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***Is NDM a ‘Natural’  
for  
Sustainable Design Decisions?***

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# ***Sustainability: A new world goal***

- ❑ *Popularized by the UN World Commission on Environment & Development (1989).*
  - ❑ *“Meet the needs of the present without compromising ability of future generations to meet their needs.”*
  - ❑ *A dynamic balance among social well-being, economic opportunity, and environmental quality.*
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# ***Why Sustainability?***

□ *A development path that cannot be maintained (State of the World Indicators, 1998):*

– Yrs to insufficient land, northern diet	7	
– Yrs to insufficient land, southern diet	38	
– Species extinctions/day		104
– Yrs until half crude oil is gone	2	
– Yrs until 80% crude oil is gone	22	
– % Antarctic ozone depletion	70+	
– Yrs to doubling of atmospheric CO <sub>2</sub>	59	
– H <sub>2</sub> O availability		10

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# ***Sustainable Design***

- ❑ *Application of Sustainability philosophy to the design (here, **Architecture**).*
    - Also called “Green”, ‘Smart’, ‘High-Performance’ fields Distinction: ‘Green’ is improvement over std practice, ‘Sustainable’ is measured wrt normative ideals.
  - ❑ *Currently leading a **world revolution** in all design fields (and engineering).*
  - ❑ *What does it mean and how do you do it?*
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# ***Guiding Principles of Sustainable Design***

- ❑ *'A Wilderness Based Checklist – M. Wells*
  - ❑ *Nine Precepts for Ecology as basis for Design- John & Nancy Todd*
  - ❑ *The Hannover Principles – Bill McDonough*
  - ❑ *Design Strategies for Regenerative Design-John Tillman Lyle*
  - ❑ *Second Generation Ecological Design – Sim Van der Ryn*
  - ❑ *The Natural Step- Karl-Henrich Robert*
  - ❑ *BioCybernetic Design- Frederic Vester*
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# ***Getting our Heads around and our Hands on Sustainable Buildings***

- *How to use principles like:*
  - Design with Nature
  - Eliminate Waste
  - Biological equity in design
  - Recognize interdependence
  - Humans & Nature = Rights
  - Design reflects the bioregion
  - Uses renewable energy
  - Optimum levels for multiple functions
  - **First Form followed Function, then Form Followed Fiction, now Form Follows Flow**



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# ***A DM domain Made For NDM!***

- ❑ *Ill defined goals that keep evolving*
  - ❑ *Considerable inadequate or ambiguous information*
  - ❑ *Requires coordination from varied design team (Architect, engineer, Interior Designer)*
  - ❑ *Everyone is learning by doing*
  - ❑ *Sustainability impresses higher order goals*
  - ❑ *Feeling of real need to accomplish quickly*
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# ***The Path to Sustainable Design Decision Making***

- ❑ *First, embrace visible and immediate opps:*
  - Specify Recycled Content & salvaged materials, and sustainably harvested products.
  - Construction Waste Management.
  - Energy Efficient design.
  - Passive Solar and Daylighting.
- ❑ *Second, run competitions, study pathfinders, assess experience, develop local tools, e.g. LCA/EBA.*
- ❑ *Third, construct Sustainable and Green Building Design Guides and DM assists (98-'00}.*

# ***Current North American SD/GB Design Decision Making Systems***

- *At least 8 different systems or guides available:*
  - Simple Checklist (Environmental Bldng. News).
  - Points assignment in Categories (waste, energy, H2O, site, IEQ).
  - Hierarchical category ratings aligned to ISO 14000.
  - MAUM for products selection based on LCA (BEES).
  - Building Performance based on Emergy measure from natural ecosystems.

# Major GB/SD Rating Systems

- ❑ *LEED- USGBC, 7 prerequisites and 32 credits worth 64 points available in Site, H2O, Energy, Materials, & IEQ sections.*
- ❑ *Minnesota Sustainable Design Guide – CALA UMN, 50 points available in above sections ,+ waste.*



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# ***Critiques of Current SD Design Guides/Rating Systems (2<sup>nd</sup> Gen)***

- ❑ *1<sup>st</sup> generation were too difficult and/or confusing to use. All under revision.*
  - ❑ *Point systems miss the dynamic synergy and interleaved strategies of ecological building design.*
  - ❑ *Point systems can have hidden biases.*
  - ❑ *An assessment tool or a Design DM assist?*
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# ***Seeing SD as a domain for NDM***

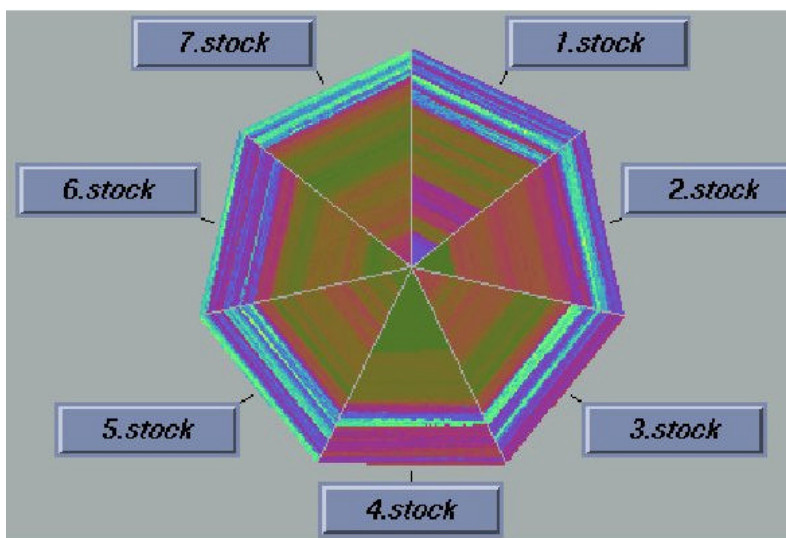
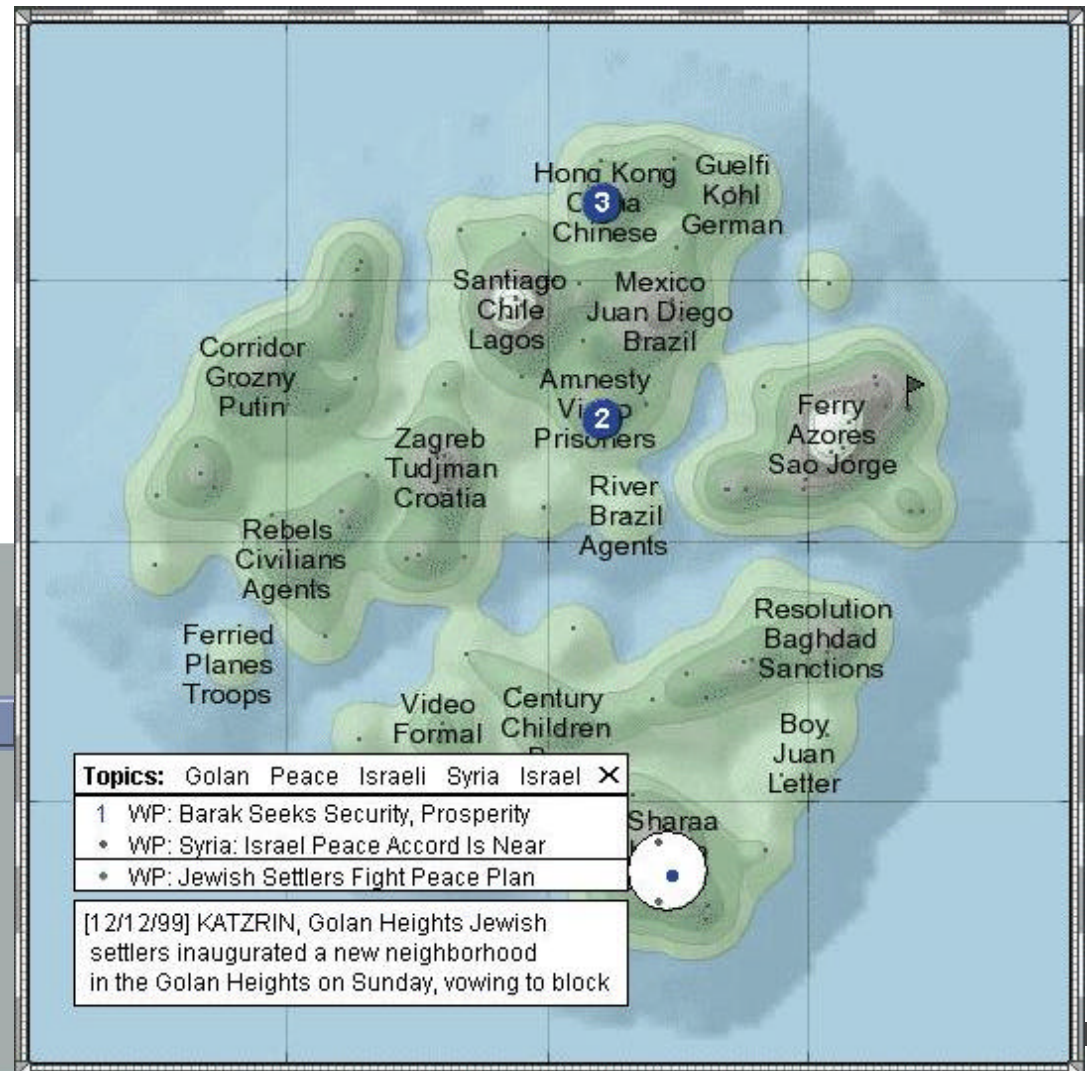
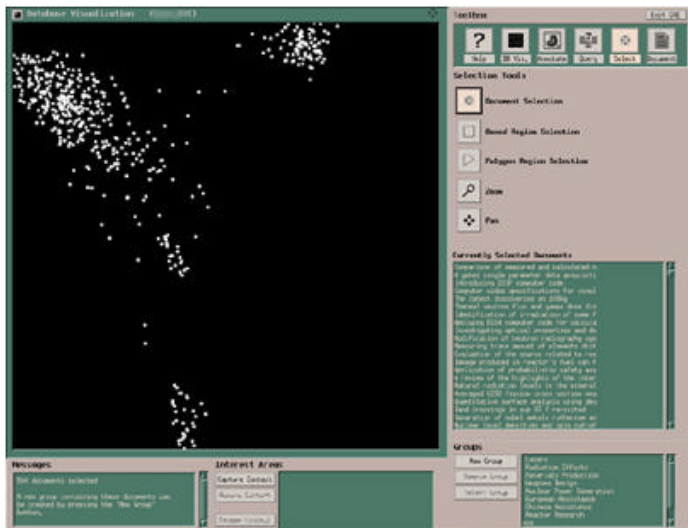
- *Design in general, and SD in particular, is a ‘wicked problem’, not well-defined and closed under ‘available alternatives’.*
    - Example: Oquirrh Park Speed Skating Oval roof used cable suspension structure to reduce steel by 1105 tons, air volume by 9% and HVAC system capacity accordingly.
      - Innovation credit (LEED) recognized, but did not suggest or ‘lead’ designers to that solution.
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## ***Seeing SD as a domain for NDM, II***

- ❑ *Recognize that major drivers of SD are cost savings, value of SB profile, and considerable occupant benefits.*
  - ❑ *Focus SD guides on structuring the path decisions designers have to make and on collaborative cmu tools for the design team.*
  - ❑ *Access components like BEES (MAU-based) for special selection or sustainability resolution issues.*
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*Information Visualizations offer means to sense design performance and guide buildings and systems into form.*



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# ***Decision Theory and Design: Together at Last?***

- ❑ *Visual thinking supported by rigorous modeling and access to simulation tools.*
- ❑ *Synthesis and search guided by criteria of Sustainable Design.*
- ❑ *An emergent 'convergence to pattern' between human and nature centered design.*

