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

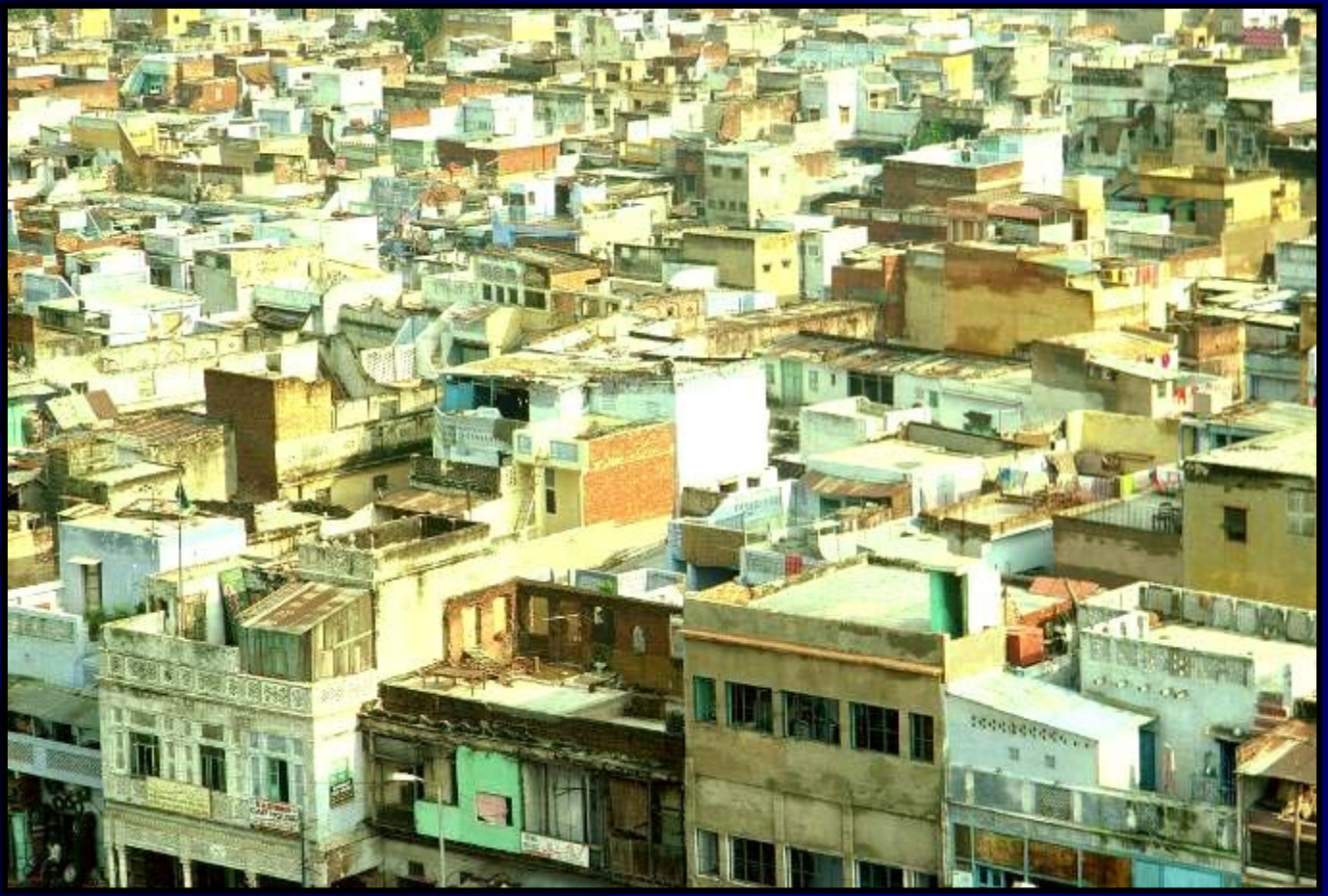
We are at a defining moment in history

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

Source: Peopleandplanet.net

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%

….Overdependance 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

Source: Peopleandplanet.net

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

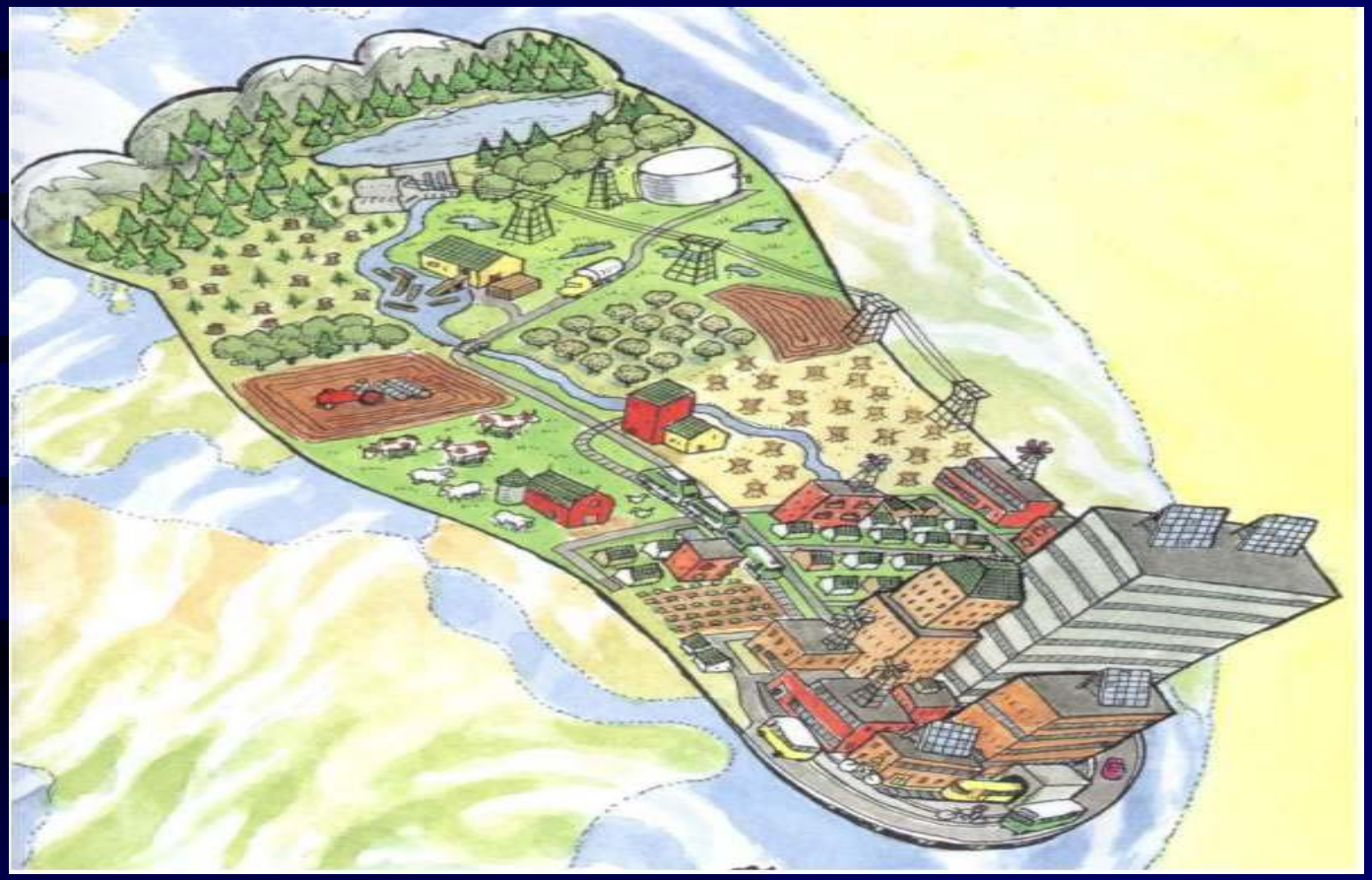
• Most of the urbanization that will exist in 2030 has not yet occurred. The urban pop. of developing nations will double by 2030 at which time…

60% of the world's people will be urbanites

Source: York Times Almanac 2004

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

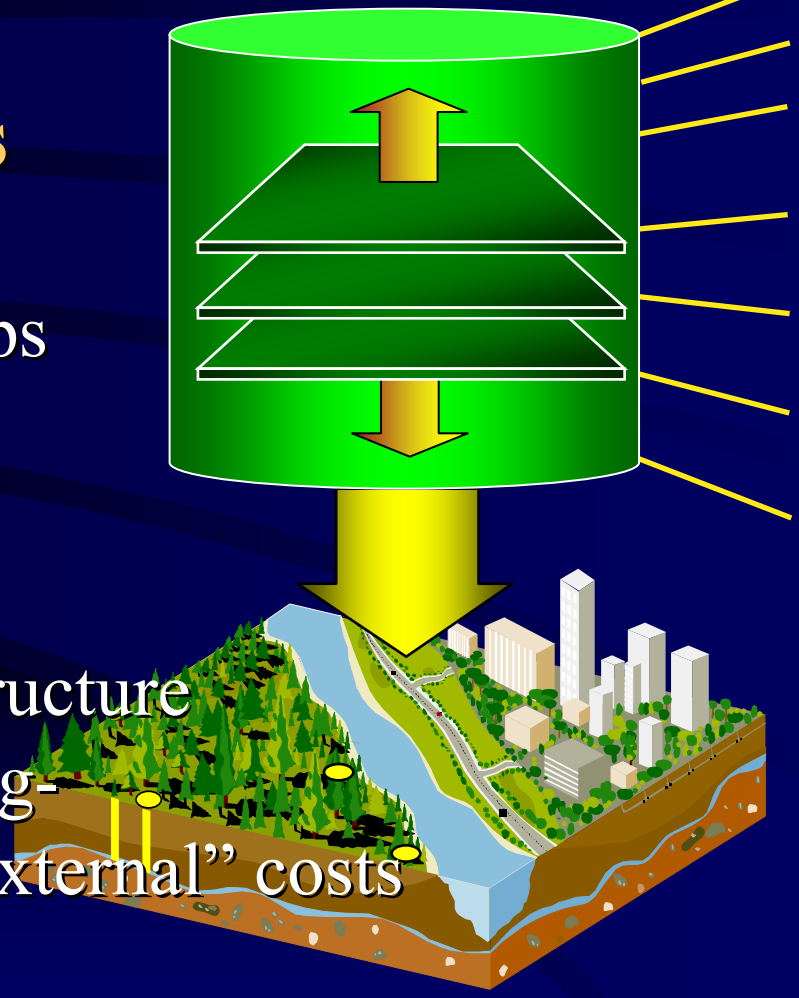
We have to provide cities with assistance in best practices to leapfrog the past mistakes of industrialization

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

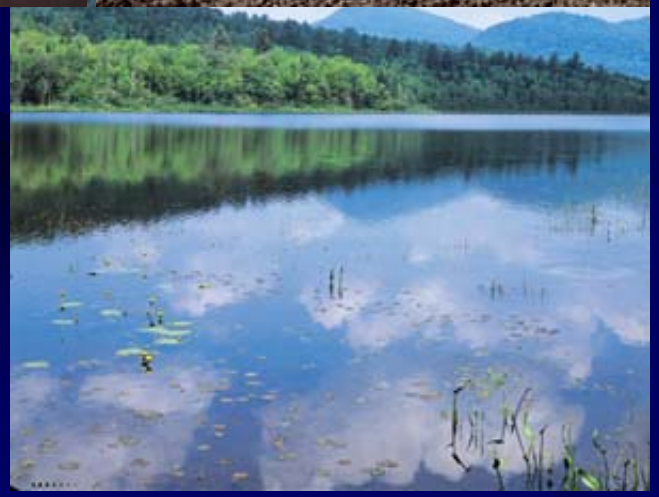
Mayors' Asia-Pacific Environmental Summit

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

Land Use

Sustainability Principles

Build Cities for People Not Cars

Land Use

Sustainability Principles

Utilize "Smart Growth" Design

Land Use

Sustainability Principles

Preserve Ag Land & Open Space

Land Use

Sustainability Principles

Utilize Good Urban Design

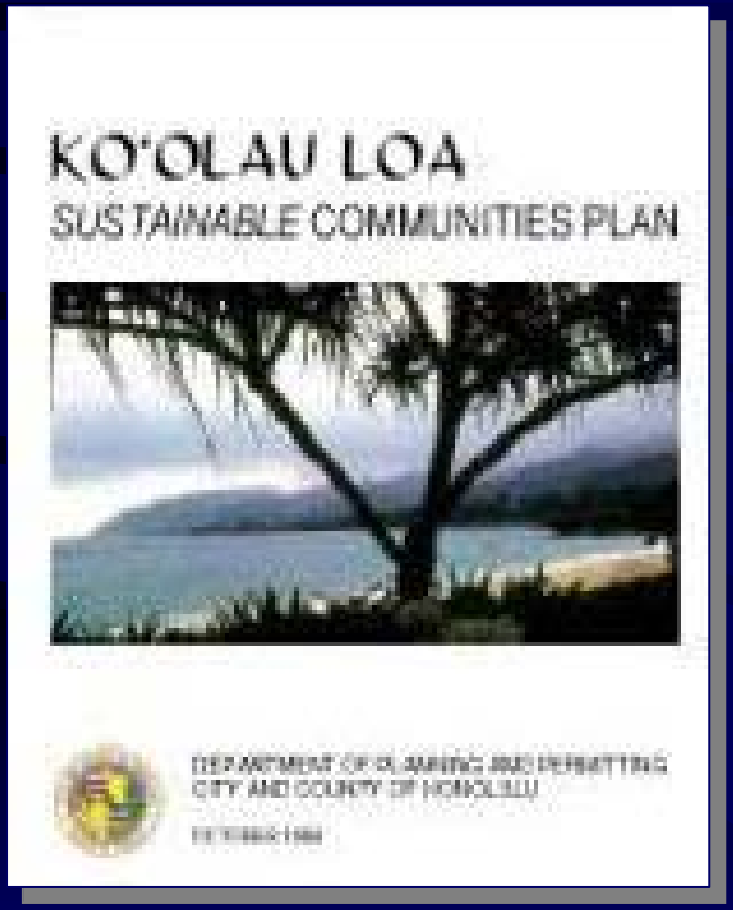
Land Use

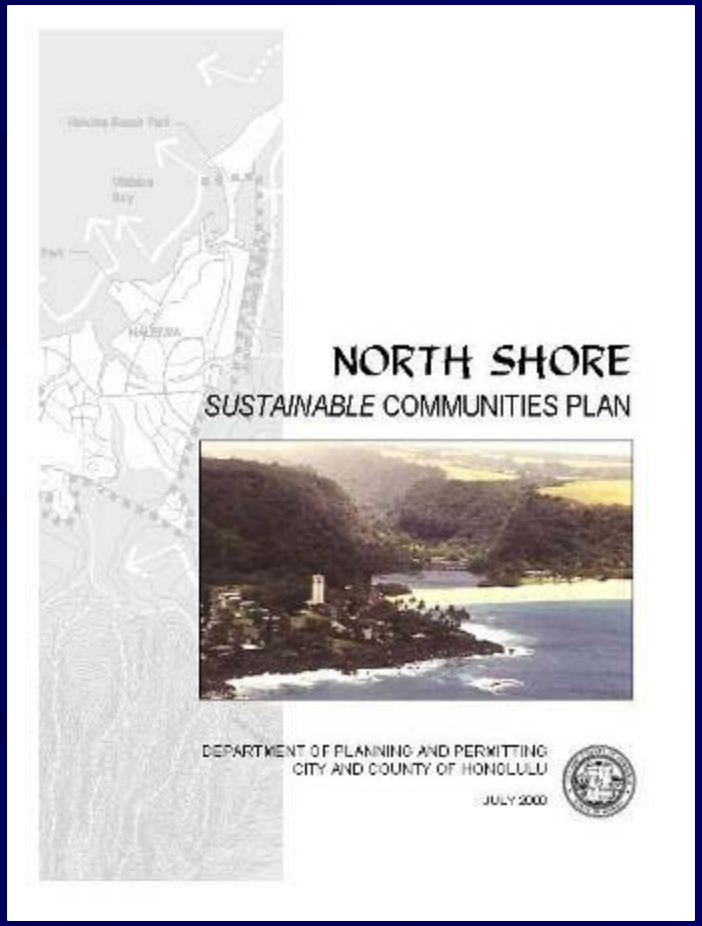
Curbing Urban Sprawl

Car First Priority - A Failed Paradigm

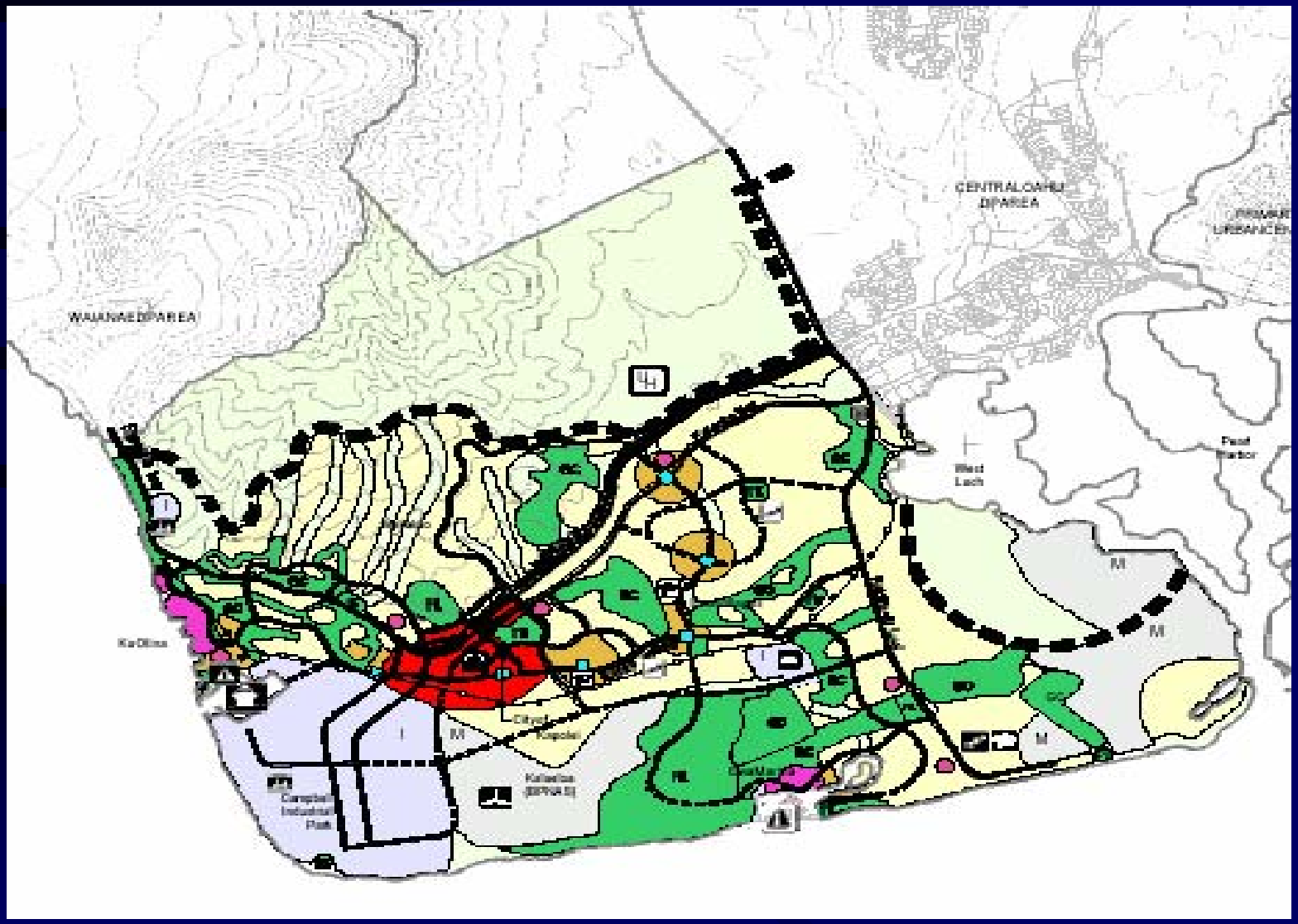
Land use should drive transportation, instead of allowing transportation to drive land use.

Sustainable Community Plans





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

Transportation

Sustainable Principles

Reduce Transportation Demand

Transportation

Sustainable Principles

Shift From Autos To Public Transit

Cities – the Sustainable Prescription

Transportation

Sustainable Principles

Shift To Renewable Energy

Growth Policies Gone Wrong

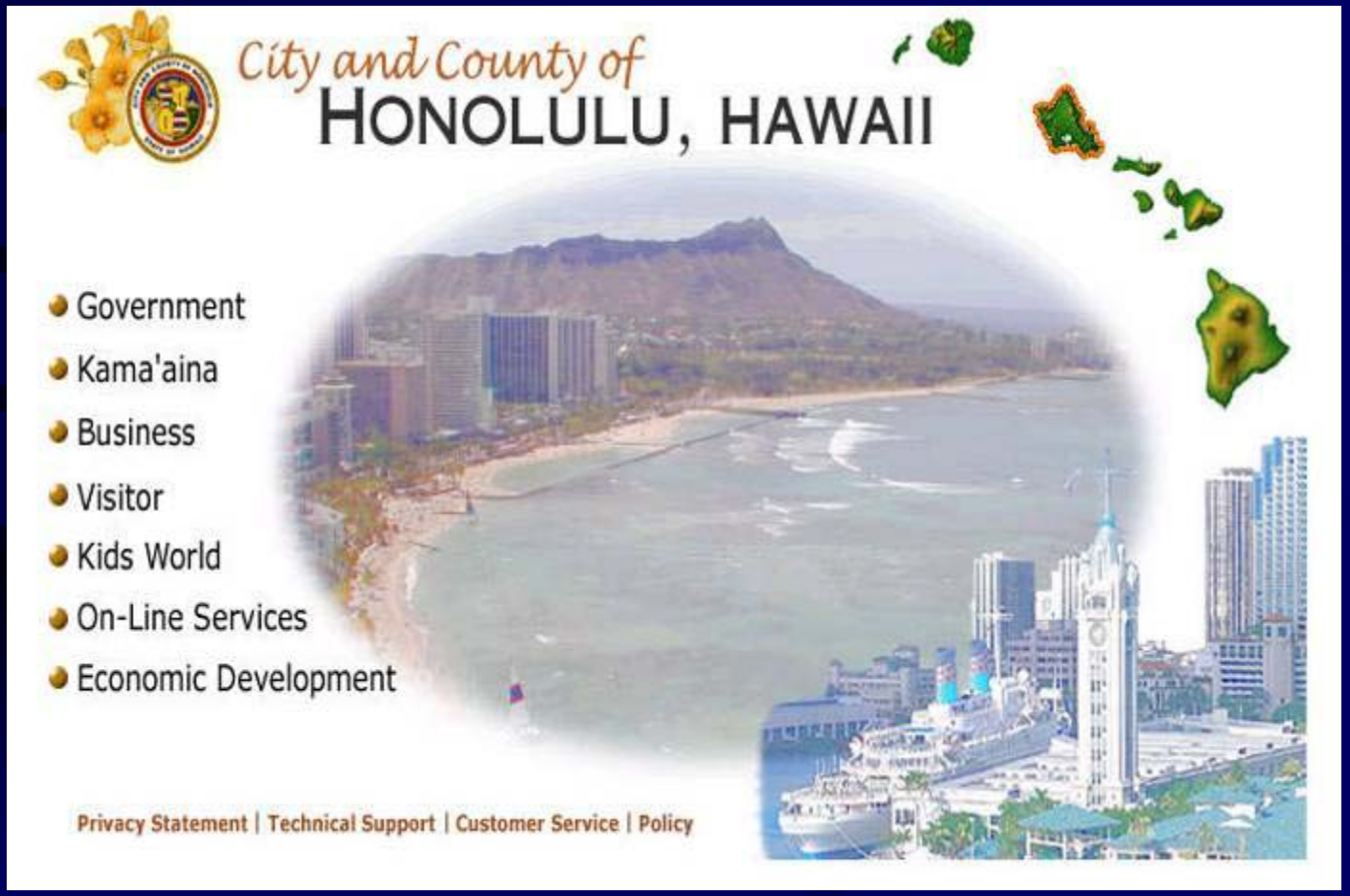
Needed – A Systems Approach

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

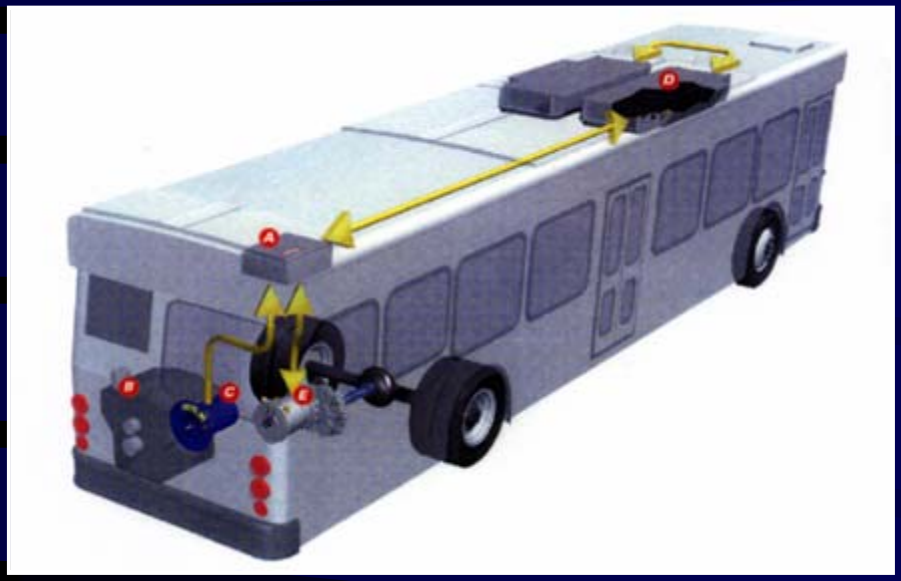


13 million hits per month – 16,000 Web pages

Best Transit System
Smart Bus Technology

Curitiba – Quest for Sustainable Transit

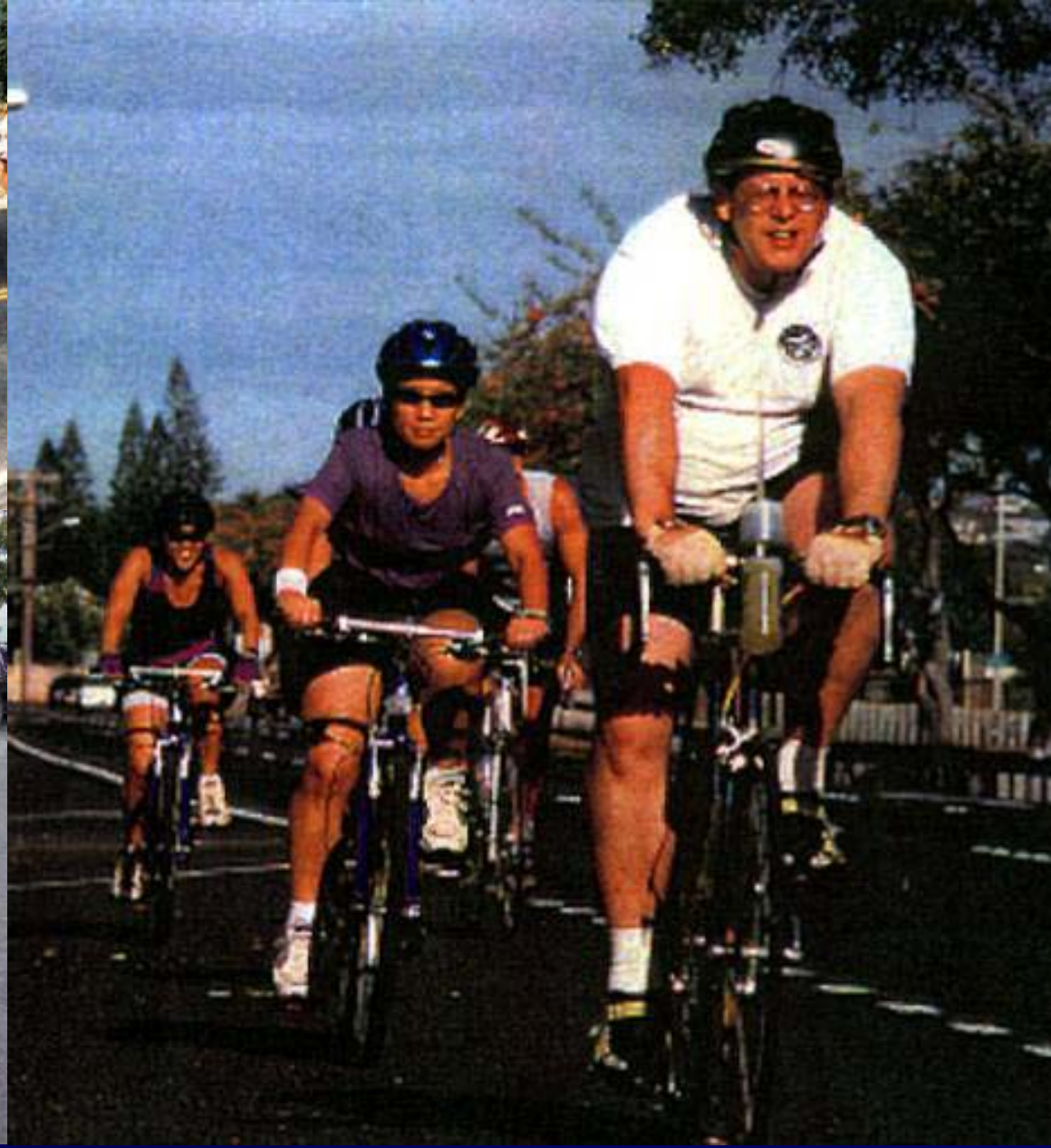
The Honolulu Experience



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

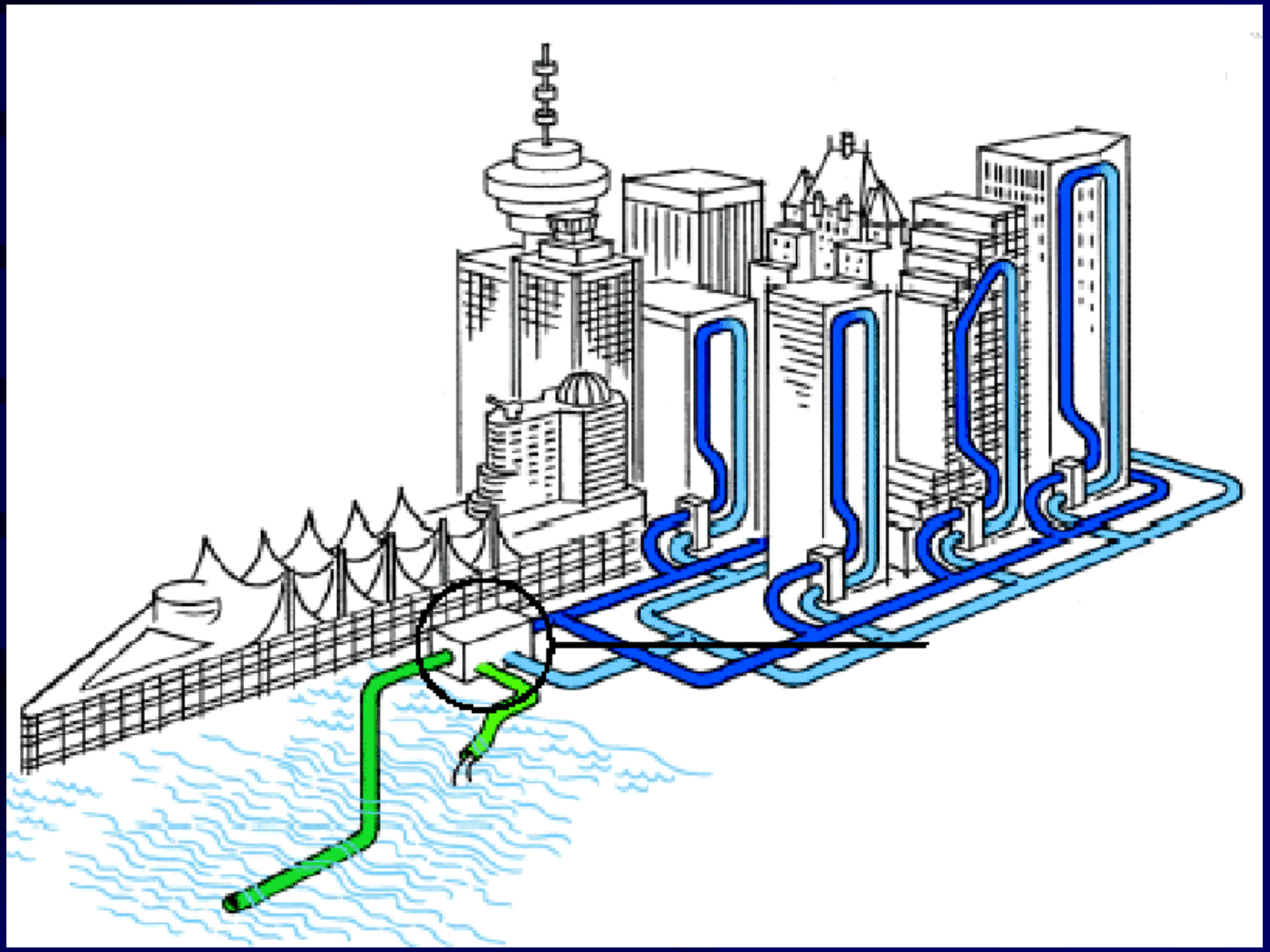
Honolulu Bio-Power Initiative

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

Source: Time Almanac 2004

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

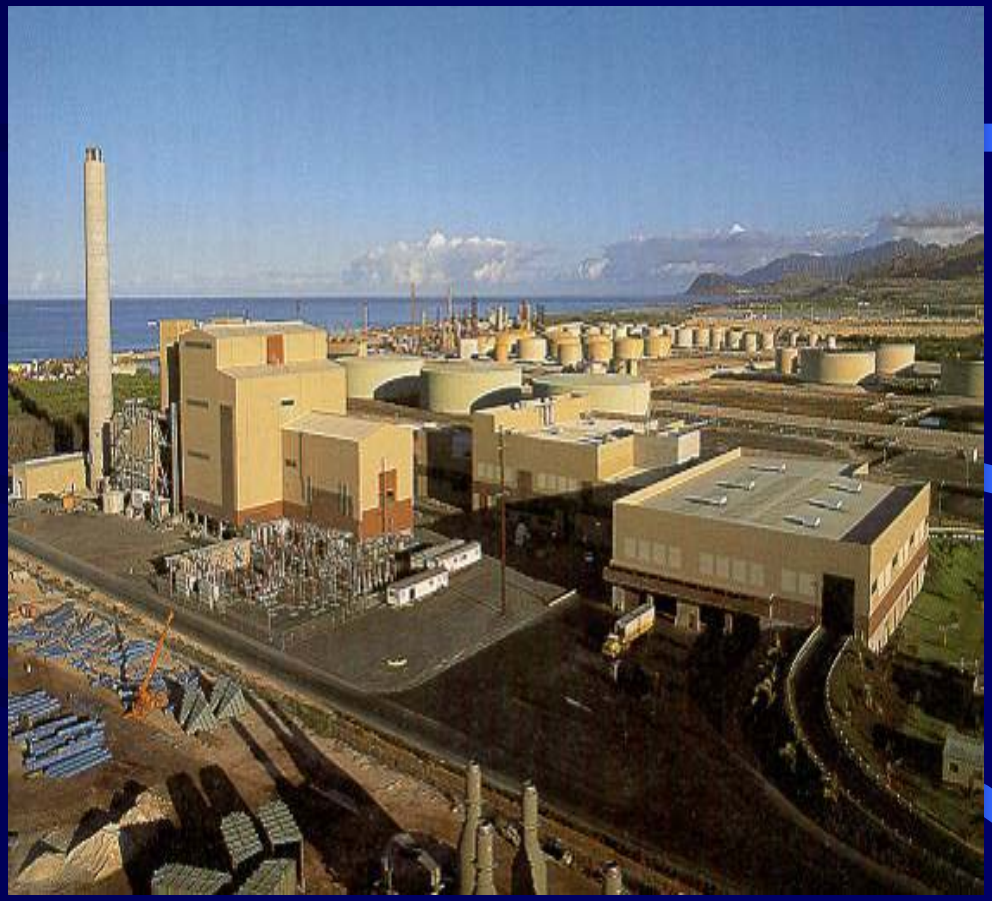
Environmentally Sensitive Practices

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

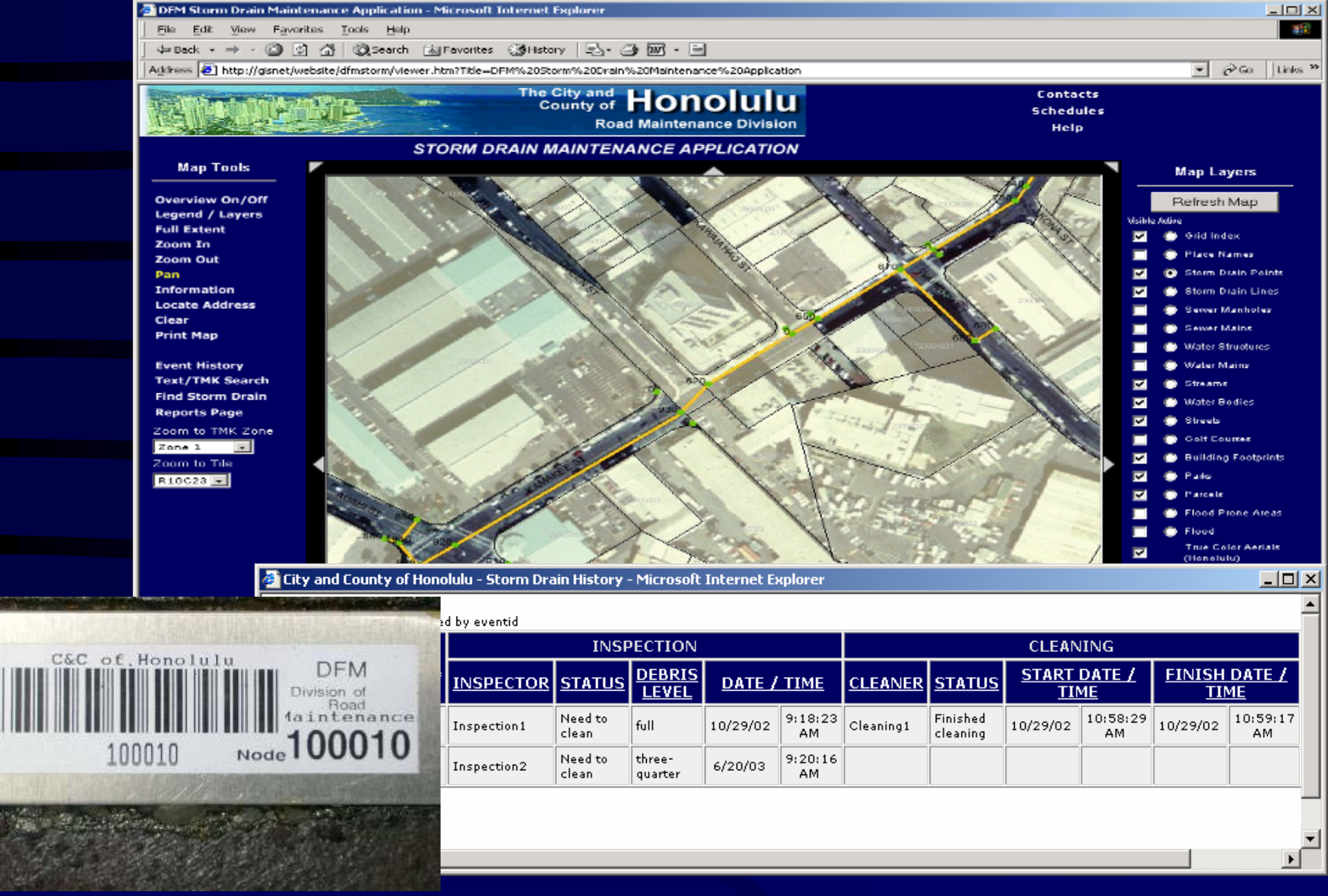
Watershed Protection

Grading Controls – Detention & Retention Ponds

Watershed Protection

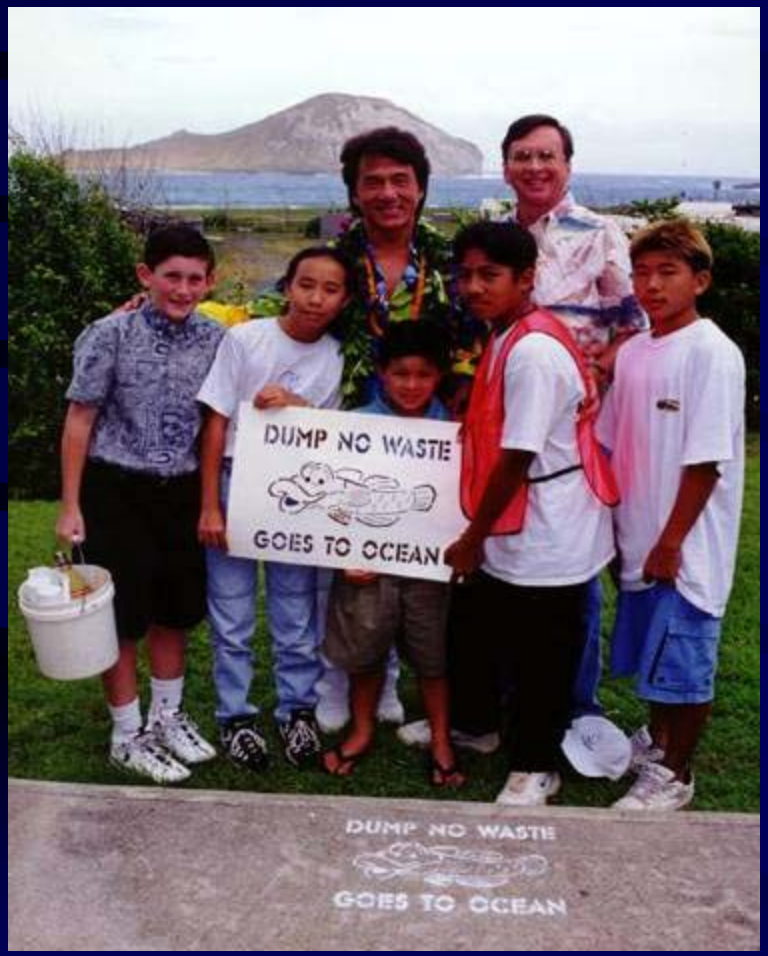
Controlling Non-point Source Pollution

Storm-drain maintenance



Providing field workers with real-time information

Watershed Protection
Public Education Programs



Storm-drain maintenance

Watershed Management

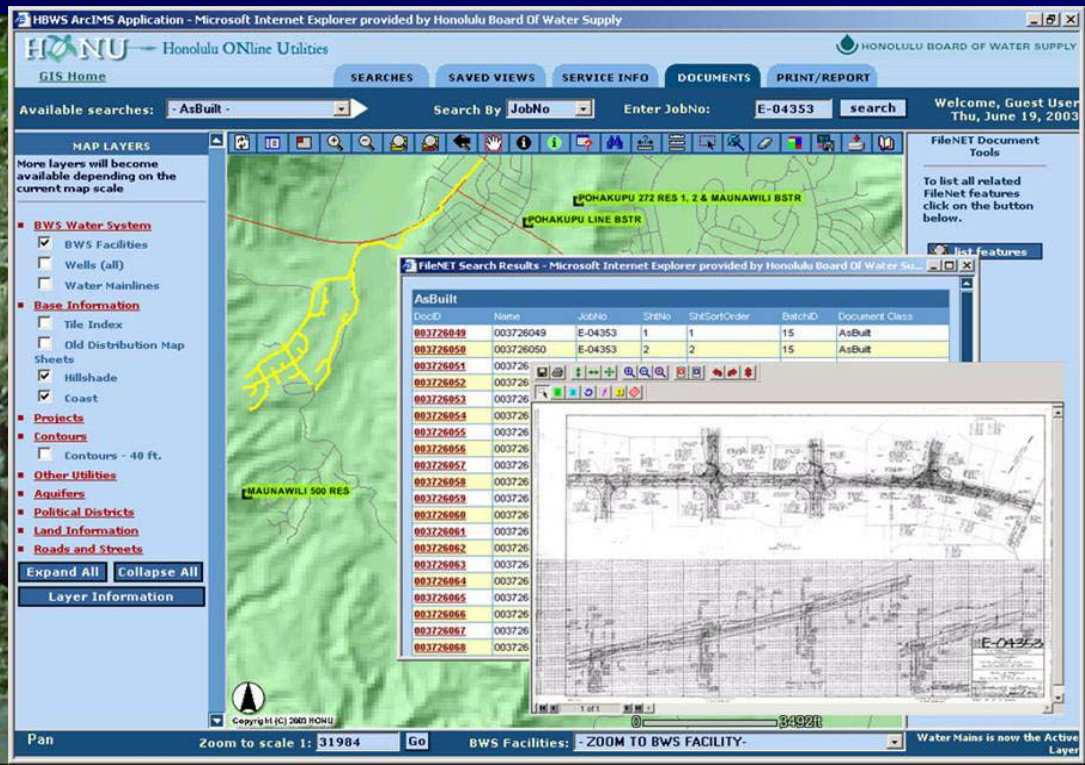
Citizen Involvement – Adopt a Stream Programs

Cities – the Sustainable Prescription

Potable Water

Sustainability Principles

Watershed Management



Watershed Protection

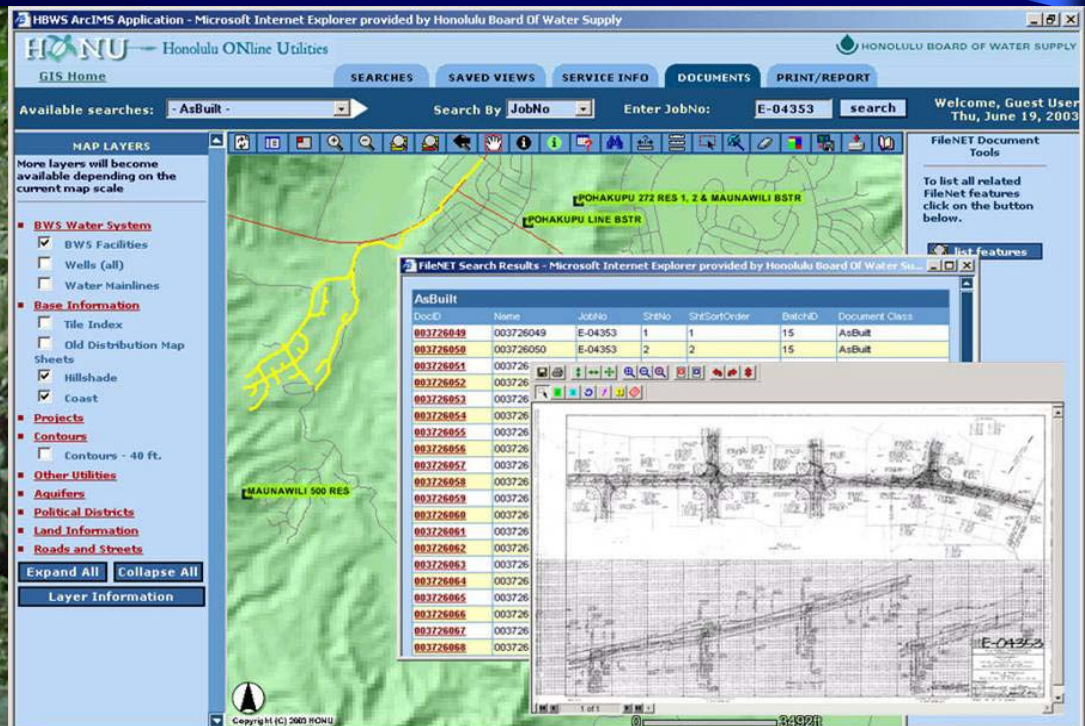
Source: Peopleandplanet.net

Cities – the Sustainable Prescription

Potable Water

Sustainability Principles

Demand-Side Management

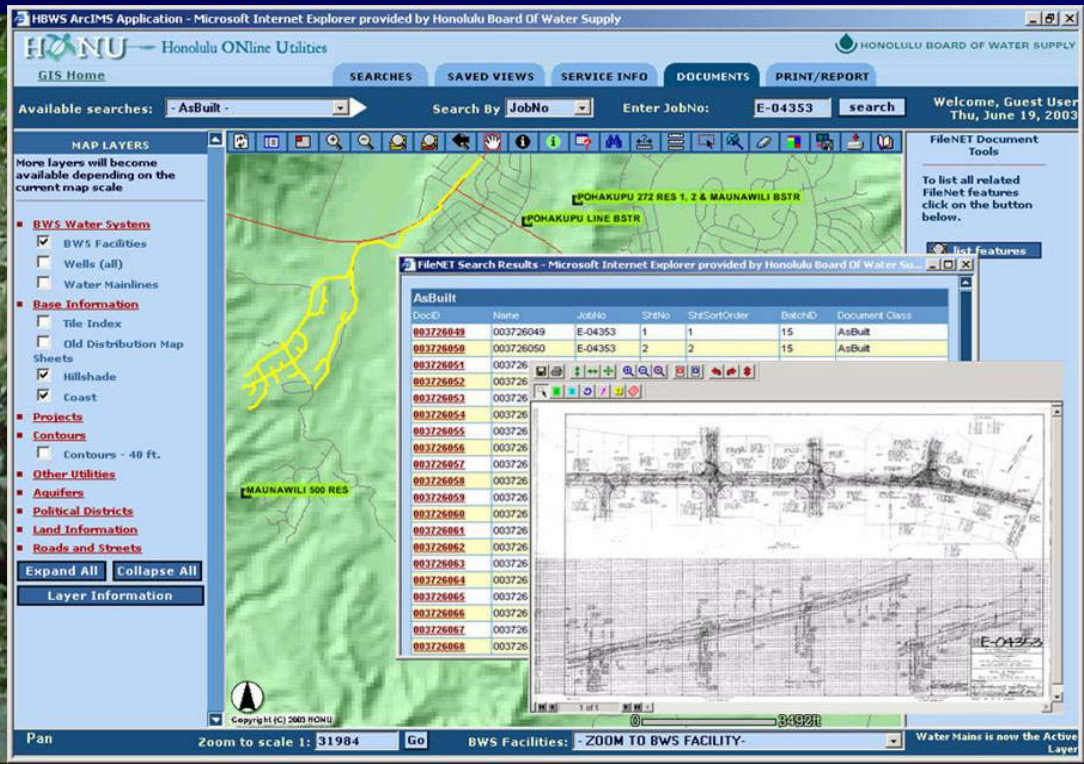


Cities – the Sustainable Prescription

Potable Water

Sustainability Principles

Improved Ag Techniques



Wastewater Recycling

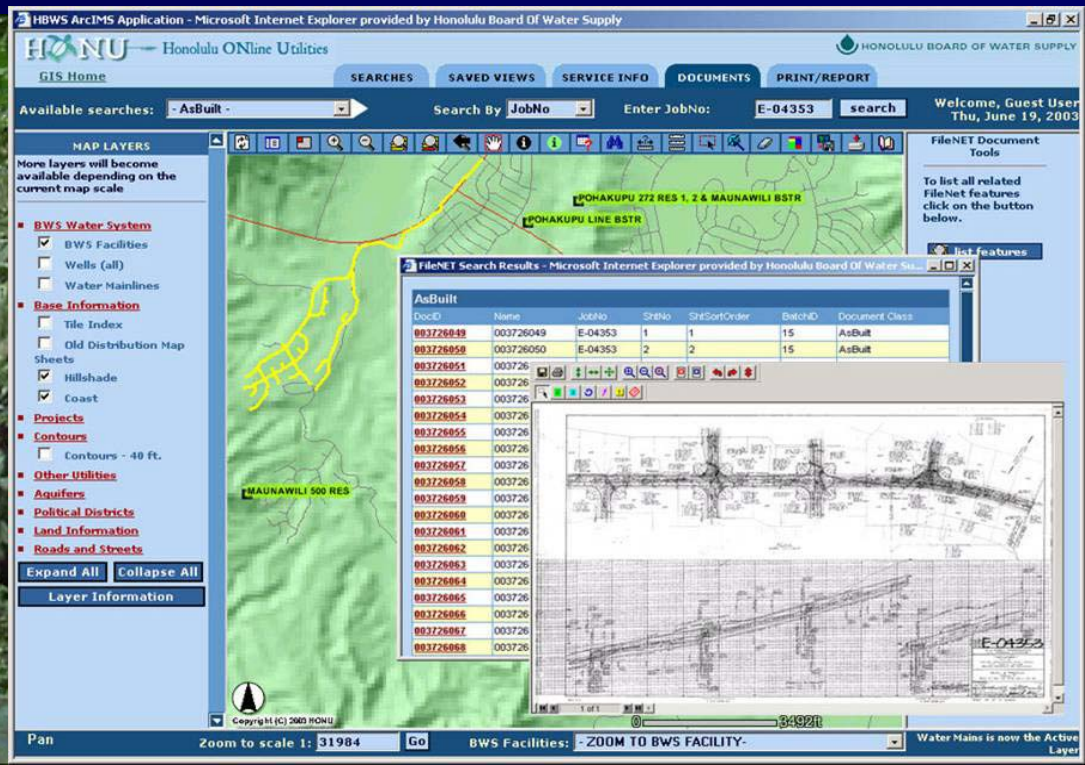
Agricultural irrigation

Cities – the Sustainable Prescription

Potable Water

Sustainability Principles

Water Treatment & Transmission



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

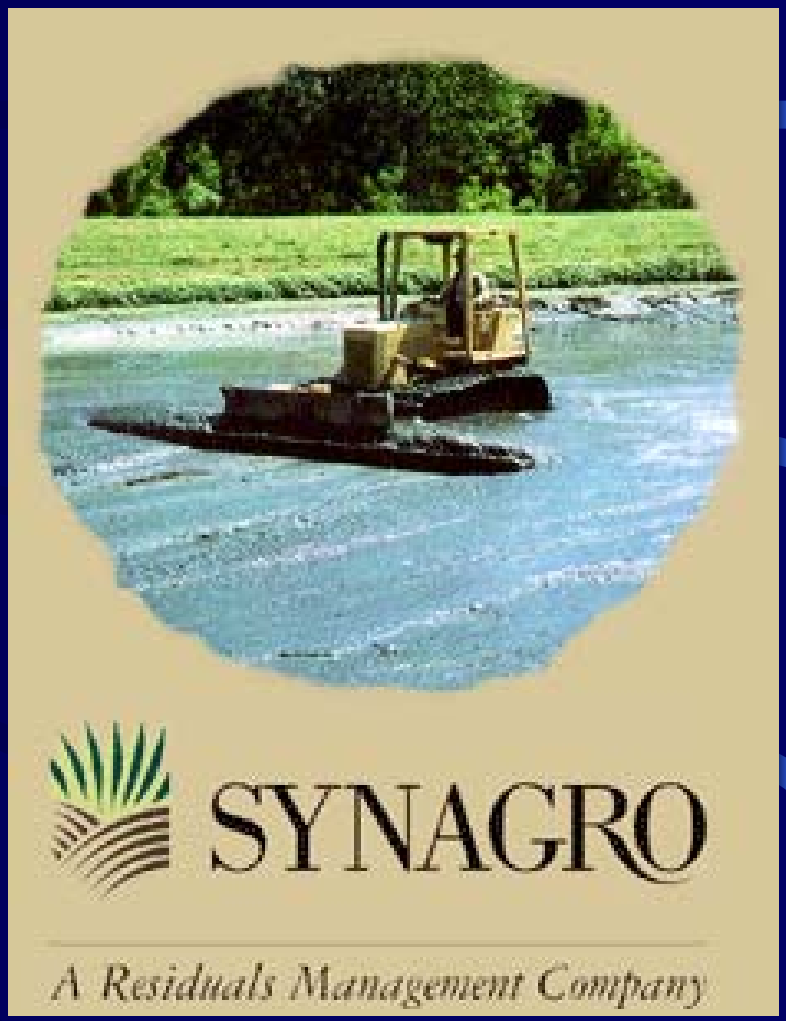
Recycling of Effluent & Solids

Environmentally-Caused Disease

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

Source: World Resources Institute

Conserving Our Natural Resources



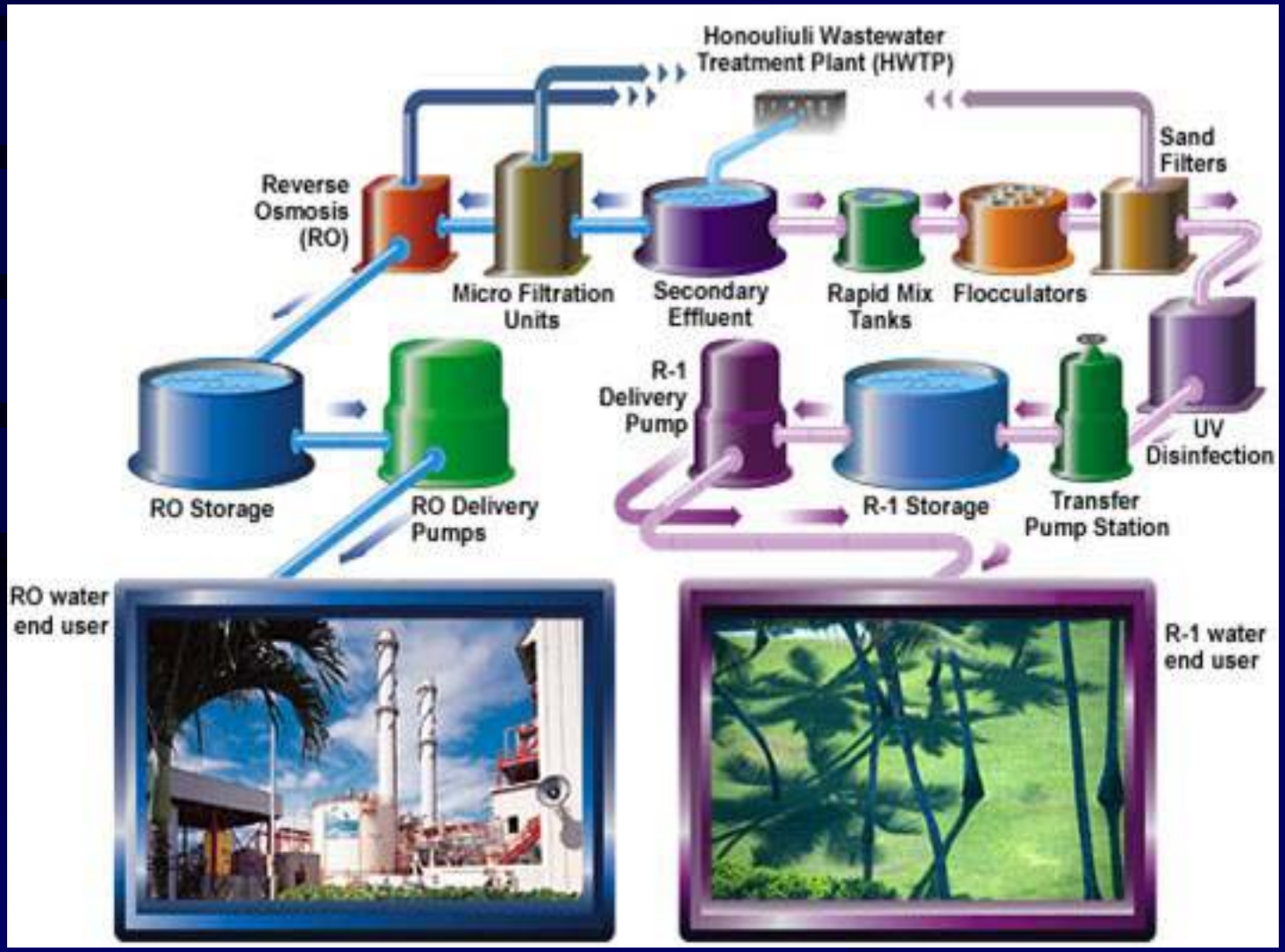
The Search for New Technologies

Wastewater Recycling

Membrane technology

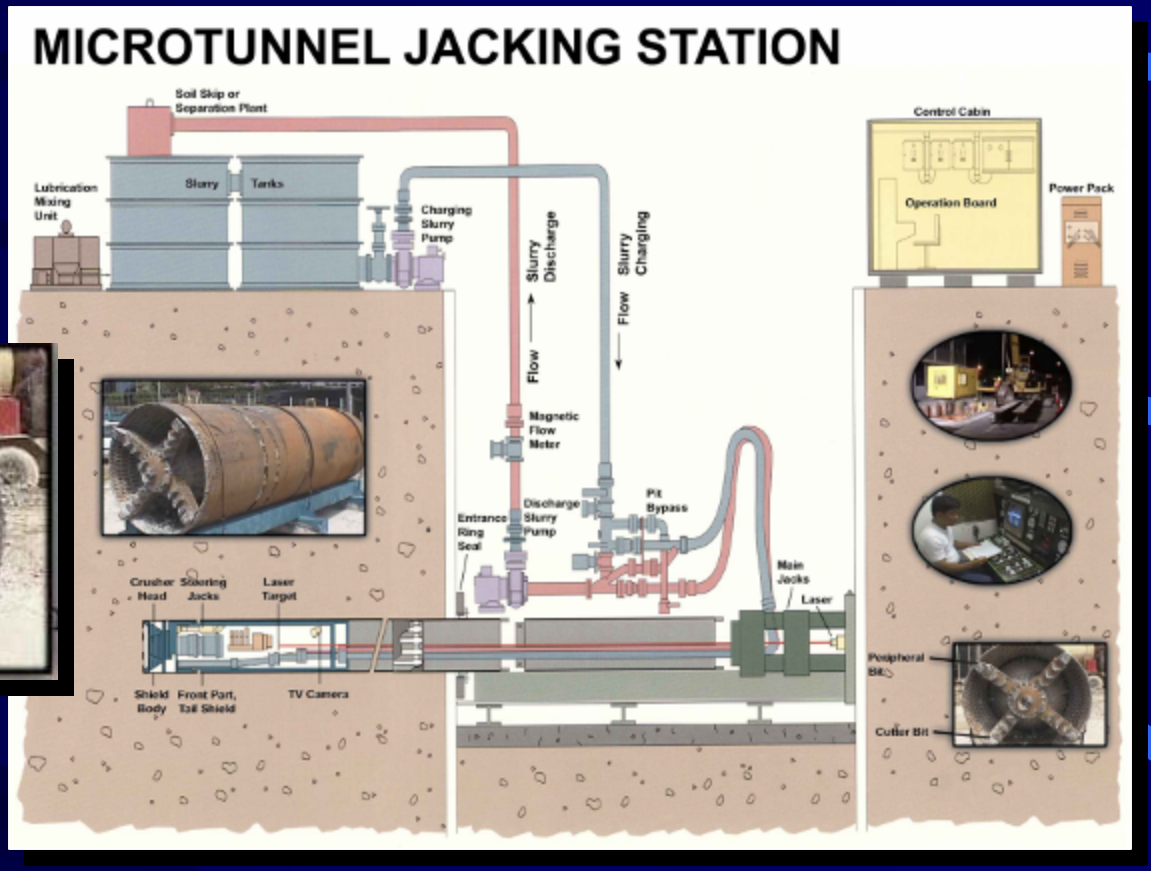
The Honolulu Experience

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

Cities – the Sustainable Prescription

Financing

Sustainability Principles

Triple-Net Analysis

Cities – the Sustainable Prescription

Financing

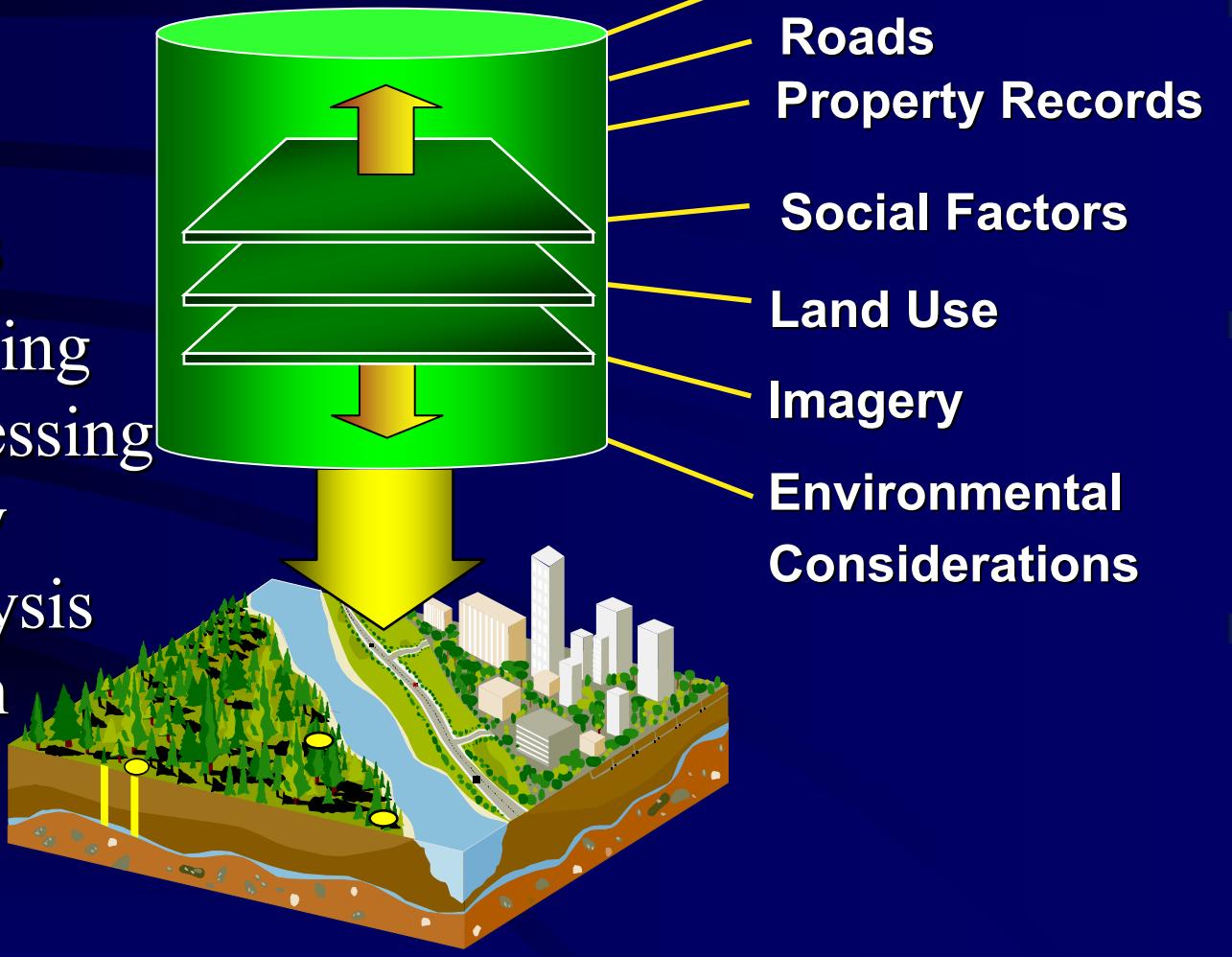
Sustainability Principles

Third Party Financing

The Honolulu Experience

Enterprise-wide GIS

Integrated Decision-making Tool



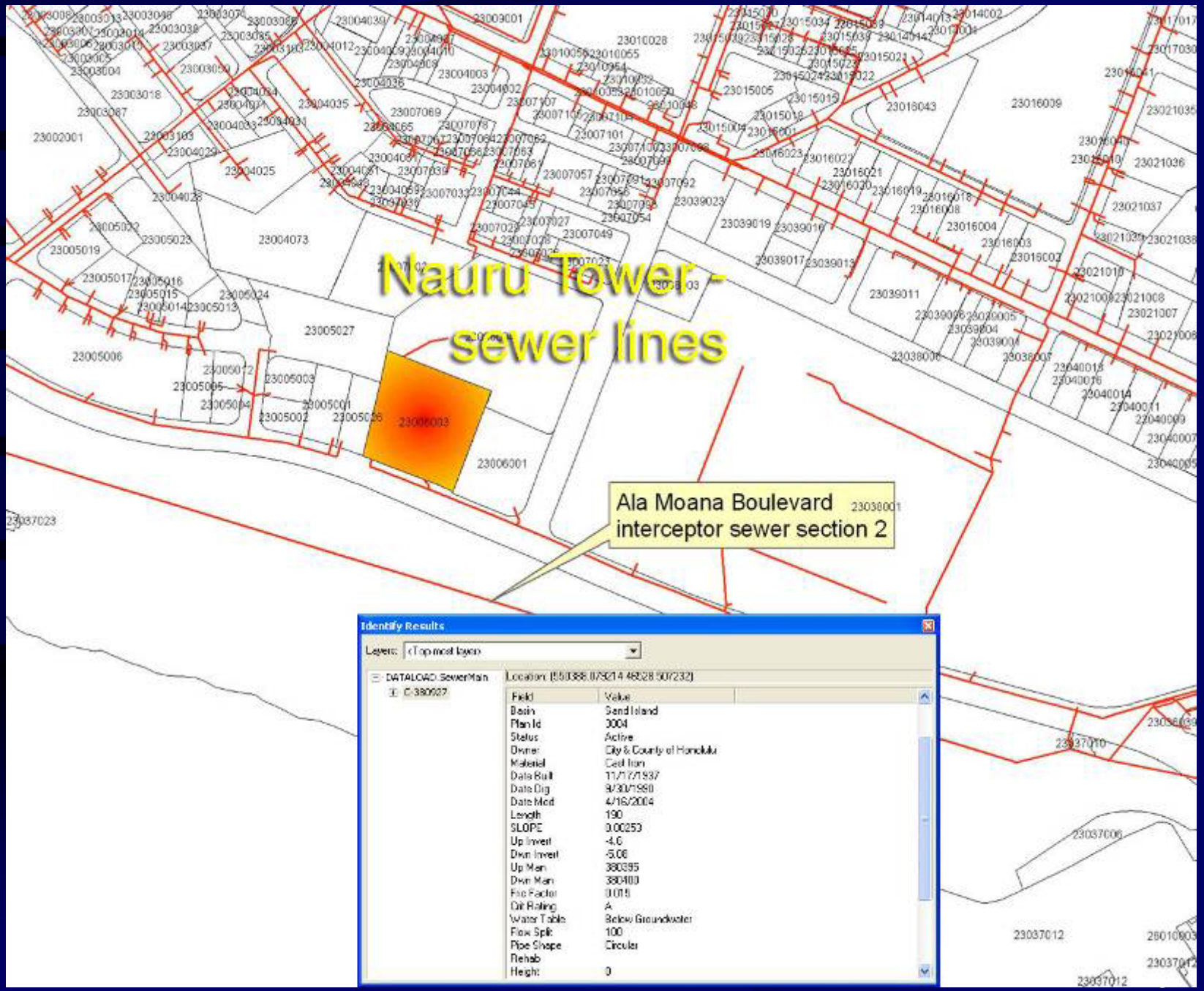
Key Concepts

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

Planning for the Future

Tools - GIS

Construction Plans - GIS Virtual 3D data


Nauru Tower - sewer lines
Ala Moana Boulevard interceptor sewer section 2
Identify Results
Layers: <Top most layer>
DATALOAD.SewerMain
Location: (550388.075214.46828.507232)
Field
Value
Basin
Sand Island
Plan Id
3004
Status
Active
Owner
City & County of Honolulu
Material
Cast Iron
Date Built
11/17/1937
Date Dig
9/30/1980
Date Mod
4/16/2004
Length
190
SLOPE
0.00263
Up Invert
-4.0
Dwn Invert
-5.06
Up Man
380395
Dwn Man
380400
Fac Factor
0.015
Qlt Rating
A
Water Table
Below Groundwater
Flow Split
100
Pipe Shape
Circular
Rehab
Heigh
0

Building a Model Sustainable City

Economy

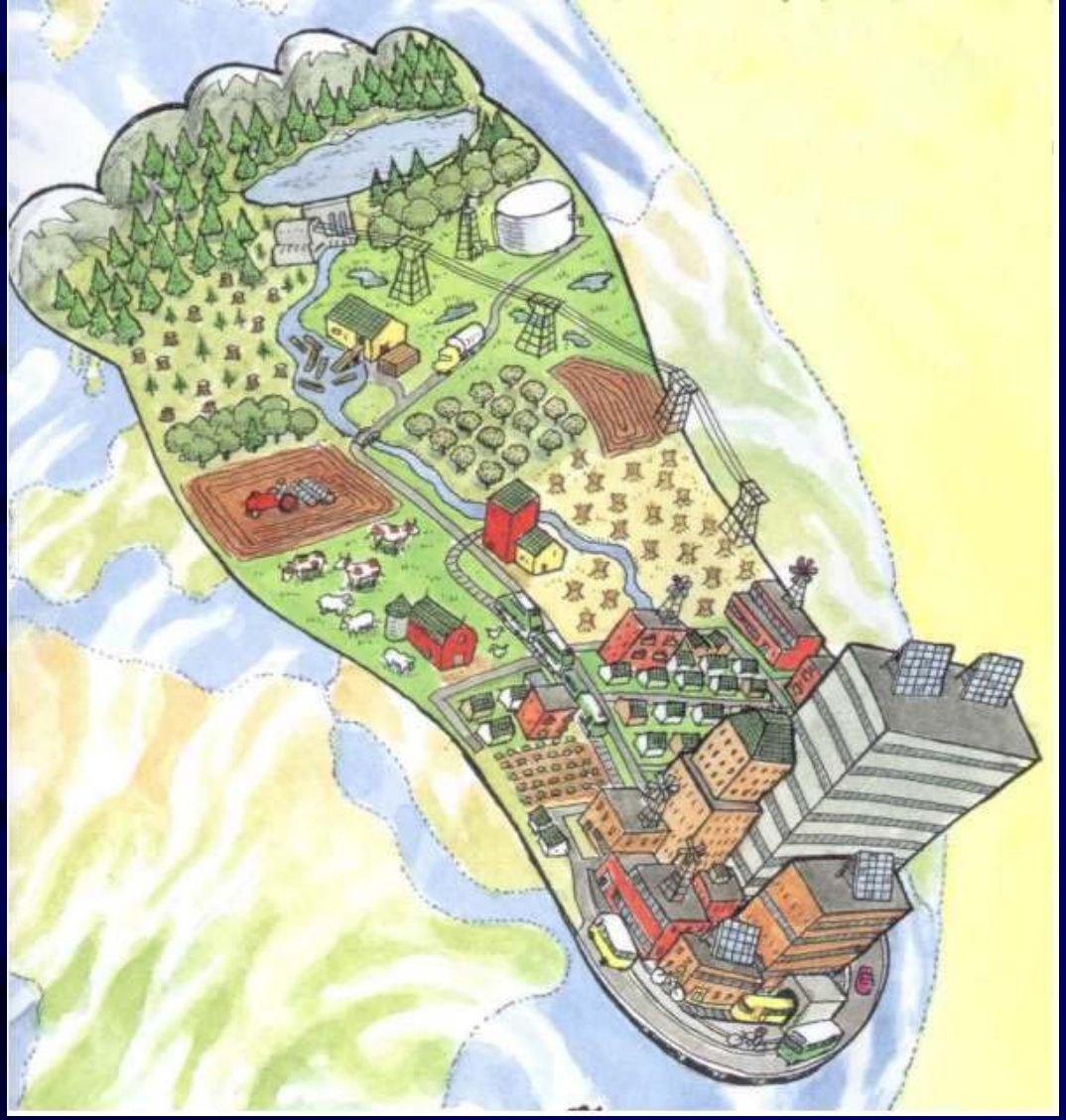
Land Use & Agriculture

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

Source: York Times Almanac 2004

Coastal Zone Destruction

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

Source: Population Reference Bureau

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

Solar Power

H_2

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

Source: World Resources Institute

Environmentally-Caused Disease

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

Source: World Resources Institute

Desertification

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

Source: United Nations

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

Source: Population Reference Bureau

Making Our Cities Sustainable

Modeled after natural ecosystems

High productivity

All nutrients recycled/reused

All components interconnected into stable system

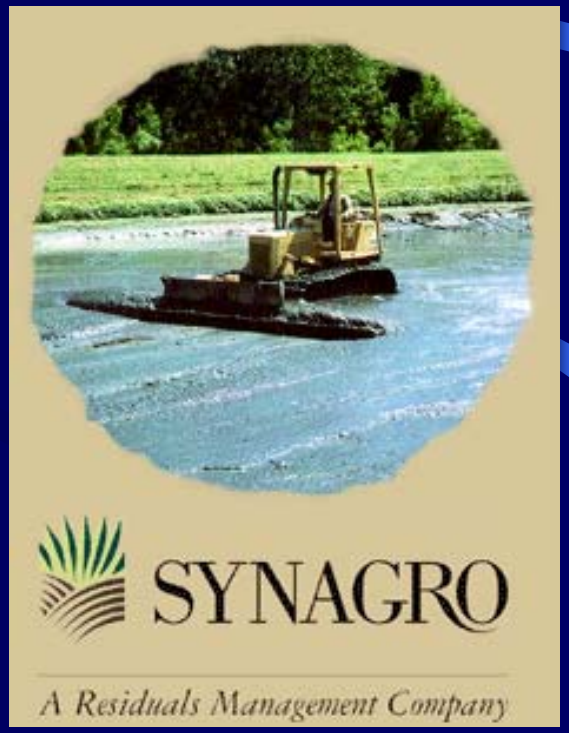
Planning that integrates land use, transportation, energy, natural resource and economic components

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

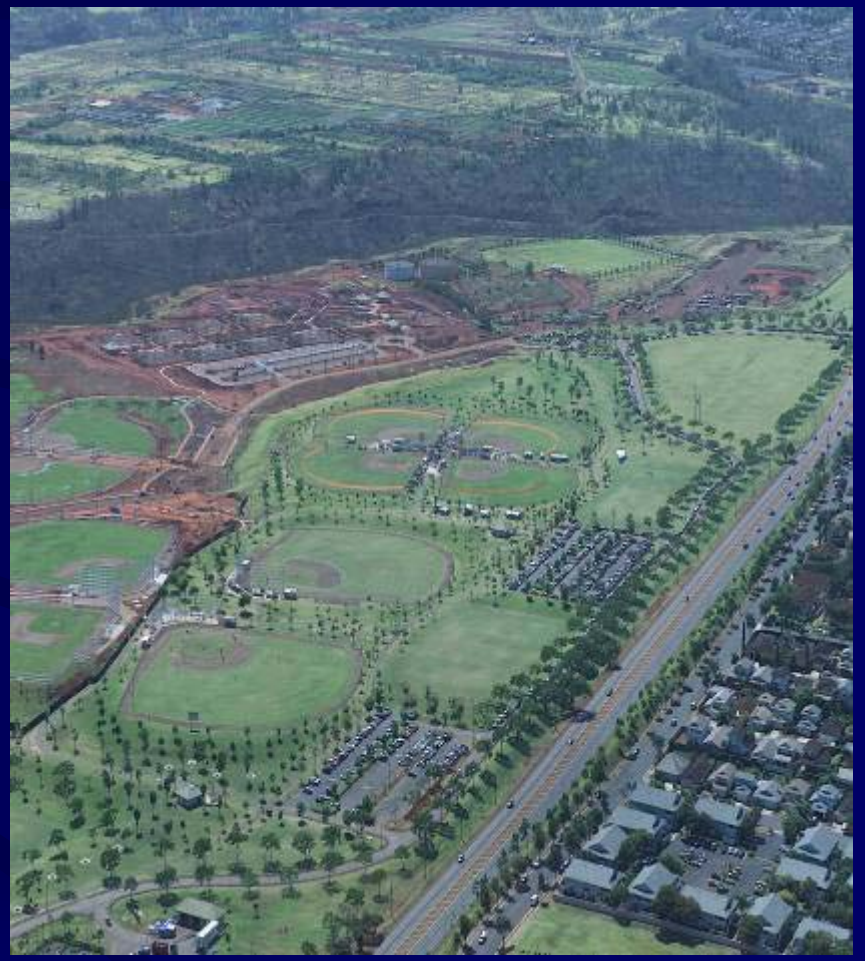
Sustainable Tourism
Eco-Tourism

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

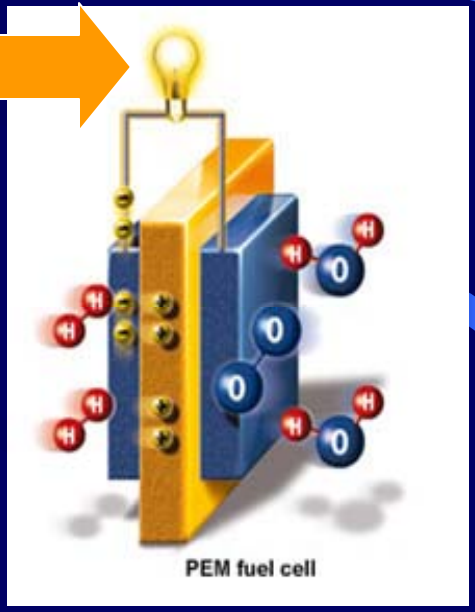
Fuel Cell

H_2

O_2

(Air)

Power



Hot Water

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

Source: Population Reference Bureau