

Statement of the Problem

- Significant attention is being placed on designing sustainable engineering technologies to reduce:
 - i. energy consumption,
 - ii. water consumption, and
 - iii. greenhouse gas (GHG) emissions
- Few sustainability assessment metrics and tools account for the local social, geographic, and economic conditions

Background

- KSA energy consumption/capita is 5215 kWh/cap (2006)
- Population of the city of Jeddah is ~3.4 million (2006)
- Energy consumption of Jeddah is 17.73 billion kWh (15% of KSA total)
- Water consumption of Jeddah is 73,000 liters/cap.(2008)

Methodology

• RETScreen Clean Energy analysis software was used to estimate power production, cost, and GHG emissions of :

- Power generation technologies:**
- i. Wind Turbine Systems
 - ii. Tidal Power Systems
 - iii. Wave Power Systems
 - iv. Photovoltaic (Solar) Systems

- Water technologies:**
- i. Solar Water Heater Systems
 - ii. Greywater Systems

Discussion

- Jeddah annual wind speed: 3.6 m/s
- Power generation capabilities of most wind turbines limited
- Red Sea geography limits the capabilities of tidal and wave power systems
- Jeddah annual daily solar radiation: 5.94 kWh/m²/day.
- PV and solar water heater systems are ideal candidates for power generation and heating.



Fig. 1: Arabic for Sustainability

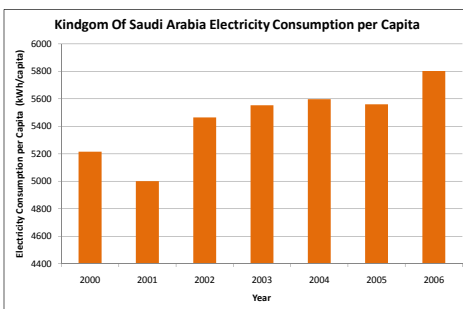
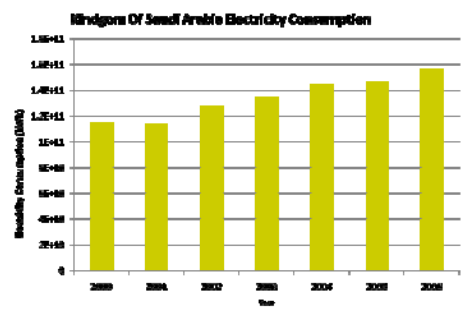


Fig. 2: Energy consumption of KSA and Jeddah

Results



Fig. 3: Wind Turbine and PV Electricity Capacity



Fig. 4: KAUST and Dar Al Hekma

Future Research

- Conduct user needs assessment of residents in Jeddah through collaboration with Dar Al-Hekma and KAUST.
- Identify manufacturers to implement the sustainable engineering technologies
- Refine initial list of appropriate engineering tech.
- Create technology and infrastructure roadmap
- Create database and website for collaboration