

## ENERKEY PRESENTATION - CSIR INPUTS -

*Presented to:*  
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## CSIR

“The objectives of the CSIR are, through directed and particularly multi-disciplinary research and technological innovation, to foster, in the national interest and in fields which in its opinion should receive preference, industrial and scientific development, either by itself or in co-operation with principals from the private or public sectors, and thereby to contribute to the improvement of the quality of life of the people of the Republic, and to perform any other functions that may be assigned to the CSIR by or under this Act.”



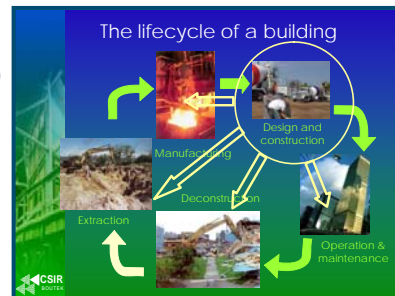
## Energy Conscious Design – Why?

- From a global resource position: Reduce dependence on oil and coal as major construction energy resources
  - Highlight opportunities and INCENTIVES to develop and explore alternative building technologies and practices to reduce energy demand
- Occupant and maintenance position: Cost reduction
  - Environmentally sound design can reduce the cost of energy use in the building by up to 80%
- Environmental position: Reduce impact on the environment
  - Climate change mitigation through reduced global air pollution (particularly CO<sub>2</sub>; NO<sub>x</sub> and SO<sub>x</sub>) related to construction and materials emissions
  - Occupant / resident health



## Construction & Operating Energy Inputs in Buildings

- Energy inputs:
  - Construction processes
  - Materials manufacturing
  - Demand (energy use in the building)
- Main systems / operating energy:
  - Heating / cooling
  - Ventilation
  - Lighting
  - Water heating
  - Demolition
  - Occupants
- Embodied energy
  - Direct; indirect and maintenance



## Energy & Built Environment Link

- Natural comfort
  - Energy for cooling and heating
- Environmental health
  - Related to energy use and practices in buildings; especially in dwellings at low-income community level
    - Cooking; space heating; lighting
- Sustainable energy in buildings & settlements
  - Settlement energisation options for renewable and alternative energy inputs
- Professional inputs / design
  - Applying an environmentally sound design ethos; consider impacts

## (Some) Energy Interventions

(across Business Units)

- Residential energy efficiency
- Green and intelligent buildings
  - Modeling
  - South African National Standards
- Sustainable settlements
  - Energy options; technical interventions; related social and behavioral research and knowledge application
- Spatial / urban form energy efficiency cost-benefit analysis
  - Incl. transportation and mobility impacts
- Sustainable cities

## Built Environment Perspective I

- Reflects national, international and CSIR recognition of sustainability and sustainable development (SD) and related KEY role of energy
- CSIR Built Environment perspective:
  - Provide information & knowledge on lifestyle and technology choices that support SD
  - Support government to implement SD policy directives
    - Demonstration linked to strategic priorities of country
    - Address demonstration gaps in market
    - Actively support partnerships with key stakeholders and broader community
  - Leadership i.t.o research, demonstration and innovation
- Demonstrate range of alternative technologies:
  - Interaction; impact and community integration; as well as the management of partnerships supporting such a comprehensive D&R facility



## Built Environment Perspective II

- Sustainable cities...
- Ecological and complexity (relational) perspective
- Modeling of city / regional resource flows
  - Net positive infrastructure
- Energy interventions and where changes could occur on municipal / regional level



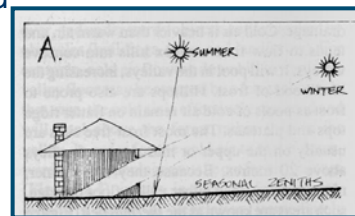
## Energy Efficient Housing – SA Case Study

- Sustainable Homes Initiative
  - Networking
  - Training
  - Technical assistance
  - Lobbying
- First comprehensive EE in low-income housing promotion programme in South Africa
  - Learning of implementation of over four years
  - Positioned current market readiness for EE promotion and uptake; DoH
    - Demonstration; Technical; Social; Cost-benefit



## Basic Principles

- Passive Solar Design: “Achieving indoor comfort by designing with nature, using sunshine, wind and night cooling together with the building materials” and “Energy flows naturally while the building responds passively, needing a minimum of imported energy”



*Primer For Energy Conscious Design - Dieter Holm & Reinold Viljoen (1996)*



## Environmentally Sound (low-income) Housing (ESH)

- ESH = energy efficiency, passive solar design, water efficiency and greening
- Sustainable housing:
  - Same concepts + locally available materials to be used by local communities and builders + climate sensitive + promotes comfortable quality housing legacy + promote informed choice
- Residential structures that are naturally thermally comfortable (warm in winter, cool in summer) and provide a healthy living environment by reducing household energy use and local and global air pollution

## Benefits of ESH

- Improved comfort of the home all year-round
- Reduced household space-heating requirements in winter
- Reduced energy bills that will allow home-owners to have spare money to pay for services
- Improved health and safety of occupants from reduced indoor smoke and fewer fires from faulty heating and cooking devices
- Improvement on the quality of life

## Integrated Design Approach

- **Passive Solar Design**
  - Orientation
    - awareness and design application = no-cost, early in design
  - Shading (roof overhang)
    - No-cost, if applicable material (usually cost intense)
  - Window placement and size
    - No cost
  - Thermal mass
    - No-cost
- **Energy Efficiency**
  - Ceilings & Insulation
    - Low-cost
  - Appliances and Fittings
    - Depends on level of finish
  - (CFLs and geyser and pipe cladding)
- **Water Efficiency**
  - Harvesting, permaculture, recycling & fittings
    - (Low-flow showerheads, tap aerators)
- **Urban Greening**
- **Community Interaction**
- **Context**



## SHI – Outputs for SA

- Interactive model
- Training Manuals for site managers and emerging contractors
- Established network of practitioners and professionals – still functioning
- Market development and readiness
- Policy inputs – DoH and DME

## Demonstration and Research Facility I

- Mainstream alternative technologies beyond basic demonstration
- Inspire
  - Inform
- Generate research possibilities
  - Educate
- Interactive (“living”) facility
- Training
- Rooted in understanding of technology vis-à-vis community acceptance and introducing technologies to communities



## Demonstration and Research Facility II

- Multi-use; multi-purpose spaces and structures
- Demonstrate (integrated alternative technologies)
- Integrated in CSIR activities / campus
- Address distinct market gap and compliment other demonstration sites and buildings
- Build on what is existing:
  - Site history
  - Wealth of knowledge
- Demonstrate a *range* of technologies
  - Not only traditional building technologies, also high-tech, cutting edge technologies



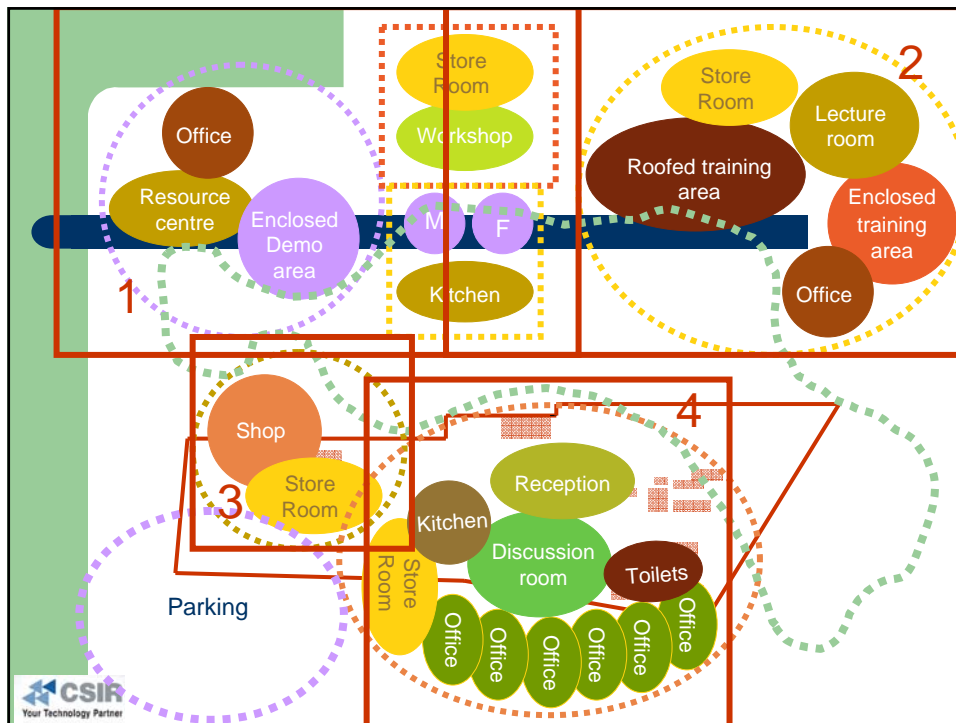
## Components

- Physical envelope
  - Structures
  - Site
  - Interface between the two
- Operation & Maintenance
  - Office building
  - Multi-functional (and use) facility
- Use
  - Demonstration
  - Research
  - Training / w/shops
  - Social impacts
- Partnerships
  - Networking
  - Information dissemination
  - Funding
  - Demonstration of new technologies
  - Marketing for products
  - Strategic support
  - Information sharing and networking
  - Build relationships i.t.o. use and maintenance
  - Ongoing income generation
- Financial management
  - Funding



## Existing CSIR Test Site





## What Are We Working With Currently?

- Existing site (costed and surveyed)
- Alternative construction technologies (demonstration)
- Outdated solar technologies!!
- **GAPS related to this discussion:**
  - **Alternative energy options & associated partnerships**
    - Building and site 'energisation'
  - **Integration of energy and construction technologies**
  - **Monitoring of interventions**
    - Design and construction options
    - Solar heating; PV; cutting edge and traditional technologies



## Opportunities For Collaboration

- Short Term
  - "Update" existing solar water heaters
  - Demonstrate new technologies
  - Link to other demonstration centers + strategic government priorities ("adopt a solar water heater")
  - Use existing infrastructure as base
- Medium Term
  - Consider site energisation options
    - Solar collector (CSIR project)
    - Off-grid and hybrid options for the site and buildings
- Longer Term
  - Demonstration building design (EE)
  - Virtual energy "streaming"
  - Modeling from Germany
    - For example – buying in RE from the solar sector

Partnerships + networking

Strategic priorities / new technologies

Funding opportunities

Communities / case studies + research opportunities

## Relevance To This Discussion

- Numerous points of intersection, however, for this discussion...
  - Spirit of fostering a partnership with Enerkey and stakeholders, in light of process and pilot projects
  - Exploring immediate and longer term opportunities for such a partnership with local cities and partners; e.g. inputs in the EE housing codes for JHB



## Thank You

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