ASU’s Global Institute of Sustainability

- University-wide Sustainable Research Federation
- First degree-granting School of Sustainability
- Decision Theater links research to community’s policy needs
- Assures ASU’s business practices are also
Social and Planning Dimensions of Sustainability

1. Introduction
2. Disasters/Collapse
3. Global Climate Change
4. Building Resilient Cities
5. Building Community Through Sustainability
6. Community Sustainability Metrics
7. Case Study of Collaborative Design for Sustainable Communities
8. The Sustainability Roadmap
1. Introduction

The Traditional Sustainability Paradigm

- Social Justice, Opportunity, Income Equality
- Overall Economic Growth and Efficiency
- Environmental Protection
- "green, profitable and fair" (sustainable development?)
- the property conflict
- the development conflict
- the resource conflict
CURRENT MOVEMENTS IN SUSTAINABILITY

• Urban Ecology - Interaction of Human and Ecological Systems
• Bio- Complexity Modeling – Urban Heat Island and Water Demand
• Community Resilience – Disaster Planning and Capacity Enhancement
• Environmental Justice -- Distributional Equity
• Sustainability Indicators – Quality of Life Factors
• Risk Reduction Strategies – Brownfield Redevelopment
• Collaborative Design – Community Based Approaches
• Green Building – Rating / Performance Criteria
• Sustainability Education -- Curricula, Facilities, Procurement
• Place Enhancement – Culture, History, Community
• Urban Health -- Urban Form
• Governance and Sustainability – Participatory / Neighborhood Level
2. Disasters/Collapse

- Hurricane Katrina
- Southeast Asian Tsunami
- China Earthquake
- Darfur, Sudan
- Dust Bowl
- Chernobyl
Hurricane Katrina
Southeast Asian Tsunami
China Earthquake
Darfur, Sudan

- Desertification: Sudan’s greatest environmental problem
This abandoned field within a collapsed irrigation scheme in Khartoum state previously supported low density rangeland. It is now barren and its remaining topsoil is being blown away.
Dust Bowl
Chernobyl
Abandoned Home near Chernobyl, all doors are open.
Chernobyl radioactive fallout across Europe
Underlying Concepts for the Roadmap

• “Collapse”
• Vulnerability
• Resilience
• Adaptation
• Risk + Uncertainty
• Institutional Capacities
3. Global Climate Change
Costs of extreme weather conditions

Global costs of extreme weather events (inflation-adjusted)

Annual losses, in thousand million U.S. dollars

- Total economic losses
- Insured losses

Number of events
Decadal average

SYR - FIGURE 2-7

IPCC
INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE
Global Climate Change

- Mitigation of Carbon Footprint
  - Alternative Energy Systems

- Adaptation
  - San Francisco
  - Policy
Climate Change
Sensitivity, Adaptability, and Vulnerability

Human Interference

CLIMATE CHANGE Including Variability

MITIGATION of Climate Change via GHG Sources and Sinks

Exposure
Initial Impacts or Effects
Autonomous Adaptations
Residual or Net Impacts

IMPACTS

VULNERABILITIES

Planned ADAPTATION to the Impacts and Vulnerabilities

Policy Responses
Green Building
Next Generation Questions

• Community Programs (Scottsdale, AZ)
• Policy Developments
• Perceptions
Perceptions of Green Building

Exhibit 1
Change in Number of Green Buildings in Organization’s Workload

Percent of Executives
Base = Executives at Organizations Currently Involved with Green Buildings

- Over Last 3 Years: 39% Increase Substantially, 49% Increase Somewhat, 12% No Change
- Expected Over Next 3 Years: 51% Increase Substantially, 42% Increase Somewhat, 7% No Change

Adapted from “Turner, Green Buildings: Market Barometer”
Perceptions of Green Building continued…

Exhibit 2
Likelihood of Being Involved with a Green Building Over Next 3 Years

Percent of Executives
Base = Executives at Organizations Not Currently Involved with Green Buildings

- Not At All/Not Too Likely: 30%
- Somewhat Likely: 31%
- Very/Extremely Likely: 39%

Adapted from “Turner, Green Buildings: Market Barometer”
Perceptions of Green Building continued…

Adapted from “Turner, Green Buildings: Market Barometer”
Perceptions of Green Building continued…

Exhibit 9
Factors Discouraging Construction of Green Buildings
Percent of Executives Rating Factor as Very or Extremely Significant in Discouraging Green Construction
Base = All Executives

- Higher Construction Costs: 70%
- Lack of Awareness of Benefits: 63%
- Short-Term Budget Horizons: 53%
- Payback Too Long: 51%
- Difficulty Quantifying Benefits: 48%
- LEED™ Documentation: 46%
- More Complex Construction: 30%
- Increased Operating Costs: 20%

Adapted from “Turner, Green Buildings: Market Barometer”
4. Building Resilient Cities
Resiliency + Vulnerability

Heat Island Effect

- Reducing Heat Island Effect by
  - Vegetation
  - Design
  - Shading
  - Green roofs
    (when appropriate)
Drought in the American Southwest

Vanishing Rainfall

Over much of the West the recent decline in rain and snow is most apparent in high mountain ranges, which normally receive the bulk of the region's precipitation. From there, rain and snowmelt recharge rivers, reservoirs, and aquifers.
Projected versus Actual Population Growth in Phoenix, Arizona

Figure 4-1 Projected versus Actual Population Growth, City of Phoenix, 1955-2005
Water Projections in Phoenix Arizona, with normal water supply conditions

Adapted from “City of Phoenix, Water Resources Plan, 2005 Update”
Water Projections in Phoenix Arizona, with severe water shortage conditions

Adapted from “City of Phoenix, Water Resources Plan, 2005 Update”
Distribution of Technological Hazards in Greater Phoenix, 1998 (TRI, TSD, CERCLA, LQG)
Cumulative Hazard Density Index (CHDI) (contour interval = 0.1)

CHDI Score
- Low
- Low to Medium
- Medium
- Medium to High
- High

CBD
Environmental Justice Spatial Pattern

TRI Facility Locations and Minority Distribution

Map Elements
- Highways
- Indian Reservations
- TRI Facilities
- Proportion White
  - 1 - 25%
  - 25 - 50%
  - 50 - 75%
  - 75 - 100%

Scale: 5 0 5 10 15 Miles
Rebuilding Marginalized Communities

Community Vulnerability and Resiliency

Place Deterioration → Place Stigmatization → Conflict → Place Enhancement

**Place Deterioration**
- Out-migration of key economic activities
- Abandonment/marginalization
- Displacement of stable neighborhoods
- Environmental injustice
- Environmental health problems

**Place Stigmatization**
- Participation Programs
- Partnership Building
- Building Trust
- Information-seeking Behavior

**Conflict**
- Economic Revitalization
- Data on Hazards/Migration
- Socialization
- Participation

**Place Enhancement**

**Community Vulnerability Factors** → Enhancing Resiliency → **Community Vulnerability Factors**
## Participation and Sustainability Lessons

<table>
<thead>
<tr>
<th>Dimensions of Sustainability</th>
<th>Participation and Sustainability Lessons</th>
</tr>
</thead>
</table>
| **Economic**                | • Identify assets and liabilities in the community  
                              • Deal directly with equity concerns and perceptions of the neighborhoods  
                              • Map out with community members short- and long-term strategies |
| **Social Community**        | • Demonstrate to the communities real outcomes from:  
                              - Neighborhood participation  
                              - University participation  
                              • Visioning is a key to inducing participation  
                              • Have the community work in terms of data collection, analysis, mapping, and making plans  
                              • Have the community do the work themselves, but have the academic planners and students also participate |
| **Environmental/Health**    | • Use surveys and asset mapping to identify health issues and social impact as key participation tools |
| **Political**               | • Work with neighborhood leaders, connecting them with advocacy planners in the city  
                              • Ensure longevity of university participation in the area |
Sustainability Indicators

City of Tucson

- Inventory global warming emissions, set reduction targets, and create action plan
- Reduce Sprawl, preserve open space, and create compact walkable communities
- Promote transportation options to single occupant car use
- Increase the use of clean renewable energy
- Improve municipal energy efficiency
- Purchase only Energy Star equipment and appliances for City use
- Practice and promote sustainable building practices, such as through the LEED program
- Reduce fossil fuel consumption by the municipal fleet
- Increase pump efficiency in water systems
- Increase recycling rates
- Maintain urban green space and promote tree planting to increase shading and to absorb CO2
- Educate other about reducing global warming pollution
Assessment of Perceptual and Objective Quality of Life Indicators in Calexico-Mexicali: Toward a Longitudinal Database for the U.S.-Mexican Border Region

Subhrajit Guhathakurta
David Pijawka
Edward Sadalla
Arizona State University

Kimberly Collins
San Diego State University

Judith Garcia
Arturo Ranfla
Universidad Autónoma de Baja California
Objectives

• Monitor both objective and subjective QoL indicators
• Collect longitudinal data (long-term monitoring)
• Provide intuitive and real-time access to this data through web interfaces for decision-makers and scholars
• Periodically present timely, intelligent analysis of trends
Chosen QoL Indicators

- Community Assets
- Education
- Economy, Income, and Jobs
- Public Safety
- Housing
- Environment
- Transportation
- Public Services
- Health Care
- Emotional Well Being
## EDUCATION

### Education
- Percent high school graduate or higher
- Percent bachelor's degree/Instrucción superior or higher
- Percentage of males ages 25 to 34 who are not high school graduates
- Percentage of population ages 3 to 34 enrolled in school

### Health and Environment
- Infant mortality rate per 1,000 live births
- Death rate per 1,000 population
5. Building Community Through Sustainability
Rapid growth

Depletion of environmental resources

Fragmented planning policy

Energy consuming

Air, water and soil degradation

Loss of visual and landscape quality

Lack of a sense of community
Maricopa County Land Use in 1934

Source: Salt River Project; Salt River Valley Water Users Association; U.S. Soil Conservation Service Fairchild Aerial Photos
Maricopa County Land Use in 1975

Source: USGS GIMAS, 1974
Maricopa County Land Use in 1995
JUSTIFICATION FOR SUSTAINABLE DESIGN IN GREATER PHOENIX

Sonoran Collaborations
Creating Sustainable Neighborhoods in the Sonoran Desert
Sonoran Collaborations
Creating Sustainable Neighborhoods in the Sonoran Desert
Timothy Beatley’s, “Place Making”

- Sense of Place
- Attachment
- Community Assets
- Culture
- Recycling Land
- Infill
- Neighborhood Sharing
Themes

- Knowledge Anchors
- Downtown Living
- Great Neighborhoods
- Arts and Entertainment Hubs
- Distinctive Shopping
- Great Places/Great Spaces
- The Connected Oasis

Form Based Codes
Building Community Through Sustainability

– Bike Trails
– Walking Trail
– Phoenix: Valley Metro Light Rail
– Art District; First Friday’s: Roosevelt Row
– Infill Development
Infill, Mixed Use, Arts District
New Urbanism
Civano/Armory Park – Tuscon, AZ

- New Urbanism
- Focus on Energy Reduction
  - 50% energy reduction
- Solar City
- Green building
- Grey water
  - 65% potable water use reduction
- Desert landscaping
- One job for every two residents
- Solid waste reduction
- Southwest building style
- Pedestrian and bicycle friendly paths

Multi-Use Trails

SW building Style
The Civano community in Tucson, Arizona (drawing by Moule & Polyzoides, Architects and Urbanists)
Valley Metro Light Rail
Phoenix Area
Visualization and Sustainable Communities
6. Community Sustainability Metrics

Environmental Showcase Home
<table>
<thead>
<tr>
<th>Category</th>
<th>Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy efficiency</td>
<td>Energy-efficient production methods, Energy-efficient design, Energy-efficient usage</td>
</tr>
<tr>
<td>Sustainability</td>
<td>Recycled content, Recyclable, Sustainable source material and production process, Low maintenance and durable</td>
</tr>
<tr>
<td>Transferability</td>
<td>Cost-effectiveness, Availability, Acceptability</td>
</tr>
<tr>
<td>Health</td>
<td>Avoidance of harmful chemicals, Reduction of off-gassing</td>
</tr>
<tr>
<td>Qualities of supplier or manufacturer</td>
<td>Commitment to resource efficiency, In-house environmental programs, Marketing commitment to environmental responsibility, Local production capability</td>
</tr>
</tbody>
</table>
# A Frame Work for Sustainable Design

<table>
<thead>
<tr>
<th>Actions toward environmental sustainability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practice pollution prevention</td>
</tr>
<tr>
<td>Minimize environmental health risks</td>
</tr>
<tr>
<td>Use renewable over nonrenewable resources</td>
</tr>
<tr>
<td>Reuse, reduce, recycle materials</td>
</tr>
<tr>
<td>Use embodied energy in existing material</td>
</tr>
<tr>
<td>Protect endangered resources</td>
</tr>
<tr>
<td>Enhance ecosystem viability</td>
</tr>
<tr>
<td>Minimize water and energy use</td>
</tr>
<tr>
<td>Protect old-growth forests</td>
</tr>
<tr>
<td>Reduce resource depletion rates</td>
</tr>
<tr>
<td>Replace toxic substances in manufacturing processes</td>
</tr>
<tr>
<td>Make use of life cycle assessments</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sustainable design strategies in the ESH</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Site</strong></td>
</tr>
<tr>
<td>- Hazard-free (radon-free) site</td>
</tr>
<tr>
<td>- Indigenous plants</td>
</tr>
<tr>
<td>- Site material reuse</td>
</tr>
<tr>
<td>- Use of natural topography of site</td>
</tr>
<tr>
<td>- Low-maintenance landscaping</td>
</tr>
<tr>
<td>- Damaged area restoration</td>
</tr>
<tr>
<td>- Restriction of heat-absorbing materials</td>
</tr>
<tr>
<td>- Restriction of pesticide and chemical use</td>
</tr>
<tr>
<td>- Shade from existing plants</td>
</tr>
<tr>
<td><strong>Water</strong></td>
</tr>
<tr>
<td>- Low-flow fixtures</td>
</tr>
<tr>
<td>- Low-water-use appliances</td>
</tr>
<tr>
<td>- Gray water reuse</td>
</tr>
<tr>
<td>- Underground irrigation</td>
</tr>
<tr>
<td>- Rainwater harvesting</td>
</tr>
<tr>
<td>- Xeriscape</td>
</tr>
<tr>
<td>- Hydrozones</td>
</tr>
<tr>
<td>- Run-off design</td>
</tr>
<tr>
<td>- Retention areas</td>
</tr>
<tr>
<td><strong>Materials</strong></td>
</tr>
<tr>
<td>- Resource efficient</td>
</tr>
<tr>
<td>- Low in embodied energy</td>
</tr>
<tr>
<td>- High in recycled content</td>
</tr>
<tr>
<td>- Nontoxic material</td>
</tr>
<tr>
<td>- Recyclable</td>
</tr>
<tr>
<td>- No indoor air pollution</td>
</tr>
<tr>
<td>- No use of old-growth timber</td>
</tr>
<tr>
<td>- No need for finishes</td>
</tr>
<tr>
<td>- Natural material in furnishings</td>
</tr>
<tr>
<td>- On-site waste reuse</td>
</tr>
<tr>
<td>- Material reduction through design</td>
</tr>
<tr>
<td>- Use of local products</td>
</tr>
<tr>
<td><strong>Energy</strong></td>
</tr>
<tr>
<td>- Energy-efficient appliances</td>
</tr>
<tr>
<td>- High-efficiency space cooling/heating systems</td>
</tr>
<tr>
<td>- Zonal control</td>
</tr>
<tr>
<td>- Natural ventilation</td>
</tr>
<tr>
<td>- Photovoltaics</td>
</tr>
<tr>
<td>- Airtight construction</td>
</tr>
<tr>
<td>- Low-energy lighting</td>
</tr>
<tr>
<td>- Sun-tempered design</td>
</tr>
<tr>
<td>- High-efficiency fenestration</td>
</tr>
<tr>
<td>- Shading systems</td>
</tr>
<tr>
<td>- Superinsulation</td>
</tr>
<tr>
<td>- Low window-to-floor space ratio</td>
</tr>
<tr>
<td>- East-west orientation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Environmental benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Indigenous plant preservation</td>
</tr>
<tr>
<td>- Reduced chemicals in groundwater</td>
</tr>
<tr>
<td>- Fewer natural resources used</td>
</tr>
<tr>
<td>- Less potable water used</td>
</tr>
<tr>
<td>- Reduced water and wastewater treatment</td>
</tr>
<tr>
<td>- Less energy consumed</td>
</tr>
<tr>
<td>- Smaller waste stream produced</td>
</tr>
<tr>
<td>- Harmful chemicals avoided</td>
</tr>
<tr>
<td>- Old-growth forests sustained</td>
</tr>
<tr>
<td>- Harmful air emissions avoided</td>
</tr>
<tr>
<td>- Landfill life extended</td>
</tr>
</tbody>
</table>
Comparative Life Cycle Assessments
Michael Pasqualetti and David Pijawka

Figure 9: Comparisons of Walls, Roofs, and Floors in the Environmental Showcase Home and a "Typical Home" in Phoenix, Arizona*

<table>
<thead>
<tr>
<th>Resources</th>
<th>Units</th>
<th>Typical home wall</th>
<th>ESH home wall</th>
<th>% change **</th>
<th>Typical home roof</th>
<th>ESH home roof</th>
<th>% change **</th>
<th>Typical home floor</th>
<th>ESH home floor</th>
<th>% change **</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>kg</td>
<td>53</td>
<td>38</td>
<td>+39</td>
<td>49</td>
<td>36</td>
<td>+27</td>
<td>75</td>
<td>71</td>
<td>+5</td>
</tr>
<tr>
<td>Wood</td>
<td>g</td>
<td>1,080</td>
<td>3</td>
<td>+359</td>
<td>1,040</td>
<td>460</td>
<td>+126</td>
<td>0</td>
<td>0</td>
<td>—</td>
</tr>
<tr>
<td>Oil and gas feedstocks</td>
<td>g</td>
<td>230</td>
<td>300</td>
<td>-39</td>
<td>110</td>
<td>210</td>
<td>-91</td>
<td>10</td>
<td>23</td>
<td>-130</td>
</tr>
<tr>
<td>Ores and minerals</td>
<td>kg</td>
<td>3</td>
<td>9</td>
<td>-200</td>
<td>6</td>
<td>1</td>
<td>+500</td>
<td>25</td>
<td>22</td>
<td>+12</td>
</tr>
<tr>
<td>Energy: all forms</td>
<td>MJ</td>
<td>66</td>
<td>55</td>
<td>+17</td>
<td>60</td>
<td>43</td>
<td>+28</td>
<td>112</td>
<td>92</td>
<td>+18</td>
</tr>
</tbody>
</table>

* All values shown in this table represent quantities per square foot of structure.
** The percentage change represents the positive contribution (i.e., the reduction in measured quantities) between the ESH and typical home construction.
A Model Conventional Subdivision
Air emissions in lbs/yr for typical versus sustainable subdivision.
Comparison of energy use of typical subdivision versus a sustainable subdivision

- Typical subdivision: 20,000,000 kWh (1200 units)
- Sustainable subdivision: 4,000,000 kWh (1370 units)
# Ecological Footprint Decreases

<table>
<thead>
<tr>
<th>Environmental Indicators</th>
<th>Conventional Subdivision</th>
<th>Sustainable subdivision</th>
<th>% reduction sustainable subdivision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resource Use (Kg)</td>
<td>$668 \times 10^6$</td>
<td>$186 \times 10^6$</td>
<td>72%</td>
</tr>
<tr>
<td>Embodied energy (MJ)</td>
<td>$740 \times 10^6$</td>
<td>$331 \times 10^6$</td>
<td>55%</td>
</tr>
<tr>
<td>Energy use (KWh)</td>
<td>$18.8 \times 10^6$</td>
<td>$4.8 \times 10^6$</td>
<td>74%</td>
</tr>
<tr>
<td>Water use (ga/yr)</td>
<td>$177.2 \times 10^6$</td>
<td>$97.4 \times 10^6$</td>
<td>45%</td>
</tr>
<tr>
<td>Material air emissions (kg)</td>
<td>$181.5 \times 10^6$</td>
<td>$99.3 \times 10^6$</td>
<td>45%</td>
</tr>
<tr>
<td>Appliance air emissions (lb/yr)</td>
<td>$37.6 \times 10^6$</td>
<td>$9.4 \times 10^6$</td>
<td>75%</td>
</tr>
<tr>
<td>Car emissions (lb/yr)</td>
<td>$13.5 \times 10^6$</td>
<td>$7.5 \times 10^6$</td>
<td>44%</td>
</tr>
<tr>
<td>Energy emitted by road surface (kw)</td>
<td>$113 \times 10^6$</td>
<td>$53 \times 10^6$</td>
<td>53%</td>
</tr>
</tbody>
</table>
7. Case Study of Collaborative Design for Sustainable Communities

Future: Where are we moving to?
Creating Sustainable Neighborhoods In the Sonoran Desert

Presented by:
David Pijawka, Arizona State University
Frederick Steiner, University of Texas at Austin
BACKGROUND AND OBJECTIVES

- Application of sustainability principles to design of specific sites
- Two sites typical of developing areas in southwestern U.S:
  1. Inner city - Marginalized
     - Brownfield (post industrial site)
     - Infill opportunity
  2. Rural/Urban fringe - Desert ecology
     - Rapid urbanization
     - Sprawl
     - Sameness

OBJECTIVES

- To draw public and private interests together to stimulate development of sustainable communities in desert southwest
- To construct set of criteria and measures to guide development in desert southwest
- To prepare design options for two neighborhoods- integrate principles of sustainable building and neighborhood design
DESIGN PROCESS GOALS

- To explicate the planning and design process to help others in creating sustainable neighborhoods
- Full participation as part of sustainable design
  - ecology
  - equity-community goals
  - economic
- President’s Council on Sustainable Development
  - “New collaborative decision process that leads to better decisions; more rapid change and more sensible use of human, natural and financial resources”
  - Key philosophy in sustainability is securing the democratic involvement of residents in the project planning process alongside elected representatives, professional planners, and key stakeholders
FOUR PHASE PROCESS

ORGANIZATION
- Team building
- Site selection
- Work plan

BACKGROUND RESEARCH
- Literature review/case studies
- Site assessments
- Focus groups

DEVELOPMENT OF GUIDELINES
- Interactive design sessions
- Set of goals in achieving sustainability
- Identifying design criteria for neighborhoods

CHARRETTES
- Intensive and cooperative workshop to address design problems
SITE SELECTION

- Two sites involved in proposed development
- Not theoretical but practical/pragmatic
- Development of potential sites
- Urban desert fringe/ suburban sprawl
  - Low density
  - Loss of biodiversity
  - Sameness
  - Transportation-energy-lack of mass transit
- Redevelopment areas/infill
  - Brownfield sites
  - 30-35% land in Phoenix vacant
  - Have existing structure and form
    (neighborhoods, street patterns, transit lines)
  - Pre-existing conditions- limitations on design

Arroya Vista- Two Prominent Washes

La Lomita-Little Hills
LA LOMITA SITE

- Historical context
- Ownership (state land department)
- Transition area
- Freeways/ minority area/ community needs
- Development pressure
- Environmental concerns
- Archaeological resources
FOCUS GROUP

PARTICIPANTS

- Community participation
- More than 100 community leaders
- Five focus groups
- Neighbors around sites; environmentalists; development community (builders, planners, architects, finance)

OBJECTIVES

- Obtaining local and regional perspectives of sustainable development
- Providing vehicle for public participation in design process
- Educating and informing local interests about program
- Identify community issues
- Identify design elements that contribute to sustainability ("public cooperative designs")
<table>
<thead>
<tr>
<th>Sustainability</th>
<th>Goals</th>
<th>Design Elements</th>
</tr>
</thead>
</table>
| Energy Use    | • Reduce consumption through planning  
                • Reduce consumption through building design  
                • Increase efficiency of use | • Site access to public transit  
                • Solar open space lighting  
                • Building orientation  
                • Smaller homes  
                • Energy conservation education |
# INTERACTIVE DESIGN SESSIONS - SUSTAINABLE DESIGN CRITERIA

## BIODIVERSITY

### Design with Nature
- Clustering increases land available for habitat
- Park networks to consider wildlife corridors
- Build in least sensitive areas
- Use nature for circulation—washes
- No chemical applications
- Restore damaged landscapes
- Use nature for infrastructure (ecological infrastructure)

### Retain Valuable Habitat
- Edges are sensitive areas
- Identify and manage invasive biota
- Walls can hinder movement
- Golf and park development impact wildlife
- Ensure animal corridors/movement
- Identify pockets of rich biodiversity

### Link Open Space to Habitat Needs
- Manage invasive species
- Reintroduce native species (La Lomita)
- Preserve areas for natural vegetation
- Link site to larger bioregime context
- Relate geographic scale to biodiversity
INTERACTIVE DESIGN SESSIONS- SUSTAINABLE DESIGN CRITERIA

SENSE OF COMMUNITY

Facilitate Social Interaction

• Housing clusters and nodes
• Reduced setbacks
• Cooperative housing
• Community parks/open space for recreation
• Semi-public spaces (courtyards)
• Building design to facilitate “neighborhood feeling”
• Community centers/civic facilities
• Use distinct neighborhood nodes (unique social identities)
• Street scale and form to facilitate interaction
• Campus/public use commercial space

Connect to Surroundings

• Provide sense of safety
• Place value on unique areas
• Identify culture in place
• Use gateways to identify neighborhoods
• Delineate distinct neighborhood boundaries via gardens, green edges, landscaping
Distinct similarities between all designs
North area identified as residential commercial space at fairly high density
Southern area - Light industrial, office space due to limited road access and proximity to airport
Archaeological site left undeveloped - open space and education
Create space for community gardens
- education, places for social interaction
- protection from outside
- recycle organic waste products

Leave large open-space patch to buffer noise from freeway and serve as recreation area for community
- active recreation and drainage
- include sports and community facilities, links to bike trails
- community farm/nursery
- open space networks

Sound wall
- mitigate noise from the freeway
- design use for decoration and energy production with inclusion of solar panels and windmills

Create linear corridors through residential areas on the north
- open spaces corridors offer habitats for wild life, improves air circulation, provide green spaces to offset higher densities, space for pedestrian/bike path
- houses open onto common linear greenways
- restore indigenous vegetation to a denuded site
**LA LOMITA CHARRETTE**

**Incorporate courtyard housing**

- three-story structures to accommodate higher densities (24-30 apartments/buildings)
- shaded microclimate could result from proximity of buildings to one another and revegetation of the courtyard open spaces

**Public central square**

- allow neighborhood scale retail as opposed to community-supported retail on NE corner of site
- public squares connect open spaces and are energized by the intersection of residences, commercial retail and open-space network
- lowest density typology would consist of a cluster of four detached units that work together to form an interior space. Allows families to combine efforts to buy homes and creates courtyards without requiring large amounts of space for each home
8. The Sustainability Roadmap

Past
(1970-1990)

• End of Pipeline Regulation
• Pollution Prevention
• Stewardship
• NEPA Implementation

Present
(1990-2010)

• Neighborhood greening
• Sustainability Metrics
• Life Cycle Accounting
• Industrial Ecology

Future
(2010-2020)

• Sustainable Technology
• Urban Recycling (Brownfields)
• Participatory Design
• Policy Based Indicators

• 3 R’s: Reduce, Reuse, Recycle
• Landscape Ecology
• Green Building
• Carbon Footprints
• Environmental Justice
• Risk Management
• Eco-effectiveness
• Community Based Sustainability
• Greening versus Sustainability Debates
• Resiliency Planning
Sustainability implies balance and permanence: a balance between people living in a community and the jobs available there; a balance between renewable resources continuously available locally and local consumption patterns; a balance between maintaining the natural environment in good health and the needs of the human community that lives within it. Like an individual in balance a sustainable community will be healthy: socially, economically and biologically.

Calthorpe, 1986