable Planning Urban Design



Sustainable Planning Urban Design



Sustainable Planning Urban Design



Sustainable Planning Urban Design



Cities – the Sustainable Prescription

Transportation

Sustainable Principles

Reduce Transportation Demand



Cities – the Sustainable Prescription

Transportation

Sustainable Principles

Shift From Autos To Public Transit



Cities – the Sustainable Prescription

Transportation

Sustainable Principles

Shift To Renewable Energy



Growth Policies Gone Wrong



Needed – A Systems Approach

Car First Priority - A Failed Paradigm



Cities must reduce demand thru land use changes & other methods, not just replace transportation technology.

Technology – Honolulu Web Site

www.co.honolulu.hi.us



13 million hits per month – 16,000 Web pages

Best Transit System

Smart Bus Technology

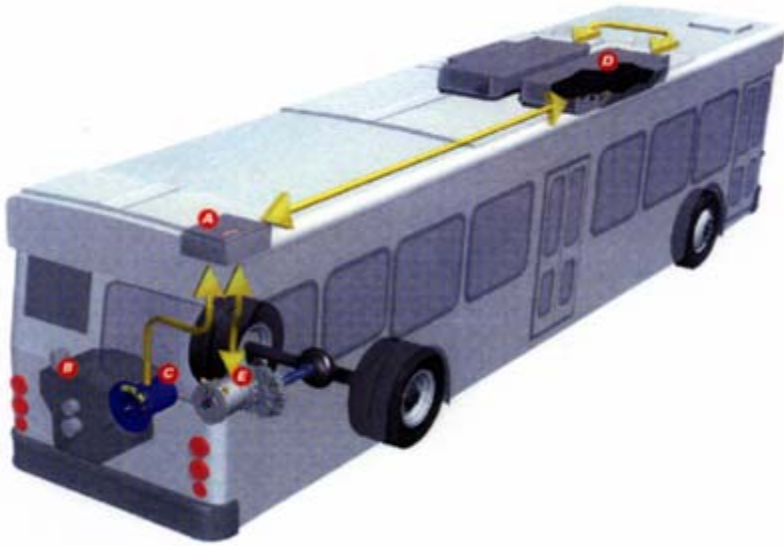


Curitiba – Quest for Sustainable Transit





The Honolulu Experience

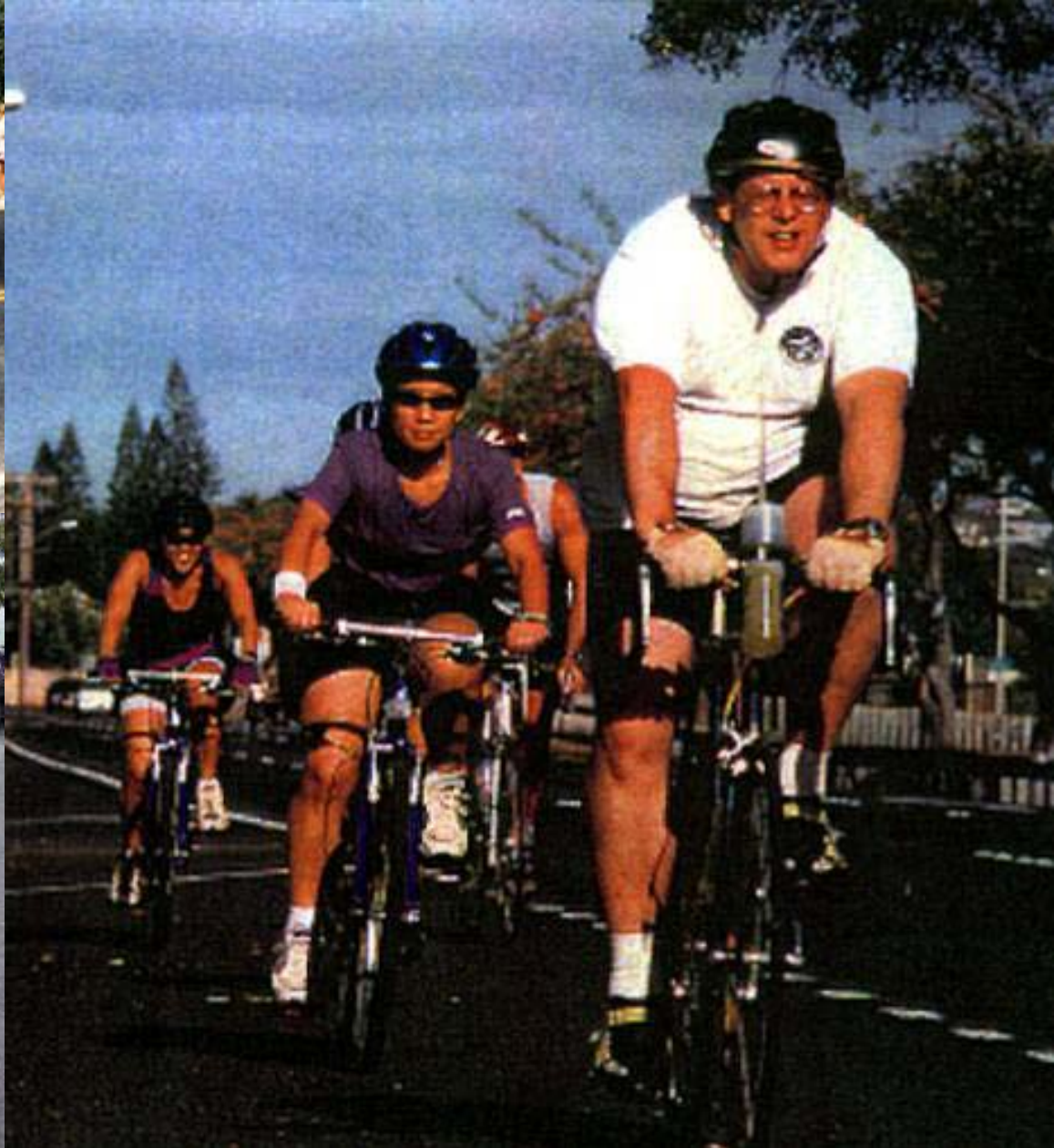


Hybrid Electric Buses

Sustainable Planning



Honolulu's Bus Rapid Transit: New Hybrid Electric Buses



Cycling – Multi-Modal Approach

New Technology

Smart Bus Technology – Emergency Services

Global Positioning Systems





Fuel Cell Technology- Urban Purchasing Consortiums ?

Cities – the Sustainable Prescription

Energy

Sustainability Principles

Energy Efficiency/Reduce Demand



Cities – the Sustainable Prescription

Energy

Sustainability Principles

Distributed Energy Systems



Cities – the Sustainable Prescription

Energy

Sustainability Principles

Renewable Energy Resources

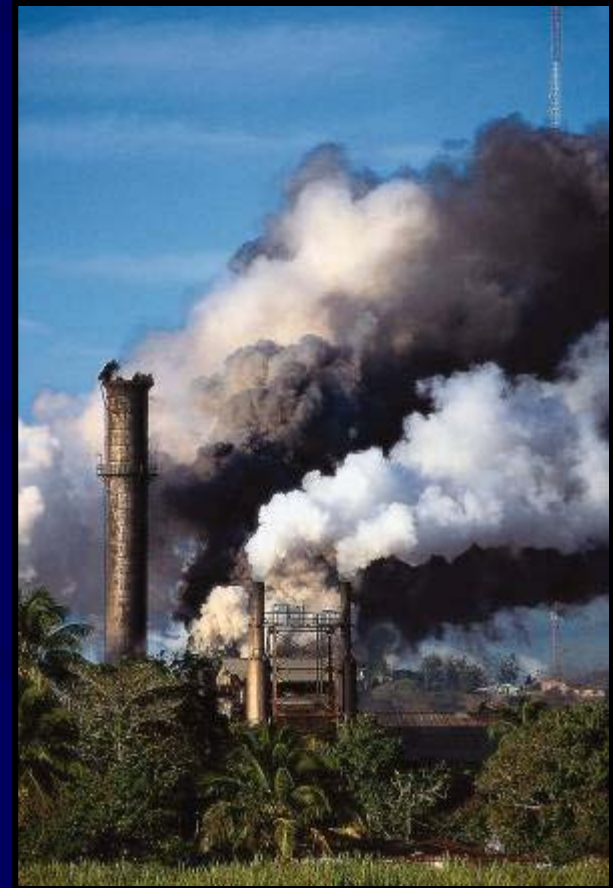


What Needs To Be Done?

Emissions



Kyoto Protocol - industrial countries must reduce their carbon emissions an average 5.2 percent below 1990 levels



Cities Can Lead the Way

Energy Efficiency Upgrades



City Hall



Kaneohe District Park



Kaneohe Police Station

The Honolulu Experience



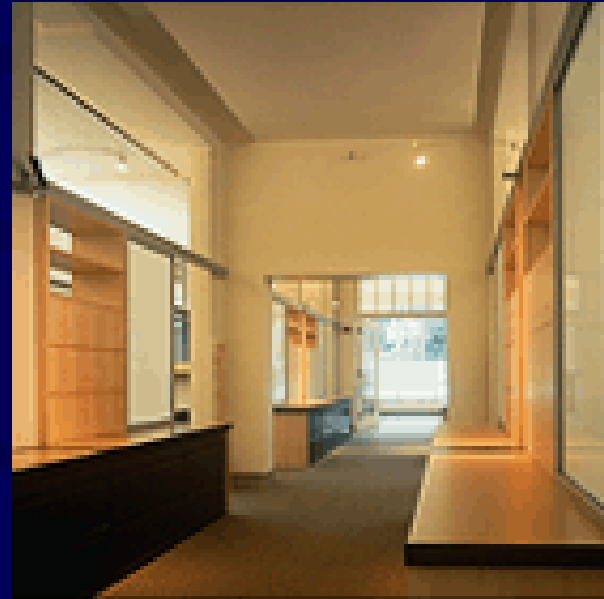
Replacement of traffic lights with light-emitting diodes saves \$250,000 annually

City Energy Code



Over \$300 million projected savings

Green Building Standards



City partnership with UH School of Architecture and Rebuild America to establish standards for all new city construction

The Honolulu Experience

Co-generation



Electrical demand at City Hall cut by 80 percent

The Honolulu Experience

Honolulu Bio-Power Initiative

Powering our wastewater
treatment plants with gas
from waste

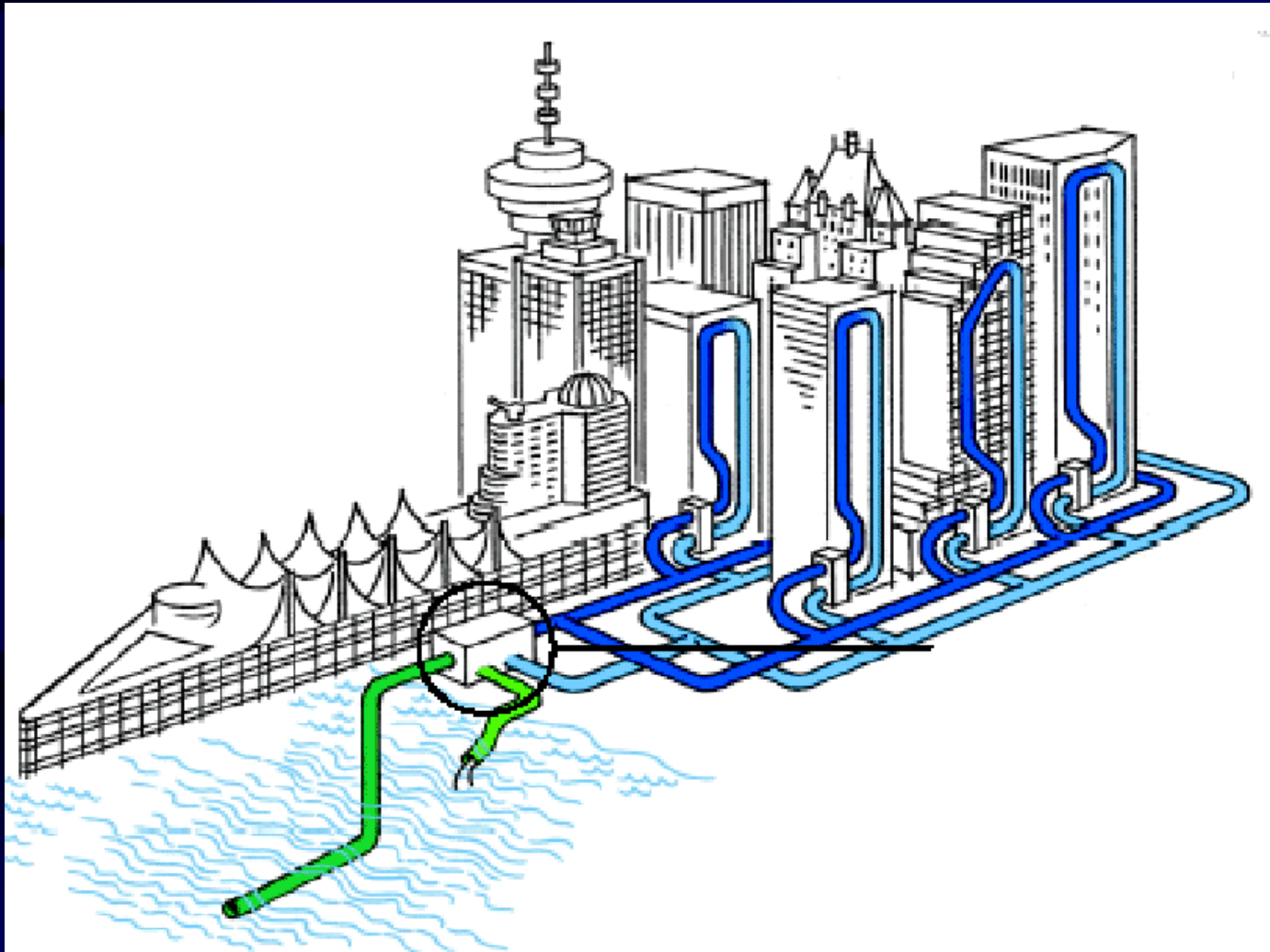


U.S. Department of Energy Partnership



Street light runs on solar and wind power

New Technology – District Cooling



Environmentally sustainable air conditioning

The Honolulu Experience



Homeowners get low-interest loans
to install solar water heating systems

The Honolulu Experience



Renewable Energy – Photovoltaic

The Honolulu Experience

Green Fleets



Renewable Energy – 1,000 Bio-diesel City Vehicles

Energy – Access Inequality

Invest in
Leapfrog
Technology



About 2.5 billion people have no access to modern energy services

Cities – the Sustainable Prescription

Solid Waste Management

Sustainability Principles

Demand-Side Management



Cities – the Sustainable Prescription

Solid Waste Management

Sustainability Principles

Recycle – Users Not Consumers



Cities – the Sustainable Prescription

Solid Waste Management

Sustainability Principles

Energy Generation



Cities – the Sustainable Prescription

Solid Waste Management

Sustainability Principles

Environmentally Safe Landfills



The Honolulu Experience

Protecting Our Natural Resources

Solid Waste

Sustainable Practices



- Recycling
- Source Separation
 - Plastics
 - Metals

Environmentally Sensitive Practices



Recycling Plastic

Environmentally Sensitive Practices



Recycling Glass

Environmentally Sensitive Practices



Recycling Green Waste

Curitiba – Recycling for Food



The Honolulu Experience

Refuse-Derived Fuel Power Plant

- Converts 2,000 tons of waste per day
- Electric for 40,000 homes
- Reduced imported oil by 12 million barrels



The Future-

Plasma arc technology ?

Sustainable Landfill Management



**Leachate Protection, Energy Generation,
Ash Reuse-Aggregate, Construction Block**

Cities – the Sustainable Prescription

Storm Water Management

Sustainability Principles

Grading Controls



Cities – the Sustainable Prescription

Storm Water Management

Sustainability Principles

Hazardous Chemical Controls



Cities – the Sustainable Prescription

Storm Water Management

Sustainability Principles

System Design & Maintenance



Watershed Protection



Grading Controls – Detention & Retention Ponds

Watershed Protection

Controlling Non-point Source Pollution



Storm-drain maintenance

DFM Storm Drain Maintenance Application - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites History Print

Address <http://gisnet/website/dfmstorm/viewer.htm?Title=DFM%20Storm%20Drain%20Maintenance%20Application> Go Links

The City and County of **Honolulu**
Road Maintenance Division

Contacts
Schedules
Help

STORM DRAIN MAINTENANCE APPLICATION

Map Tools

- Overview On/Off
- Legend / Layers
- Full Extent
- Zoom In
- Zoom Out
- Pan
- Information
- Locate Address
- Clear
- Print Map
- Event History
- Text/TMK Search
- Find Storm Drain
- Reports Page
- Zoom to TMK Zone
- Zone 1
- Zoom to Tile
- R10C23

Map Layers

Refresh Map

Visible Address

- ☒ Grid Index
- ☐ Place Names
- ☒ Storm Drain Points
- ☒ Storm Drain Lines
- ☐ Sewer Manholes
- ☐ Sewer Mains
- ☐ Water Structures
- ☐ Water Mains
- ☒ Streams
- ☒ Water Bodies
- ☒ Streets
- ☐ Golf Courses
- ☒ Building Footprints
- ☒ Parks
- ☒ Parcels
- ☐ Flood Prone Areas
- ☐ Flood
- ☒ True Color Aerials (Honolulu)

City and County of Honolulu - Storm Drain History - Microsoft Internet Explorer

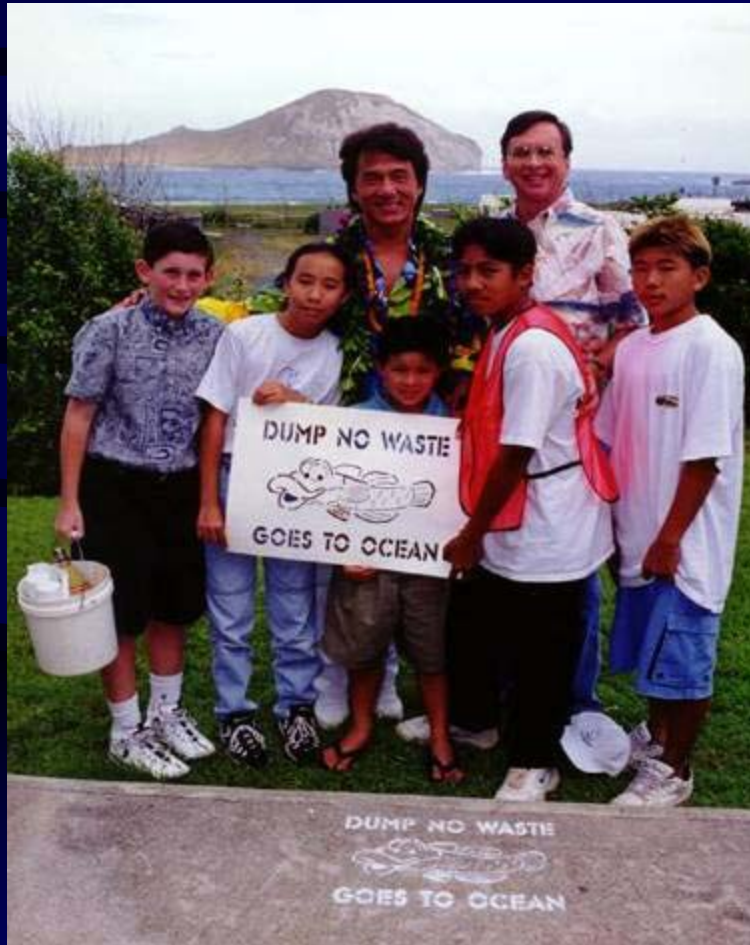


ed by eventid

INSPECTION					CLEANING					
INSPECTOR	STATUS	DEBRIS LEVEL	DATE / TIME		CLEANER	STATUS	START DATE / TIME		FINISH DATE / TIME	
Inspection1	Need to clean	full	10/29/02	9:18:23 AM	Cleaning1	Finished cleaning	10/29/02	10:58:29 AM	10/29/02	10:59:17 AM
Inspection2	Need to clean	three-quarter	6/20/03	9:20:16 AM						

Providing field workers with real-time information 102

Watershed Protection Public Education Programs



Storm-drain maintenance

Watershed Management



Citizen Involvement – Adopt a Stream Programs

Cities – the Sustainable Prescription

Potable Water

Sustainability Principles

Watershed Management



HBWS ArcIMS Application - Microsoft Internet Explorer provided by Honolulu Board Of Water Supply

HONOLULU ONLINE UTILITIES

GIS Home SEARCHES SAVED VIEWS SERVICE INFO DOCUMENTS PRINT/REPORT

Available searches: - AsBuilt - Search By JobNo Enter JobNo: E-04353 search

Welcome, Guest User Thu, June 19, 2003

FileNET Document Tools

To list all related FileNet features click on the button below.

MAP LAYERS

More layers will become available depending on the current map scale

- BWS Water System**
 - ☒ BWS Facilities
 - ☐ Wells (all)
 - ☐ Water Mainlines
- Base Information**
 - ☐ Tile Index
 - ☐ Old Distribution Map Sheets
 - ☒ Hillshade
 - ☒ Coast
- Projects**
- Contours**
 - ☐ Contours - 40 ft.
- Other Utilities**
- Aquifers**
- Political Districts**
- Land Information**
- Roads and Streets**

Expand All Collapse All Layer Information

FileNET Search Results - Microsoft Internet Explorer provided by Honolulu Board Of Water Supply

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003726067	003726					
003726068	003726					

Map showing MAUNAWILI 500 RES and POHAKUPU 272 RES 1, 2 & MAUNAWILI BSTR. POHAKUPU LINE BSTR.

Water Mains is now the Active Layer

Zoom to scale 1: 31984 Go BWS Facilities: - ZOOM TO BWS FACILITY -

Watershed Protection



Cities – the Sustainable Prescription

Potable Water

Sustainability Principles

Demand-Side Management



HBWS ArcIMS Application - Microsoft Internet Explorer provided by Honolulu Board Of Water Supply

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POHAKUPU 272 RES 1, 2 & MAUNAWILI BSTR

POHAKUPU LINE BSTR

MAUNAWILI 500 RES

E-04353

Cities – the Sustainable Prescription

Potable Water

Sustainability Principles

Improved Ag Techniques



HBWS ArcIMS Application - Microsoft Internet Explorer provided by Honolulu Board Of Water Supply

HONOLULU ONLINE UTILITIES

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Map showing POHAKUPU 272 RES 1, 2 & MAUNAWILI BSTR, POHAKUPU LINE BSTR, and MAUNAWILI 500 RES.

Scale: 3492ft

Water Mains is now the Active Layer

Wastewater Recycling



Agricultural irrigation

Cities – the Sustainable Prescription

Potable Water

Sustainability Principles

Water Treatment & Transmission



HBWS ArcIMS Application - Microsoft Internet Explorer provided by Honolulu Board Of Water Supply

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Water Mains is now the Active Layer

Zoom to scale 1: 31984 Go BWS Facilities: - ZOOM TO BWS FACILITY -

The Honolulu Experience

Potable Water Filtration System



New Technology

Electronic Meter Reading



Cities – the Sustainable Prescription

Wastewater Management

Sustainability Principles

Demand-Side Management



Cities – the Sustainable Prescription

Wastewater Management

Sustainability Principles

Independent Collection Systems



Cities – the Sustainable Prescription

Wastewater Management

Sustainability Principles

Recycling of Effluent & Solids

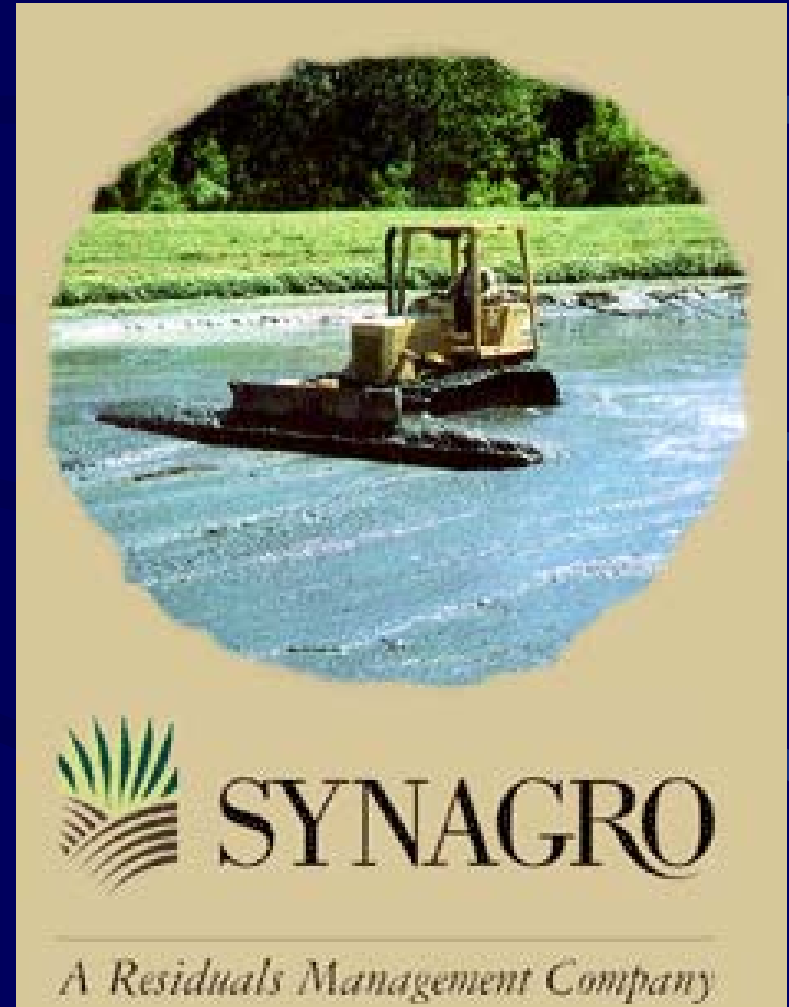


Environmentally-Caused Disease



Estimates suggest that less than 5% of sewage in developing countries is treated before it is discharged into the environment

Conserving Our Natural Resources



The Search for New Technologies

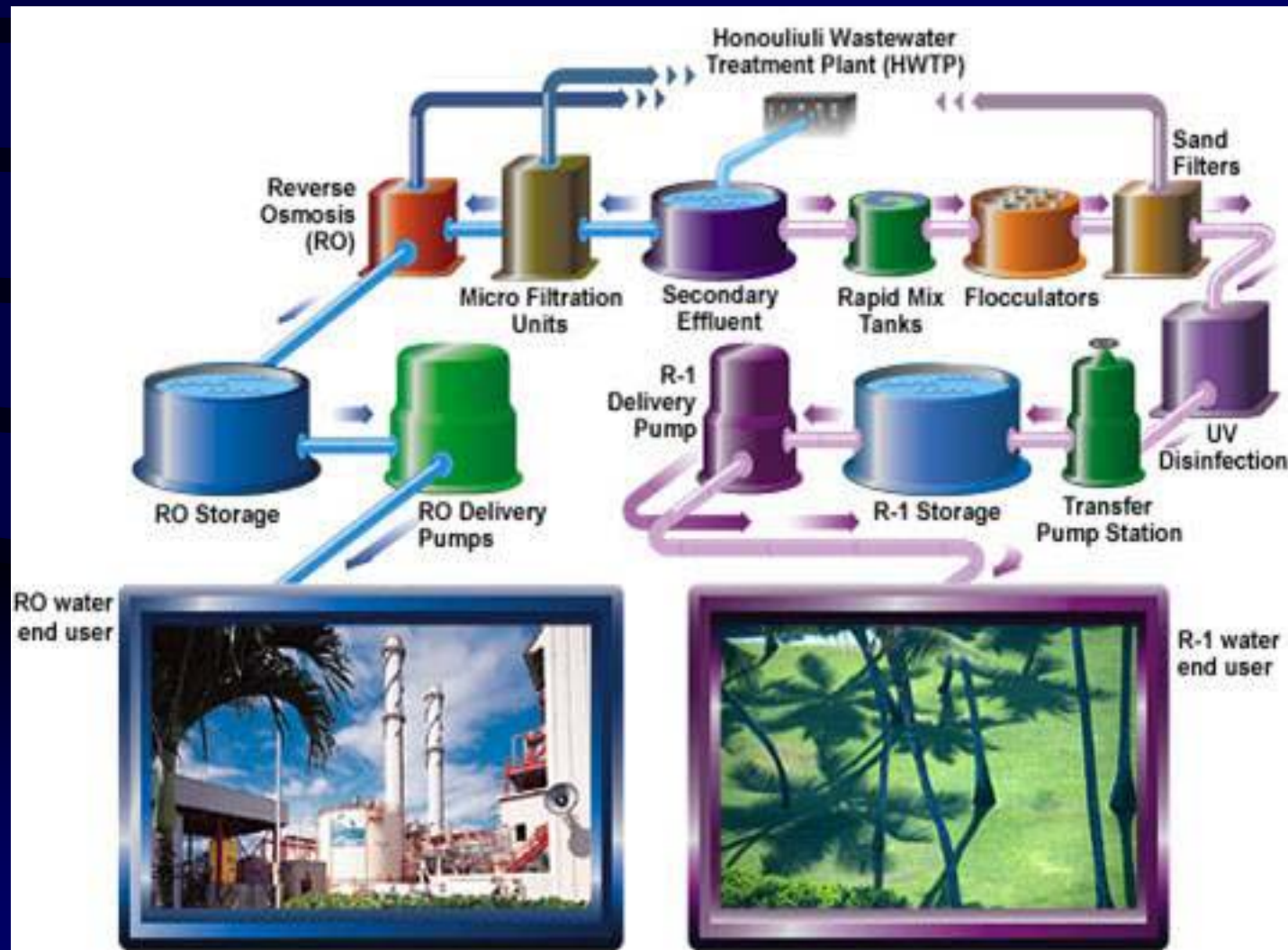
Wastewater Recycling



Membrane technology

The Honolulu Experience

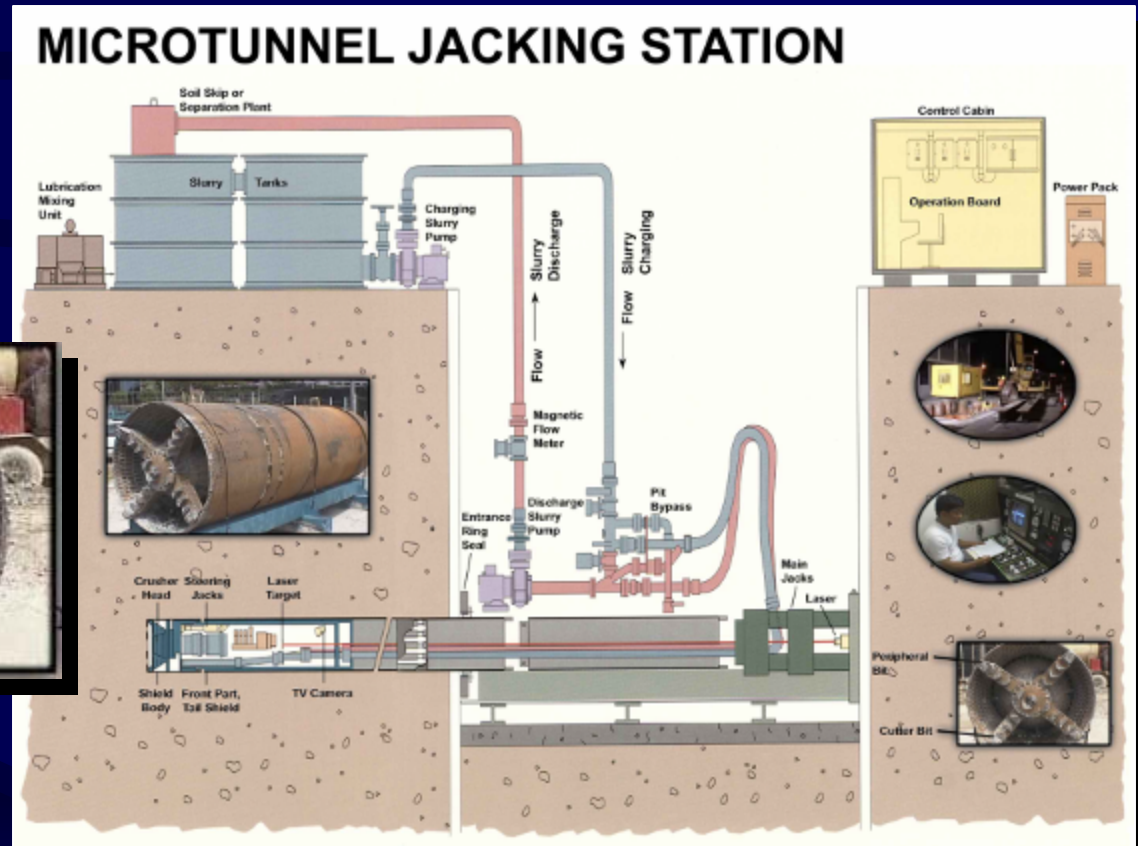
Wastewater Recycling Systems



New Technology – SCADA Monitoring



New Technology – Microtunneling



Nimitz Project – Saved \$6.5 million

✓ Award – One of the top 8 projects in the nation

Cities – the Sustainable Prescription

Natural Resources

Sustainability Principles

Habitat Protection



The Honolulu Experience **Habitat Protection**



Waimea Valley – Partnership with Audubon Society

Cities – the Sustainable Prescription

Natural Resources

Sustainability Principles

Biodiversity Protection



Loss of Habitat and Biodiversity



Hawaii is the “extinction capital” of the world

Cities – the Sustainable Prescription

Financing

Sustainability Principles

Lifecycle Costing

FITCH



Cities – the Sustainable Prescription

Financing

Sustainability Principles

Triple-Net Analysis

FITCH



Cities – the Sustainable Prescription

Financing

Sustainability Principles

Third Party Financing

FITCH



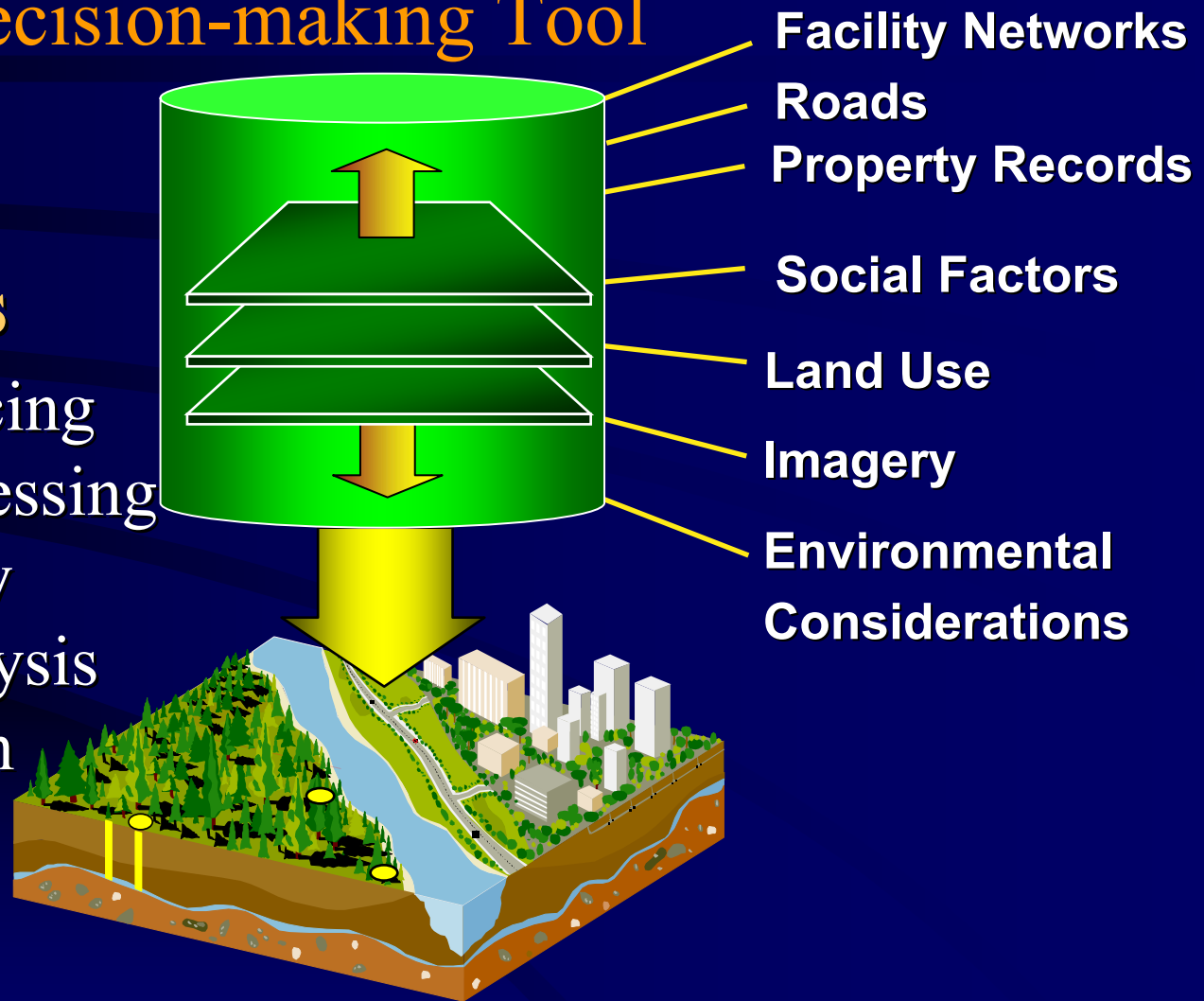
The Honolulu Experience

Enterprise-wide GIS

Integrated Decision-making Tool

Key Concepts

- GeoReferencing
- Digital Processing
- Map Overlay
- Spatial Analysis
- Visualization



Planning for the Future



Tools - GIS

Construction Plans - GIS Virtual 3D data

Windows Media Player

File View Play Tools Help

Non Playing

Query1
Query2
Query3
Query4
Query5
Query6
Query7
Query8






Virtual Honolulu

City Viewer Games Preferences Print Help

Find Media Tools HDH City Info Tourist Info Real Estate Paradise



207m

www.geosim.com

Ready

While touring the city, you can click on buildings, signs, stores etc., for detailed information and complementary visuals. For specific searches, use the menu options. Enjoy...

John F. Kennedy Jr. Harbor St

Map

USI-Hawaii

Pacific Tower

Location

Street: 1001 Bishop Street
Postcode: 96813
Complex: Bishop Square
Neighborhood: Downtown
City: Honolulu
Country: U.S.A.

Technical Data

Floors (DG): 30
Year (est): 1972

Building in General

Type of structure: high-rise building
Style: Modern
Status: completed

Facts

- Bishop Square's two towers have 922,661 sq. ft. of space.
- The Pacific Tower has an interior of poured-in-place ribbed concrete panels. Etched patterns were inspired by traditional Hawaiian designs.

Companies

architect: Chapman, Colquhoun, Deane, Seidman, Inc.
general contractor: Pacific Construction Company, Ltd.
mechanical/electrical/mechanical systems installation: Pacific Mechanical Contractors, Ltd.
mechanical/electrical/mechanical systems installation: Pacific Mechanical Contractors, Ltd.

Nauru Tower - sewer lines

Ala Moana Boulevard
interceptor sewer section 2

Identify Results		
Layers: <Topmost layer>		
LOCATION: 850388.075214 48228.507232		
DATALOAD: SewerMain		
ID: 380027		
Field	Value	
Basin	Sand Island	
Plan Id	0004	
Status	Active	
Owner	City & County of Honolulu	
Material	Cast Iron	
Date Built	11/17/1997	
Date Dig	9/30/1998	
Date Mod	4/16/2004	
Length	190	
SLOPE	0.00253	
Up Invert	-4.0	
Down Invert	-5.08	
Up Man	380395	
Down Man	380403	
File Factor	0.015	
Oil Rating	A	
Water Table	Below Groundwater	
Flow Split	100	
Pipe Shape	Circular	
Rehab		
Height	0	

Building a Model Sustainable City



Economy



Land Use & Agriculture



Transportation

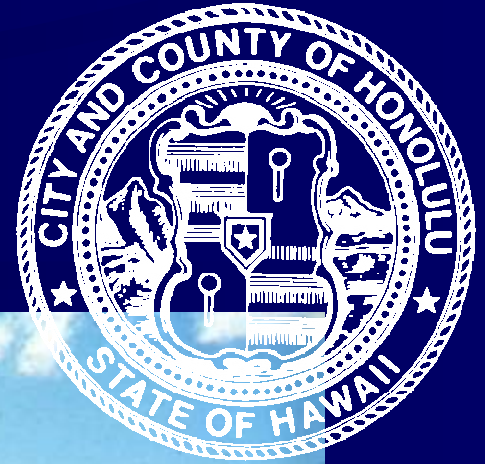


Energy

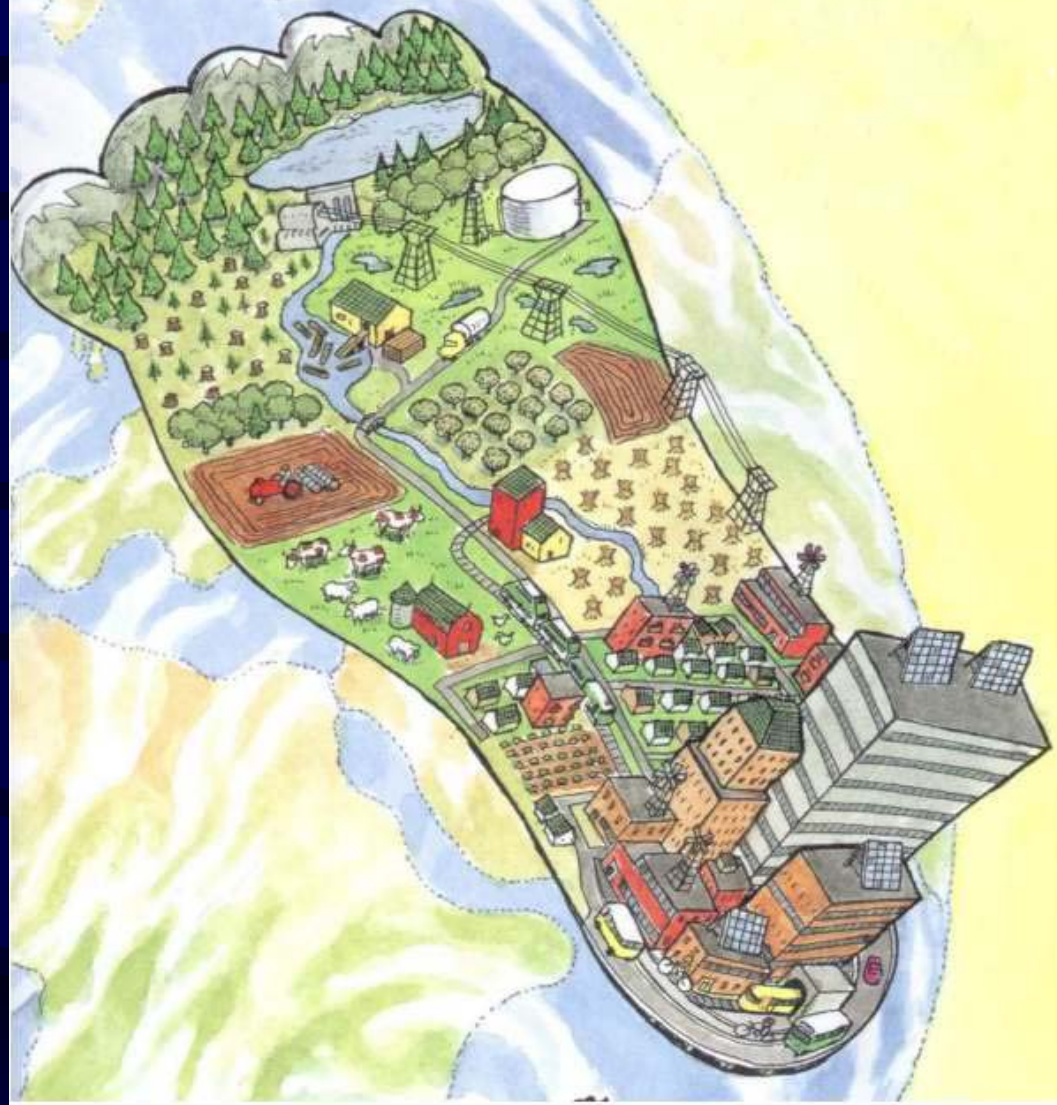


Natural Resources

Mahalo







Time of reckoning – As incomes increase, developing countries are following in the footsteps of the developed world in terms of resource consumption and waste generation

Loss of Habitat and Biodiversity



Hawaii is the “extinction capital” of the world

Urbanization



- The urban pop. of developing nations will double by 2030 at which time...
- 60% of the world's people will be urbanites

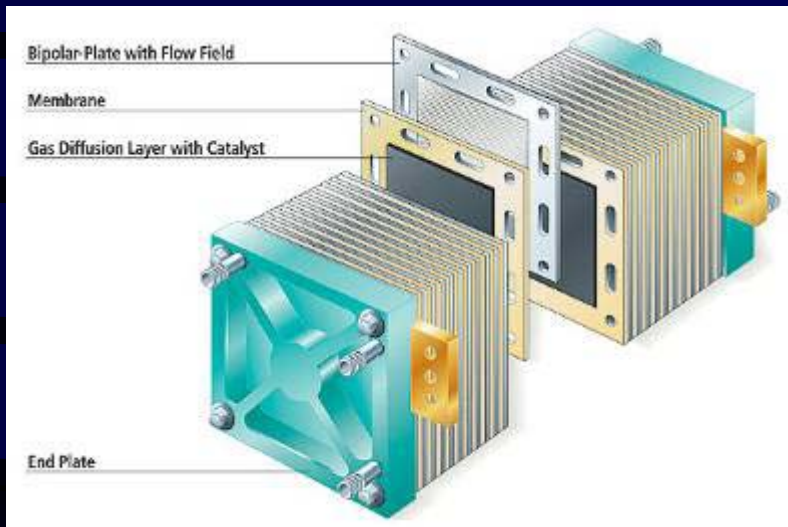
Coastal Zone Destruction



Half of the world's wetlands disappeared in the 20th century

The Honolulu Experience

Hydrogen Power Park



Partnership with:

- Hawaii Natural Energy Institute
- California Energy Commission
- U.S. Department of Energy

The Honolulu Experience

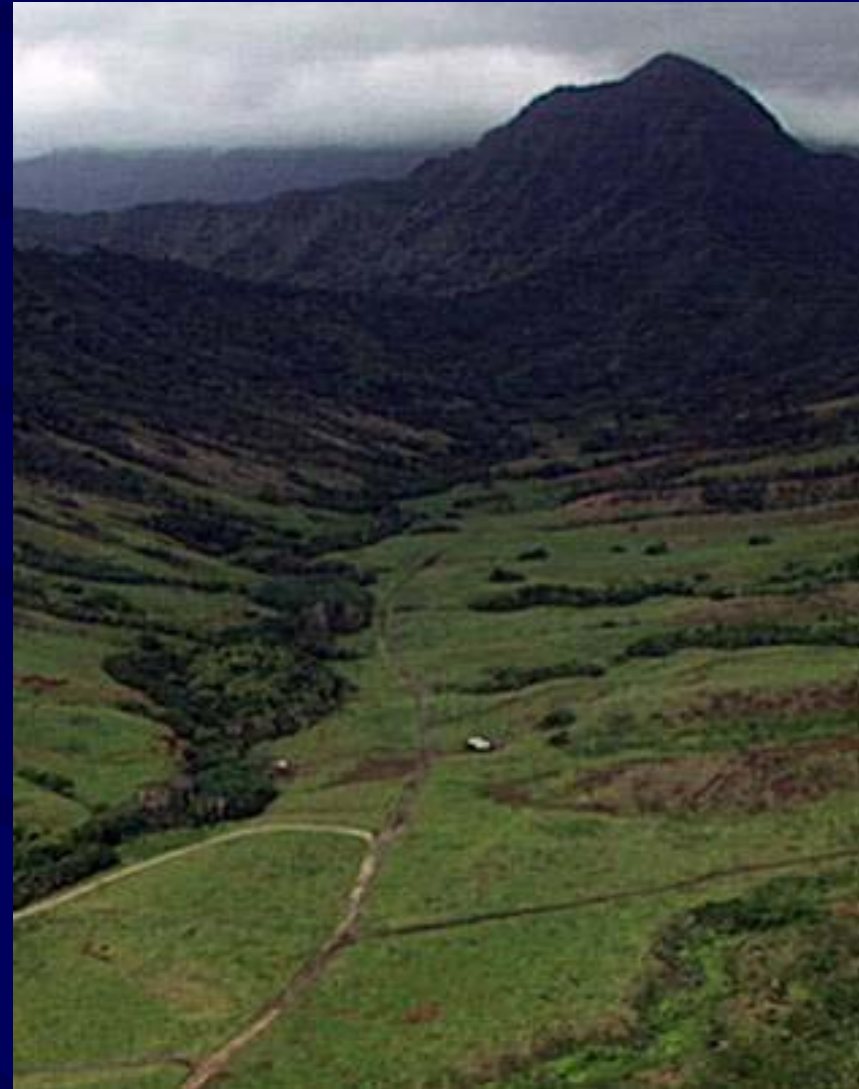
PV Covered Parking Lot



The Honolulu Experience



- Preserve watersheds
- Protect wildlife habitats
- Maintain scenic view plains



Open Space Preservation

Deforestation



- 80% of the forests that originally covered the Earth have been cleared
- 36 million acres are destroyed each year

Environmentally-Caused Disease



Smoky indoor air from cooking and heating contributes to respiratory diseases that kill 4 million a year – mostly children under 5

Desertification



Desertification threatens the livelihood
of over 1 billion people in more than 110 countries

Loss of Biodiversity



More than 11,000 species of animals and plants are known to be threatened with extinction – a rate unmatched for 65 million years

Making Our Cities Sustainable



Modeled after natural ecosystems

High productivity

All nutrients recycled/reused

All components interconnected into stable system

Planning that integrates land use, transportation, energy,
natural resource and economic components

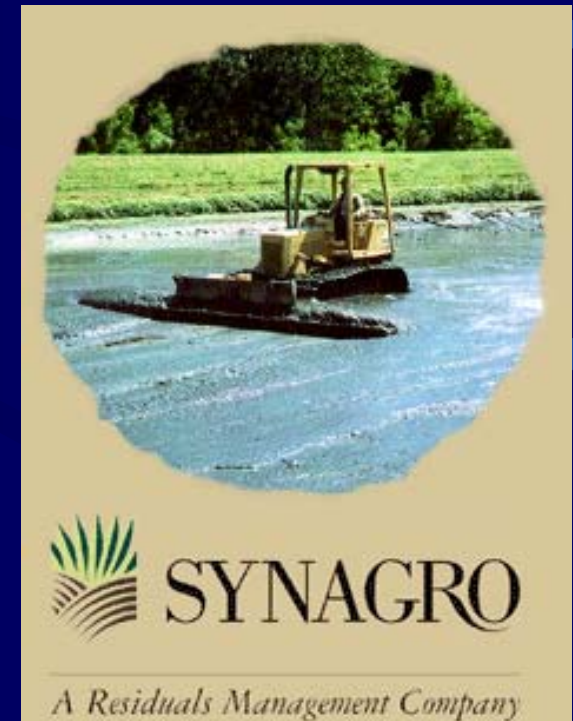
Loss of Habitat and Biodiversity



Hawaii is the “extinction capitol” of the world

Best City for the Use of Technology in Delivering Government Services

Awarded by the Center for Digital
Government – Second Year in a Row



Cities – the Sustainable Prescription

6. Economy



The Honolulu Experience



Sustainable Tourism Eco-Tourism



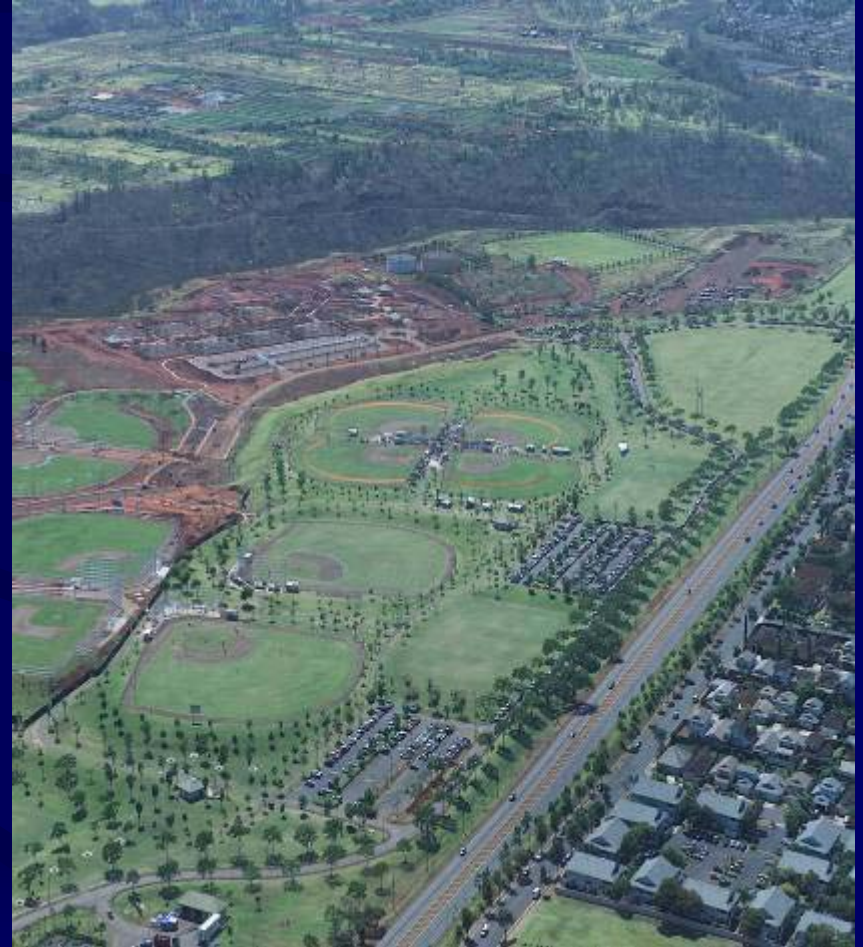
Hanauma Bay Marine Education Center

Sustainable Tourism – Waikiki



The Honolulu Experience

Sustainable Tourism – Sports Tourism



Waipio Soccer Complex and Central Oahu Regional Park

The Honolulu Experience

Knowledge-Based Industries



Asia-Pacific Urban Institute

Role of the Developed World



Until now the approach has been:
“Do as we say, not as we do.”



Natural Resource Policies Gone Wrong

Cities – the Sustainable Prescription

Economic Development

Sustainability Principles

Primary Industry - Reuse



Cities – the Sustainable Prescription

Economic Development

Sustainability Principles

Manufacturing-Natural Debt Free



Cities – the Sustainable Prescription

Economic Development

Sustainability Principles

Service/Tourism-Grow Resources



The Honolulu Experience

Unsustainable Tourism



Neglect of Native Culture

Curitiba – Honoring Culture & History

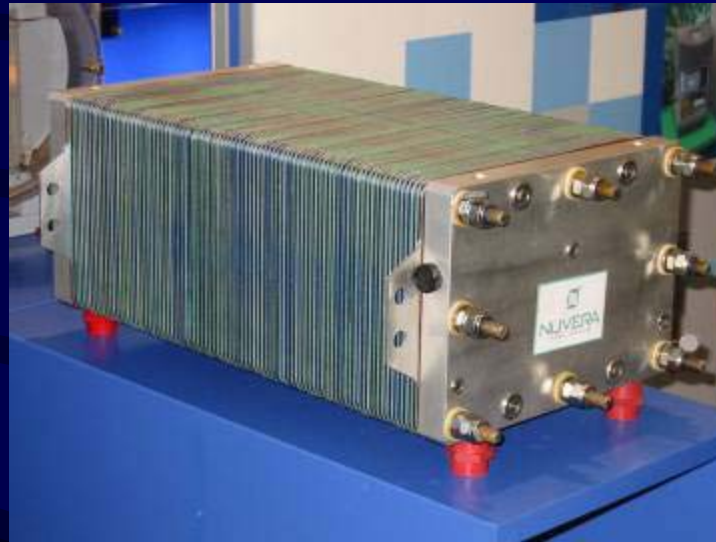


The Honolulu Experience

Fuel Cell

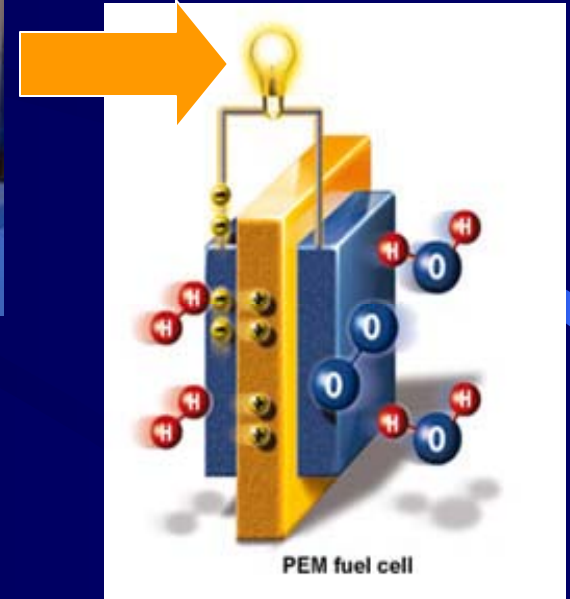
H_2 →

O_2 →
(Air)



Hot Water

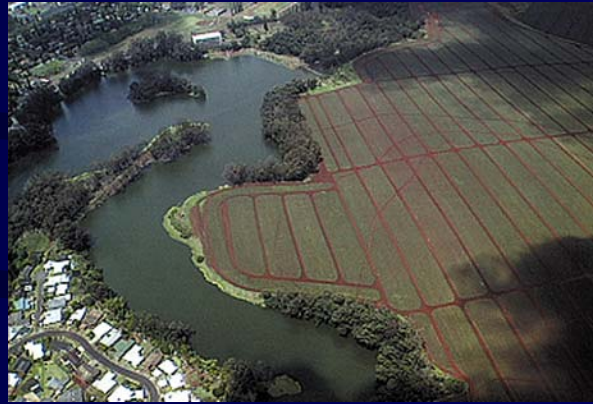
Power



Building Sustainable Cities In Partnership



Economy



Land Use & Agriculture



Transportation



Energy



Natural Resources

Non-Point Source Pollution



- 3 billion people live within 200 kilometers of a coastline
- By 2025 that figure is likely to double