Trista Patterson, PhD
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FOOTPRINTING FOR FUTURISTS:
Economic System

Energy & Material → Economic System → Waste
Energy & Material → Economic System → Waste
Recycling
Economic Subsystem
Waste
Energy & Material Inputs
Recycling
Nitrogen flow

Rockström et al.
Nature, Oct. '09

F.T. Chapin, U. AK Fairbanks
Marching Orders:

ISO 14001, EMS, ENERGY POLICY ACT OF 2005, EXECUTIVE ORDER 13423 AND THE LATEST EO 13514
GDP is a specialized tool

**Includes: activity**
- Net Exports
- Consumption Expenditures
- Government Expenditures
- Built Capital

**Excludes: Quality**
- Natural resource assets
- Ecosystem Services
- Social Capital
- Democracy
- Education
- Planetary limits
- Quality of life
- Pollution
Stewardship of the National Conservation Lands System
Stewardship of the Natural Capital Life-Support System
Vision
Land area

Courtesy: Worldmapper
Total population

Courtesy: Worldmapper
The Ecological Footprint

Tools:
Ecological Footprint

Worldmapper / Global Footprint Network
5 Footprint Areas

- Purchasing
- Water
- Transport
- Energy
- Waste
- Leadership
Footprint Area #1: Purchasing

“There will be a building called the Dragon Center. There will be dragon books, dragon movies for $2.29 and way more stuff about dragons.”
Better cell phone service would make Wrangell better. People could have more cell phones and could talk to each other more.

BY Hannah Miethe
Luxury Goods (Net Import)

Courtesy: Worldmapper
Timber Imports

Courtesy: Worldmapper
Forest Loss

Courtesy: Worldmapper
Footprint Area #2: Water
“the weather is going to change from rain, rain, rain, to sun, sun, sun!”

“But what if a flood comes and we all have to move? Or a drought, and we have no water?”

“Farm fish!”
Ground Water Depleted Aquifers
Footprint Area # 3: Fleet/Transport

More Snowmobiles!, A New ATV!
“In the future of Wrangell cars will fly. You could be flying with gravity boots and racing on floating tracks in the sky….or take a bus.”
Footprint Area #4: Energy
Fuels Use (in energy equivalents)
Declining discovery, difficult extraction = declining production
Footprint Area # 5: Waste
Carbon Dioxide Emissions
Embedded Carbon

(IEA, 2007, WRI 2006)
Species Extinctions
Species at risk
Footprint Area # 6: Leadership
“There will be different trees.”

“Better soil!”
Internet Use (the digital divide)
The Literacy Disparity

(Female Literacy is the strongest correlating factor for HDI improvement over time)
The richest fifth receives 82.7% of total world income.

The poorest fifth receives 1.4% of total world income.

Each horizontal band represents an equal fifth of the world's people.
Poverty
Stewardship of the Natural Capital Life-Support System
Vision: Living off the Interest

Natural Capital
Ecosystem Services
Societal Demands
Holy Crap! What the heck is he doing?!

Social Perception
Unintended Consequences
Wackernagel et al. 2007
Ecological Creditors and Ecological Debtors
Ecological Creditors and Ecological Debtors
Ecological Footprint (Vertical Axis) Versus the Human Development Index (Horizontal Axis)

Wackernagel et al 2007
Part IV:

TOOLS, SEEDS, SOLUTIONS
Carbon Emissions

Courtesy: Worldmapper
Tool: Valuable Case studies:

Green = National Forest System

Yellow = National Park System

Gold = National Wildlife Refuge

Purple = BLM/Private

Map: Greater Yellowstone Coordinating Committee
Cost Savings with 10%, 20%, and 30% Increases in Fuel Efficiency

* Costs are based on $3.00/gallon

10% 20% 30%

Comparison of GHG Emissions by Forest (metric tons CO₂e)

Mobile Sources
Purchased Electricity
Stationary Sources

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>Montana</th>
<th>Wyoming</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td>65 %</td>
<td>96.7 %</td>
</tr>
<tr>
<td>Oil</td>
<td>1.6 %</td>
<td>0.1 %</td>
</tr>
<tr>
<td>Gas</td>
<td>0.1 %</td>
<td>0.2 %</td>
</tr>
<tr>
<td>Other fossil fuels</td>
<td>0.1 %</td>
<td>0 %</td>
</tr>
<tr>
<td>Biomass</td>
<td>0.2 %</td>
<td>0 %</td>
</tr>
<tr>
<td>Hydro</td>
<td>33.1 %</td>
<td>1.3%</td>
</tr>
<tr>
<td>Nuclear</td>
<td>0 %</td>
<td>0 %</td>
</tr>
<tr>
<td>Wind</td>
<td>0 %</td>
<td>1.38 %</td>
</tr>
<tr>
<td>Solar</td>
<td>0 %</td>
<td>0 %</td>
</tr>
<tr>
<td>Geo-thermal</td>
<td>0 %</td>
<td>0 %</td>
</tr>
</tbody>
</table>

**TOTAL:** 100.1% 99.68%

Friendly competition
Stewardship of the Natural Capital Life-Support System
Approach: Mindset

These are our lungs.
Tool: Cultural Shift
Foundational Principles.
Tool: Lifecycle Analysis

Fuel Oil Heat - Biomass Heat = Δ Heat
Fuel Oil Carbon - Biomass Carbon = Δ Carbon

Biomass Options

Δ Heat
Δ Carbon

Truck
House
Factory
Trees
Boat
EU 27 total imports footprint = 827 million gha (5.4% the size of the global footprint). 78% comes from 20 countries (shown with arrows, + Switzerland).
Tool: Indicators

Earth Overshoot Day: Sept 25th, 2009

The day that we begin living beyond our ecological means is creeping ever earlier in the year as human consumption grows.
Approach: Biomimicry

Wild landscapes exhibit ‘genius of place’ in a way which is uniquely attuned to boundary conditions.
What settings make us most aware of our ‘place in things’, our ‘boundary conditions’, our ‘limits’?

“Climate” conditions
“Nutrient” conditions
“Social” conditions
“Temporal” conditions
Life friendly materials/ Benign manufacturing

Lotusan® paint
M.Zanowick/US EPA/Biomimicry Inst.
Lightweighting – Scots Pine
Trunks and branches of trees withstand external stresses through load-adaptive growth.
Eco-machine

Wastewater treatment without chemicals

Dr. John Todd (UVM)/ M. Zanowick US EPA / Biomimicry Inst.
Architecture: Learning from termites how to create sustainable buildings.

Passive Climate Control in the Eastgate Building, Harare Zimbabwe

conventional = status quo

sustainable = net zero (minimum)

regenerative = provides ecosystem services

"green" = better than average

Time to payback

Tongass Example
Approach:
Systems Analysis, Leverage Points, Strategic Intervention
“All the restaurants will have healthier foods so people will not get so round or sick.”
Choice Architecture
Which settings give us most cause to observe and to reflect?
Where are the most valuable conversations taking place?
Vision
We cannot manage what we do not measure.
Start where you are. Do what you can. Use the gifts you have.