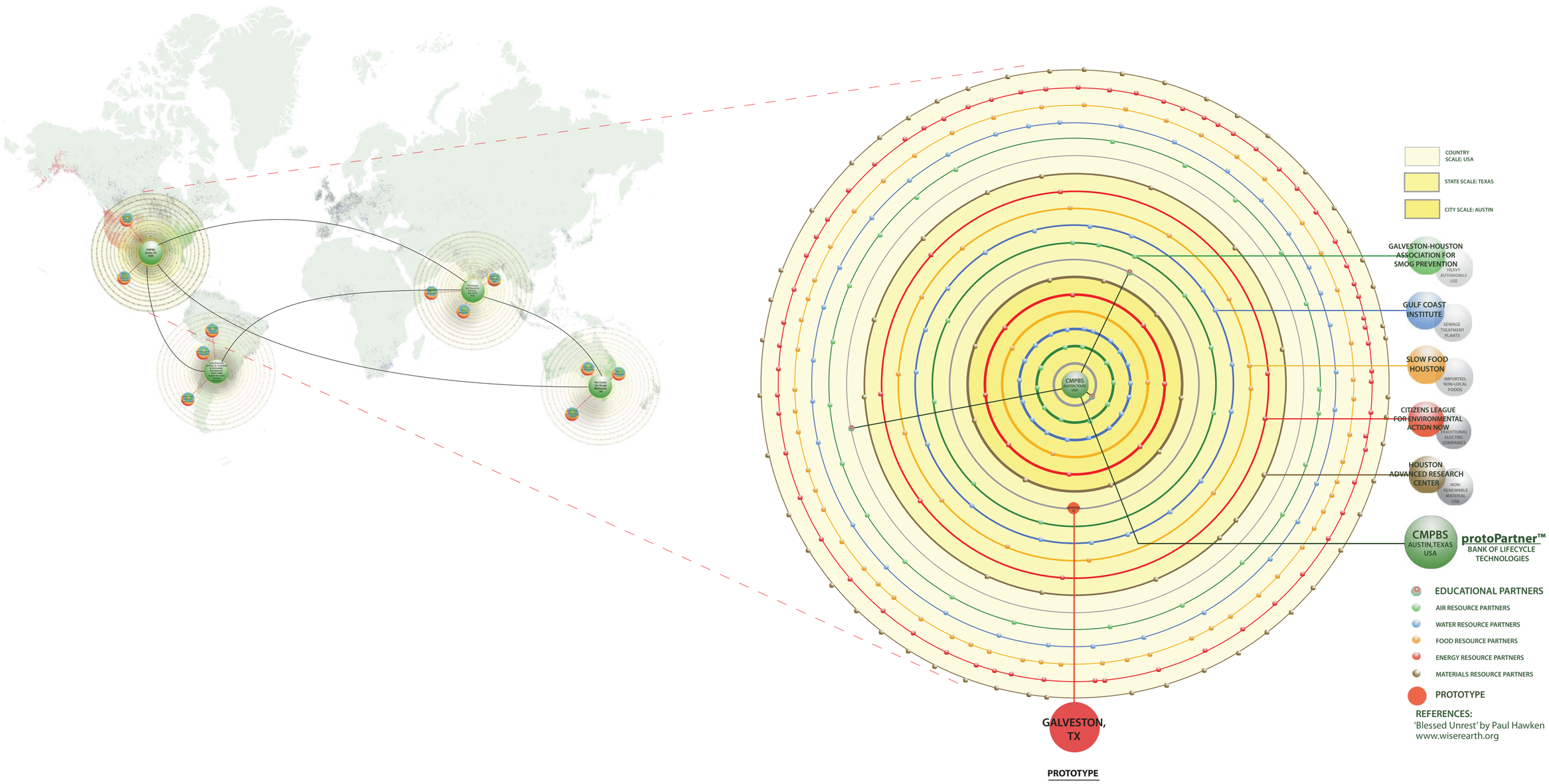
protoScope: Prototyping the Future



Original Concept Developed for 2009 Buckminster Fuller Challange

Primary Investigator:
Pliny Fisk III, Co-founder and Co-director, Center for Maximum Potential Building Systems

Lead Design Associate:
Ariel Fisk-Vittori, Center for Maximum Potential Building Systems

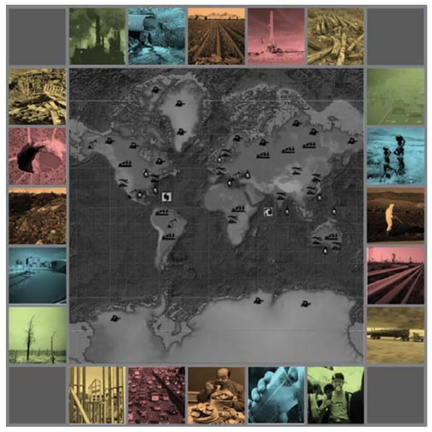
Design Associates:
Janis Fowler, Lovleen Gill Aulakh, and Jesse Miller; CMPBS

Research Associates:
Cassidy Ellis and Brady Zaitoon; CMPBS

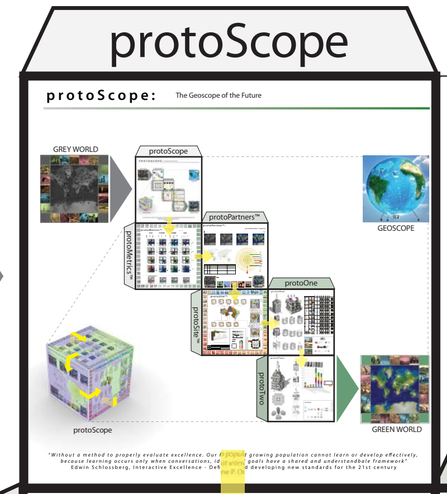
Concept updated by:
Samuel Brunswick, Charlie Candler, YoungJae Chung, Sabastijan Jemec, and Lauren Jones; CMPBS

protoScope: Prototyping the Future

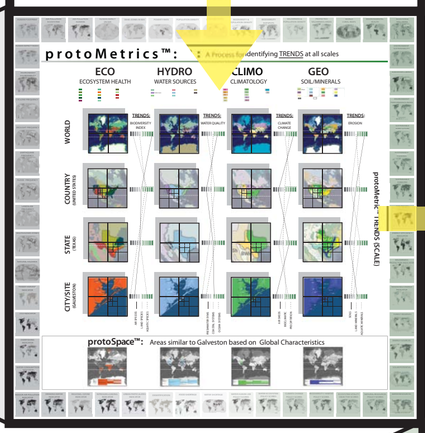
GREY WORLD



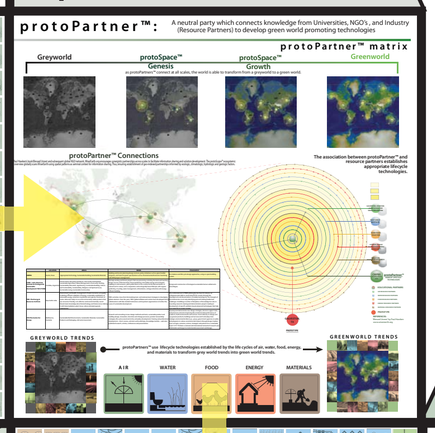
protoScope



protoMetrics™



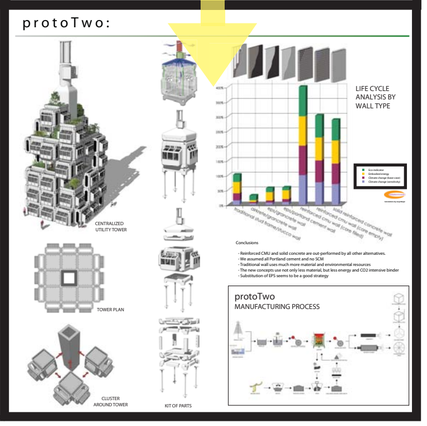
protoPartners™

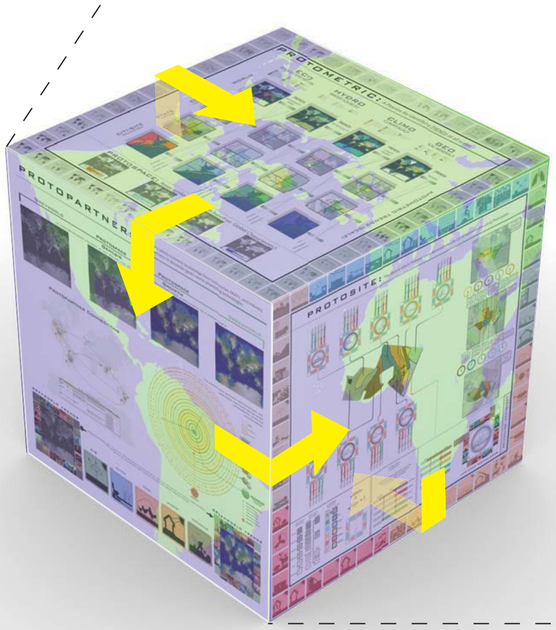


protoSite™

protoOne

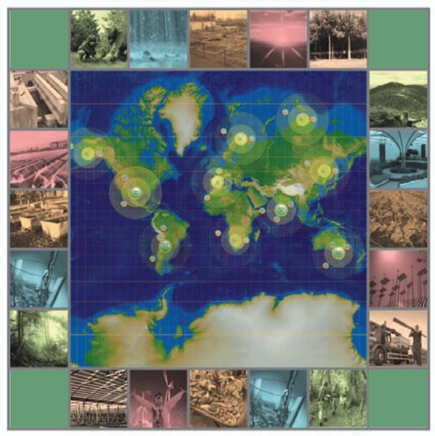
protoTwo





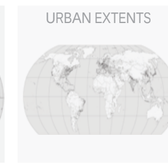
protoScope

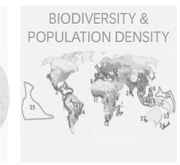
GEOSCOPE

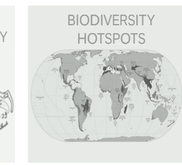


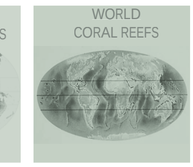
GREEN WORLD

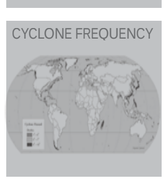
"Without a method to properly evaluate excellence. Our huge and growing population cannot learn or develop effectively, because learning occurs only when conversations, ideals and goals have a shared and understandbale framework"
Edwin Schlossberg, Interactive Excellence - Defining and developing new standards for the 21st century

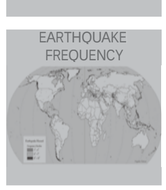


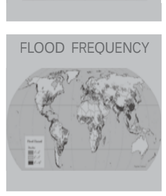


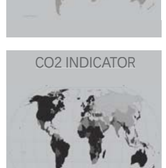


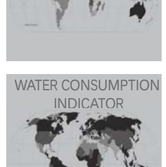


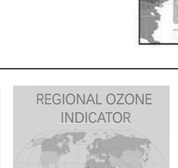


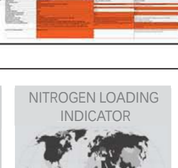


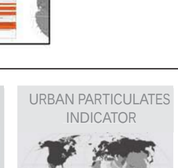


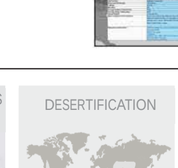


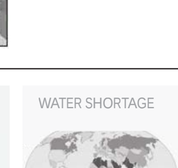


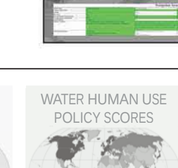


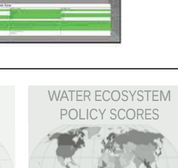


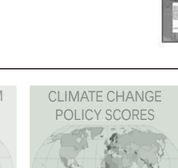


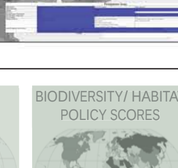












protoMetrics™:

A Process for identifying TRENDS at all scales

ECO
ECOSYSTEM HEALTH

Tropical & Subtropical Moist Broadlife Forests
Tropical & Subtropical Dry Broadleaf Forests
Tropical & Subtropical Coniferous Forests
Temperate Broadleaf & Mixed Forests
Mangroves
Boreal Forest/Taiga
Tropical & Subtropical Grasslands & Shrublands
Temerate Grasslands, Savannas & Shrublands
Temperate coniferous Forests
Flooded Grassland & Savannas
Montane Grasslands & Shrublands
Tundra
Mediterranean Forests, Woodlands & Scrubs
Deserts & Xeric Shrublands

HYDRO
WATER SOURCES

Arctic Ocean
Pacific Ocean
Atlantic Ocean
Indian Ocean
American Mediterranean Sea
Mediterranian Sea
Frozen Basin
Endoheric Basin

CLIMO
CLIMATOLOGY

Af Humid Equatorial - No Dry
Am Humid Equatorial- Short Dry
Aw Humid Equatorial- Dry Winters
BS Semiarid
BW Arid
Cf Humid Temperate- No Dry
Cw Humid Temperate - Dry Winters
Cs Humid Temperate- Dry Summer
Df Humid Cold- No Dry
Dw Humid Cold
E Cold Polar- Tundra & Ice
H Highland Climate

GEO
SOIL/MINERALS

Alfisols
Andisols
Ardisols
Entisols
Gelisols
Histosols
Inceptisols
Mollisols
Oxisols
Spodosols
Ultisols
Vertisols
Rocky Land
Shifting Sand
Ice/Glacier

WORLD

COUNTRY (UNITED STATES)

STATE (TEXAS)

CITY/SITE (GALVESTON)

TRENDS: BIODIVERSITY INDEX

TRENDS: WATER QUALITY

TRENDS: CLIMATE CHANGE

TRENDS: EROSION

AIR SPECIES
LAND SPECIES
AQUATIC SPECIES

FRESHWATER SYMS
COASTAL SYSTEMS
OCEAN SYSTEMS

AIR SHEDS
BIOCLIMATIC
PRECIPITATION

SOILS
LAND MINERALS
AQUATIC MINERALS

protoMetric™ TRENDS (SCALE)

protoSpace™: Areas similar to Galveston based on Global Characteristics

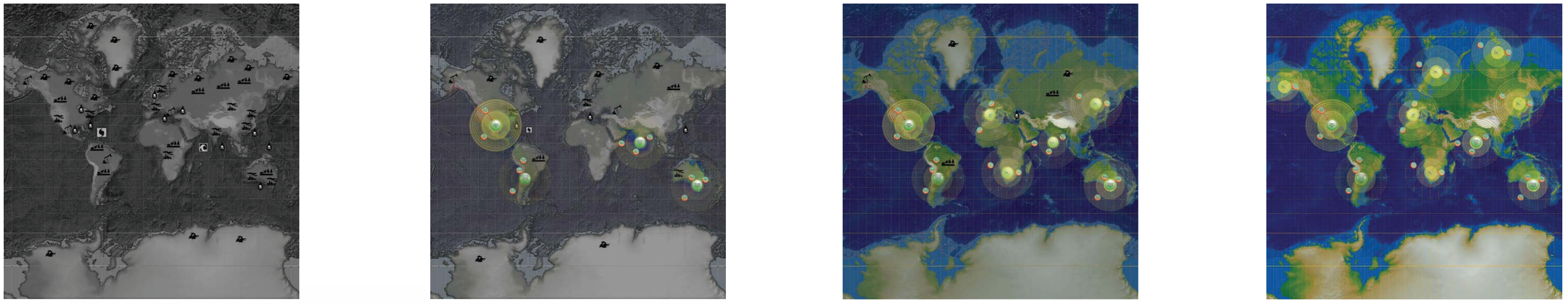
protoPartner™:

A neutral party which connects knowledge from Universities, NGO's , and Industry (Resource Partners) to develop green world promoting technologies

protoPartner™ matrix

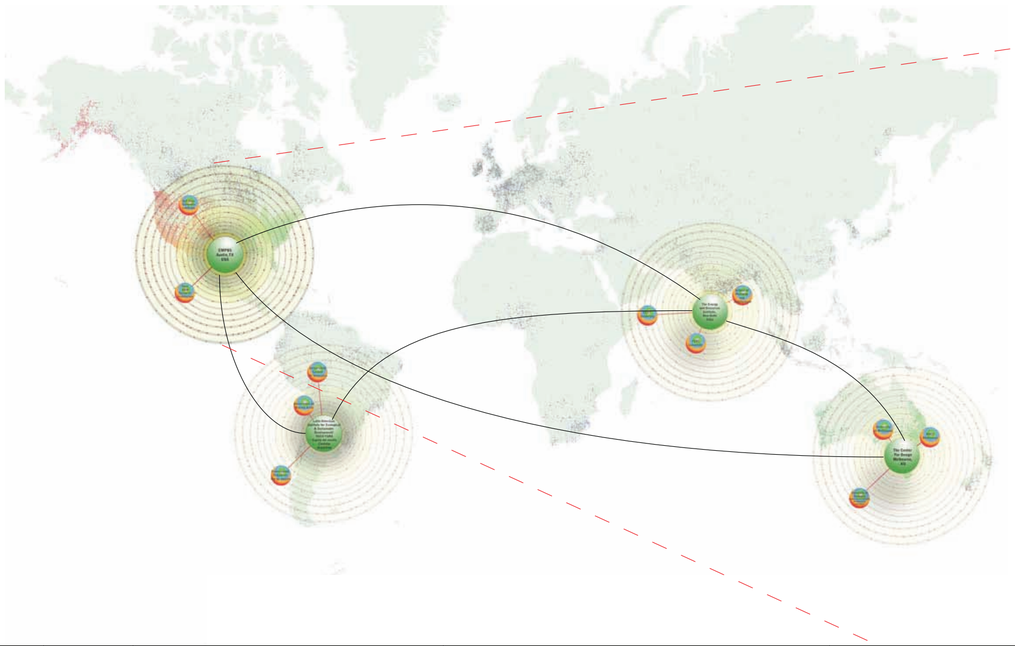
Greyworld → **protoSpace™ Genesis** → **protoSpace™ Growth** → **Greenworld**

as protoPartners™ connect at all scales, the world is able to transform from a greyworld to a green world.

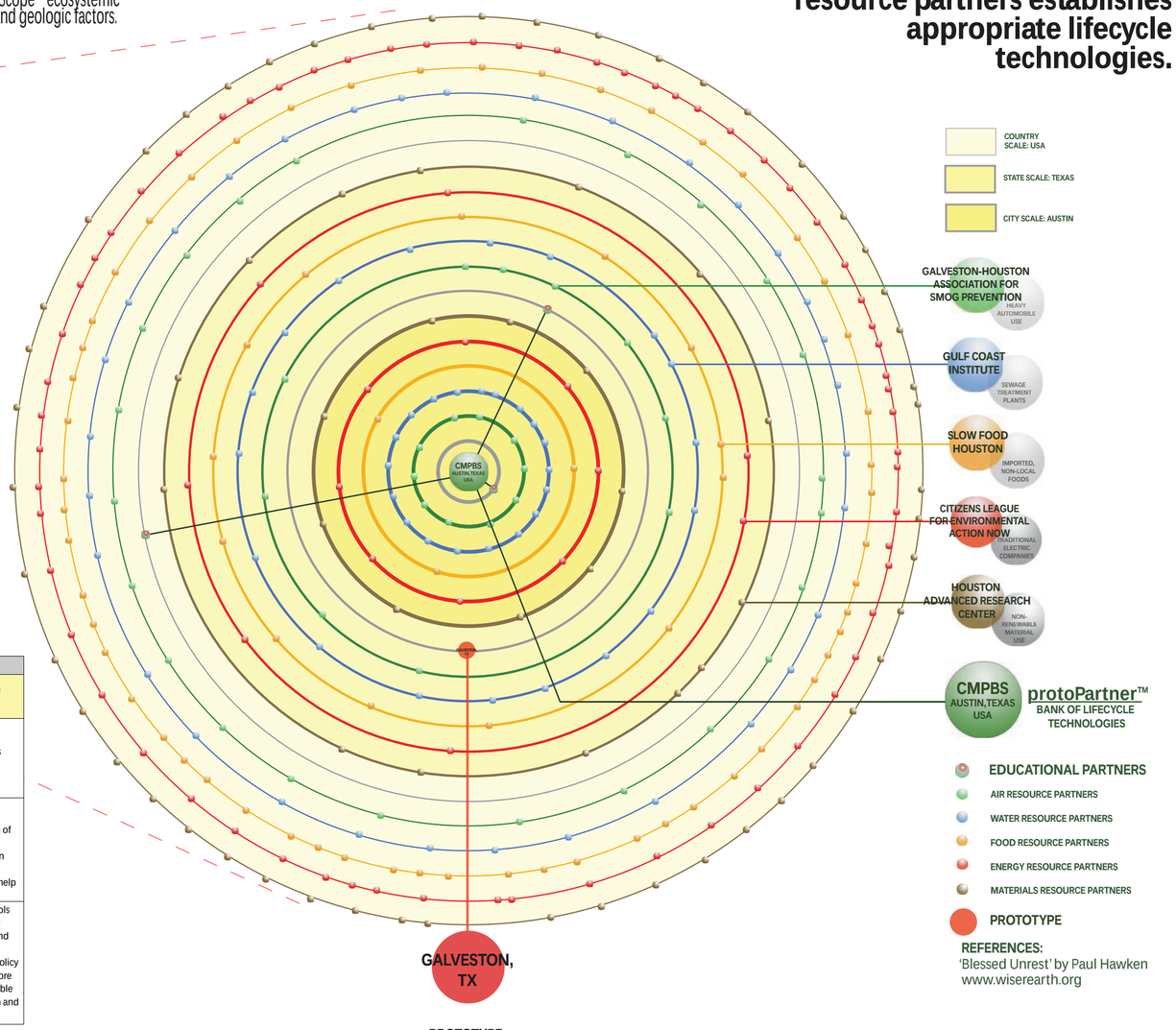


protoPartner™ Connections

Paul Hawken's book Blessed Unrest and subsequent global NGO network, WiserEarth.org encourages synergistic partnerships across scales to facilitate information sharing and solution development. The protoScope™ ecosystemic overview globally scans WiserEarth using spatial patterns as seminal context for information sharing. Thus, ensuring establishment of geo-indexed partnerships informed by ecologic, climatologic, hydrologic and geologic factors.



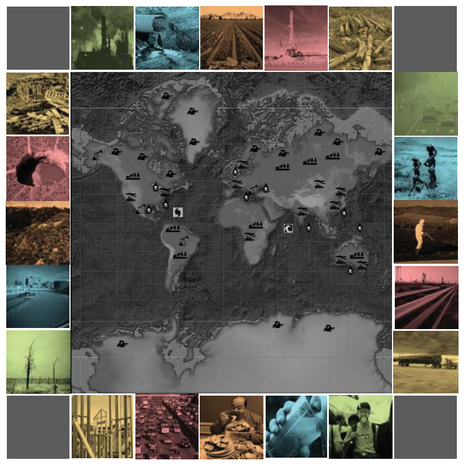
The association between protoPartner™ and resource partners establishes appropriate lifecycle technologies.



REFERENCES:
'Blessed Unrest' by Paul Hawken
www.wiserearth.org

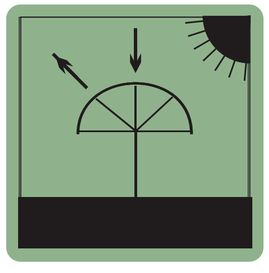
	LOCATION	AREAS	WORK	PHILOSOPHY
CMPBS	Austin, Texas	Appropriate Technology, Sustainable Building, Sustainable Materials	Building and master planning design, lectures, policy initiatives such as green builder programs, and tools for green specification such as Environmental/Economic baselining and LEED project management.	Eco-balance and life cycle design approaches, using an open-building system
ILDES - Latin-American Institute for Ecological & Sustainable Development/ YACU YURA	Cordoba, Argentina	Permaculture, Recycling and Reuse, Community Participation, Sustainable Agriculture, Waste Management, Community Training, Sustainability Education, Agroforestry, Sustainable Building, Culture and Sustainability, Sustainability, Religious and Spiritual Issues, Sustainable Living, Sustainable Communities	We help existing and future projects that are preserving, restoring the land, and teaching design courses of Permaculture, forest gardening, renewable energy and ecological building in Latin America. yACU-yURA wants to be a center for the demonstration of attunement to nature, and a cooperative and ecologically based lifestyle; with organic gardening, recycling, water management, reforestation, cottage industries and energy-efficient building	Design and construction of Ecological sustainable human settlements (Ecovillages).
TERI -The Energy & Resources Institute	New Delhi. India	Environment and health, management of water resources, air quality modeling, Efficient utilization of energy, sustainable exploitation of renewable energy, reduction in pollution and effective treatment of waste. Advocate ready-to-use and commercially viable products that are consumer-friendly, cost-effective and environmentally sound. Disseminate knowledge about biotechnology and bioresources linking it with bioremediation, plant tissue culture and plant genetic engineering.	TERI's activities move from formulating local- and national-level strategies to developing global solutions. Over the years, TERI's global affiliates and centers have developed strong collaborations with like-minded institutions and important organizations to further the cause of sustainable development.	The central element of TERI's philosophy has been its reliance on entrepreneurial skills to create benefits for society through the development and dissemination of intellectual property. The strength of the Institute lies in not only identifying and articulating intellectual challenges straddling a number of disciplines of knowledge but also in mounting research, training and demonstration projects leading to development of specific problem-based advanced technologies that help carry benefits to society at large.
CFD-The Centre For Design	Melbourne, Australia	Sustainable Built Environments, Sustainable Materials, Sustainable Products and Packaging, Life Cycle Assessment	Research and consulting in new design methods and tools, sustainable product and building design, innovation, transition and change processes, product stewardship strategies, life-cycle assessment (LCA), and policy development, Training and professional development—short courses, seminars and workshops, Knowledge transfer—web sites, published research, articles, conferences and presentations	Develop and demonstrate new design strategies, decision support tools and processes aimed at improving the environmental performance of products, built environments and services. Assist industry to design and use greener products, buildings and services and to develop more strategic environmental directions •advise government agencies on policy and programs to reduce environmental impacts through design. Explore new concepts, scenarios, actions, strategies and policies for a sustainable future; and •maintain a national and international network of research and information exchange in environmental assessment and design.

GREYWORLD TRENDS

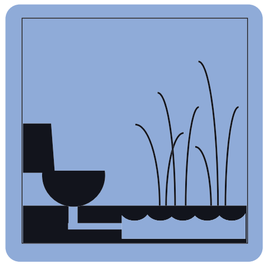


protoPartners™ use lifecycle technologies established by the life cycles of air, water, food, energy, and materials to transform grey world trends into green world trends.

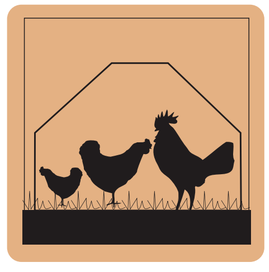
AIR



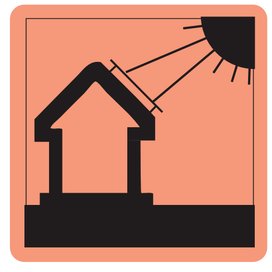
WATER



FOOD

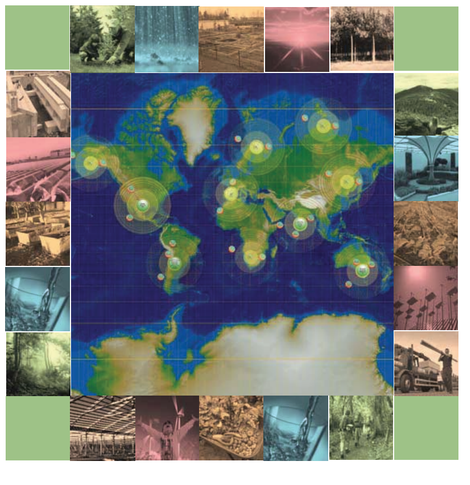


ENERGY



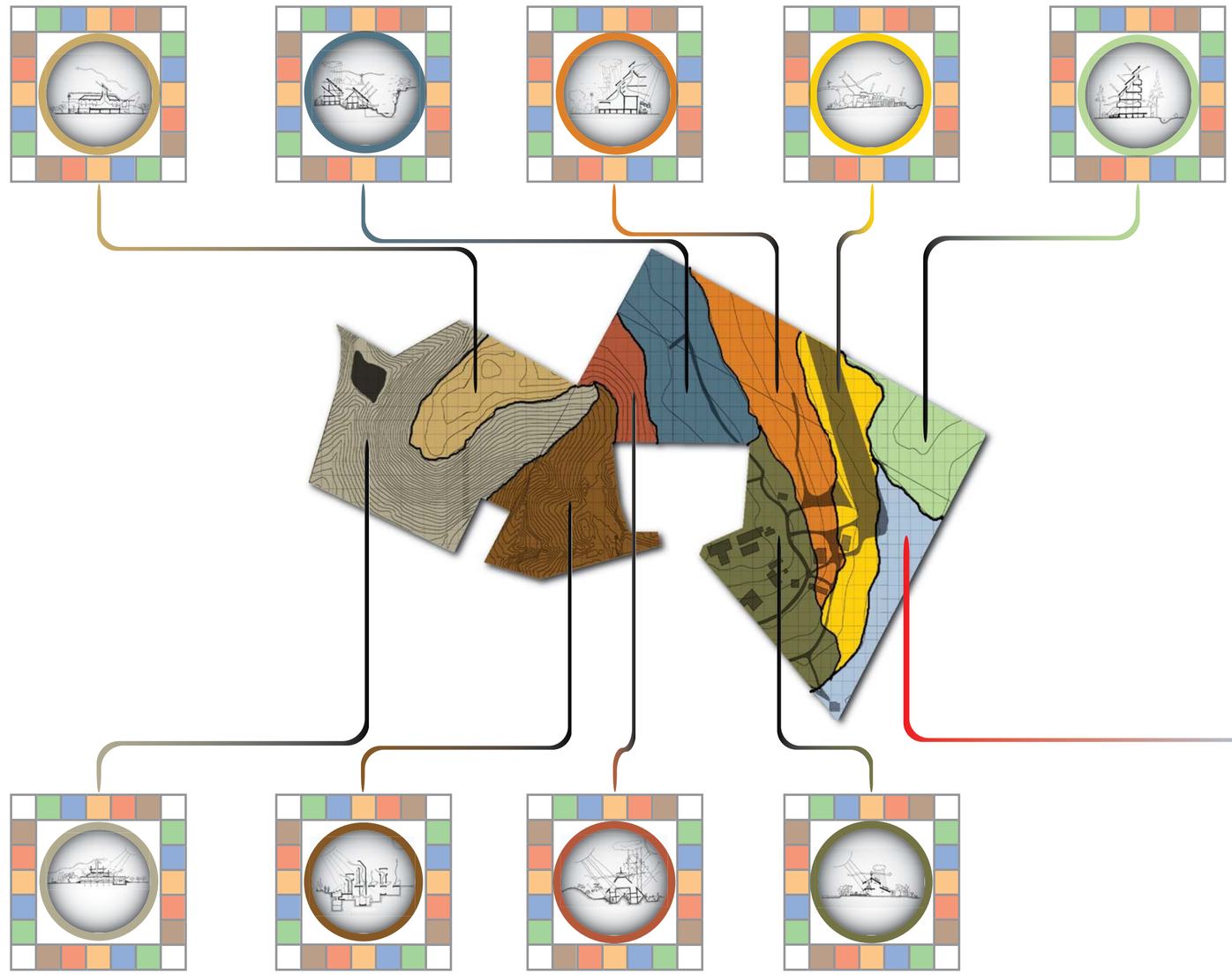
MATERIALS

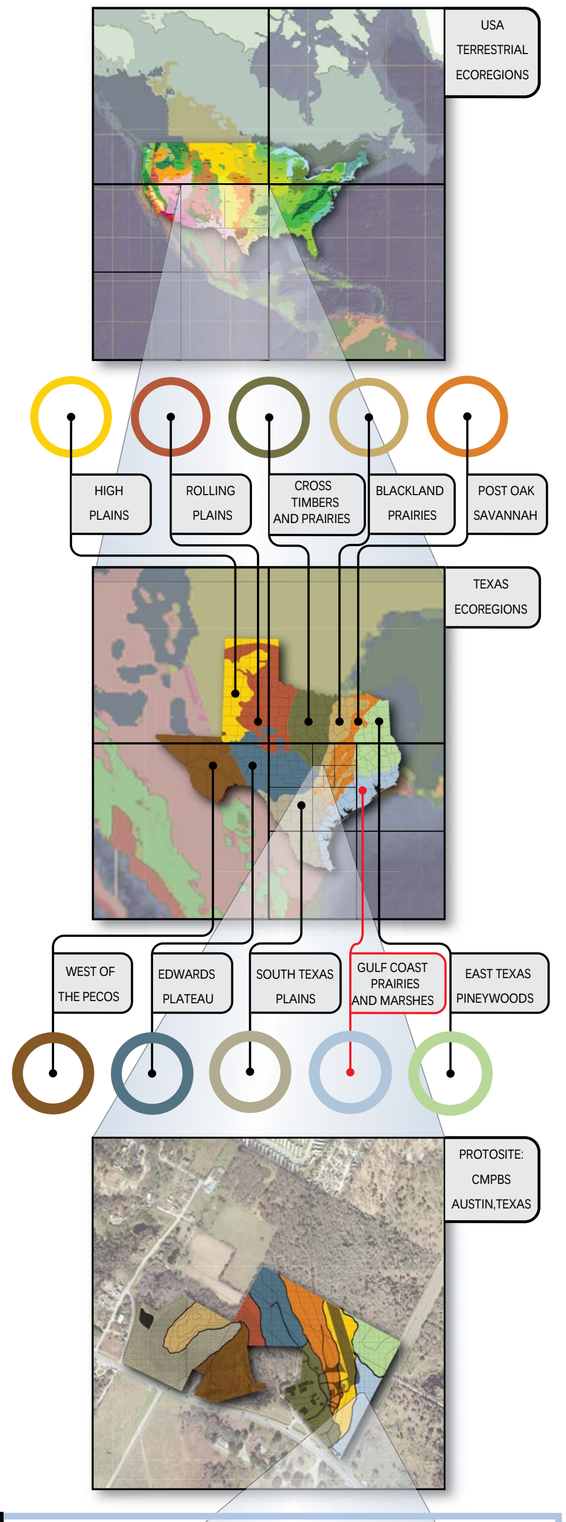
GREENWORLD TRENDS



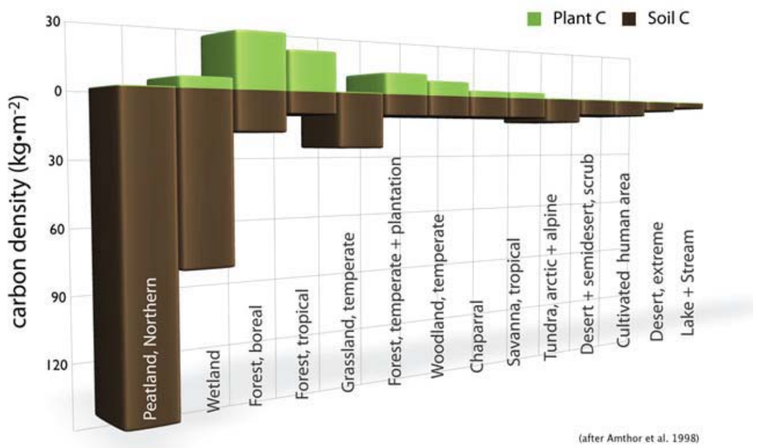
protoSite™:

The place in which protoPartners™ demonstrate Life Cycle Technologies using prototypes





CARBON OFFSET BY ECOSYSTEM



Wetlands Sequester on average 64% more carbon than cultivated land and 94% more carbon than urbanized areas.

Reestablishment of a wetland ecosystem along 367 miles of Texas Coastline would sequester 3.4 million tonnes of carbon per year, an average offset of 0.2% of annual US emissions

Ecosystem Carbon O□set

Ecosystem	NPP (gC/m2/yr)
Wetland	1180
Cultivated Cropland	425
Human Area	100
Grassland Temperate	350

Land Areas to be Reforested

	Length	Area (miles)	Area (meters square)
Galveston	N/A	64	165,759,239
Texas	367	1101	2,851,576,909
US	12380	37140	96,192,158,405

Total Carbon O□set by Ecosystem (tonnes)

	Galveston	Texas Coastline	US Coastline
Wetland	195,596	3,364,861	113,506,747
Cultivated Cropland	70,448	1,211,920	40,881,667
Human Area	16,576	285,158	9,619,216
Grassland Temperate	58,016	998,052	33,667,255

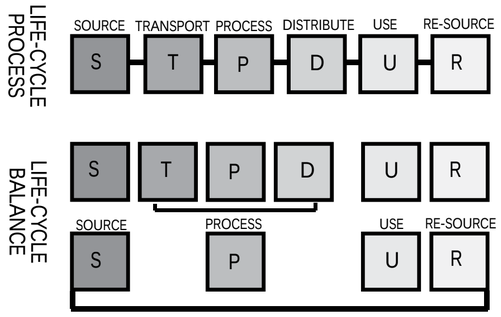
Proportion of US Annual Carbon Emissions*

	Galveston	Texas Coastline	US Coastline
Wetland	0.012%	0.204%	6.880%
Cultivated Cropland	0.004%	0.073%	2.478%
Human Area	0.001%	0.017%	0.583%
Grassland Temperate	0.004%	0.060%	2.041%

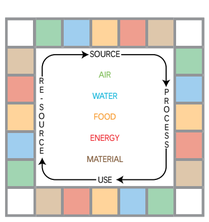
Assumptions

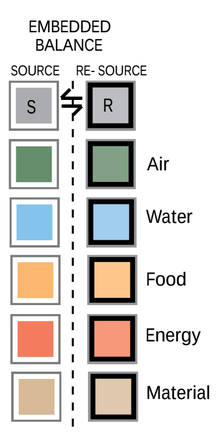
Coastline area is calculated as length of coast multiplied by 3 miles inland
Annual US CO2 emissions: 6,049,435,000 tonnes/yr
Proportion of Carbon in CO2: 27.2%
Annual US Carbon emissions: 1,649,845,909 tonnes/yr

ECOBALANCE SYSTEMATICS

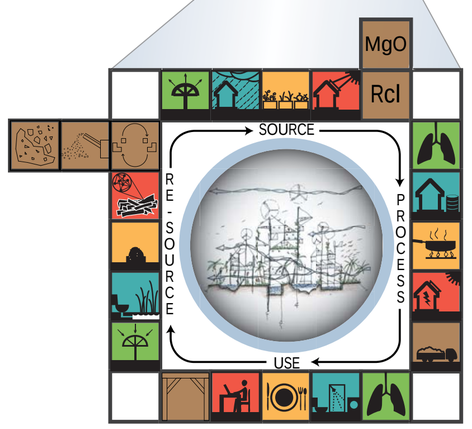


$$\frac{\text{SOURCE (S)}}{\text{re - SOURCE (r)}} = \frac{\sum \text{SOURCE}}{\sum \text{re - SOURCE}} = 1$$





PROTOTYPE: GALVESTON



Database Resources

World Wildlife Fund Wild□nder

National Geographic Wild World

IUCN Red List

Pattern Finding Resources

Michael Lynch

IBM's Stream Processing Software

ISI's Web of Knowledge

Paul Hawken's WiserEarth.org

Munich Re Group
NATHAN (NATural Hazards
Assessment Network)

National Science Foundation
Earthscope Scienti□c Community

Janine Benyus' AskNature.org

Global Impact & Vulnerability Alert System

CISCO / NASA
Planetary Skin Institute

Global Earth Obversation
System of Systems (GEOSS)

International Cooperation

Information Networking

Database Resources

WildFinder *is a map-driven, searchable database of more than 26,000 species worldwide, with a powerful search tool that allows users to discover where species live or explore wild places to nd out what species live there. Containing information on birds, mammals, reptiles, and amphibians, Wild nder is a valuable resource for scientists, students, educators, travelers, birdwatchers and nature enthusiasts alike.*

National Geographic's Wild World *maps and makes them interactive, adding pro les and photos of more than 1,000 ecoregions, multimedia features, and more. Scientists have mapped 867 land-based ecoregions across the globe. Instead of being de ned by political boundaries, each is distinguished by its shared ecological features, climate, and plants and animal communities.*

The **IUCN Red List of Threatened Species**™ *is widely recognized as the most comprehensive, objective global approach for evaluating the conservation status of plant and animal species. The goals of the IUCN Red List are to: identify and document those species most in need of conservation attention if global extinction rates are to be reduced; and provide a global index of the state of change of biodiversity.*

ISI Web of Knowledge *provides one platform for access to objective content and powerful tools that let you search, track, measure and collaborate in the sciences, social sciences, arts, and humanities.*

WiserEarth *is a free online community space connecting the people, nonpro ts and businesses working toward a just and sustainable world. WiserEarth helps the global movement of people and organizations working toward social justice, indigenous rights, and environmental stewardship connect, collaborate, share knowledge, and build alliances.*

AskNature, *the online inspiration source for the biomimicry community. Think of it as your home habitat—whether you're a biologist who wants to share what you know about an amazing organism, or a designer, architect, engineer, or chemist looking for planet-friendly solutions. AskNature is where biology and design cross-pollinate, so bio-inspired breakthroughs can be born.*

The **GIVAS** *links together existing early warning systems and attempts to make better use of new innovative ways of collecting real time data. The system is both intended to show impact (i.e. what's happening right now) and raise alarm bells as to potentially dramatically worsening vulnerabilities (i.e. what could happen if we don't act). It's main purpose is to ensure that we have the information and analysis needed to protect our most vulnerable populations against crisis.*

Pattern Finding Resources

Wolfram|Alpha's *long-term goal is to make all systematic knowledge immediately computable and accessible to everyone. We aim to collect and curate all objective data; implement every known model, method, and algorithm; and make it possible to compute whatever can be computed about anything. Our goal is to build on the achievements of science and other systematizations of knowledge to provide a single source that can be relied on by everyone for de nitive answers to factual queries.*

Autonomy *can almost be thought of as an intelligent operating system, sitting on top of the actual operating system. The core technology (IDOL) provides a platform for the automatic categorization, hyperlinking, retrieval and pro ling of unstructured information, thereby enabling the automatic delivery of large volumes of personalized information. Autonomy's technology is used across virtually every software application handling unstructured and semi-structured information - whether Enterprise Portals, CRM, Business Intelligence, Knowledge Management or E-Business Applications – and in virtually every industry vertical market.*

As the amount of data available to enterprises and other organizations dramatically increases, more and more companies are looking to turn this data into actionable information and knowledge. Addressing these requirements require systems and applications that enable e cient extraction of knowledge and information from potentially enormous volumes and varieties of continuous data streams. **IBM's System S** *provides an execution platform and services for user-developed applications that ingest, lter, analyze, and correlate potentially massive volumes of continuous data streams.*

The **EarthScope** *scienti c community is conducting multidisciplinary research across the Earth sciences utilizing the freely accessible data from geophysical instruments that measure motions of the Earth's surface, record seismic waves, and recover rock samples from depths at which earthquakes originate.*

NATHAN *presents the most up-to-date geoscienti c expertise and provides services such as interactive maps of natural hazards, extracts from the MR NatCatSERVICE database and country pro les that include socioeconomic and hazard data.*

GEOSS *will be a global and exible network of content providers allowing decision makers to access an extraordinary range of information at their desk. This 'system of systems' will proactively link together existing and planned observing systems around the world and support the development of new systems where gaps currently exist. It will promote common technical standards so that data from the thousands of di erent instruments can be combined into coherent data sets.*

Planetary Skin *Institute will research, develop and prototype an approach to provide near-to-real-time global monitoring of environmental conditions and changes. This will deliver the required decision support capabilities to manage global resources, risks and build environmental markets.*

International Cooperation

Information Networking

Austin Green Building Program:

AUSTIN ENERGY® GREEN BUILDING

Green Building Programs Across the Country

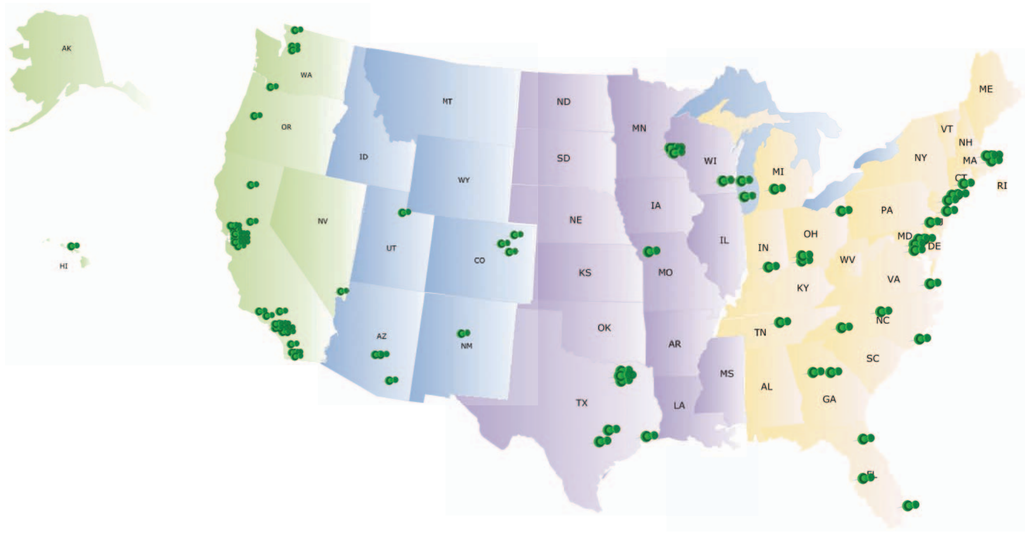
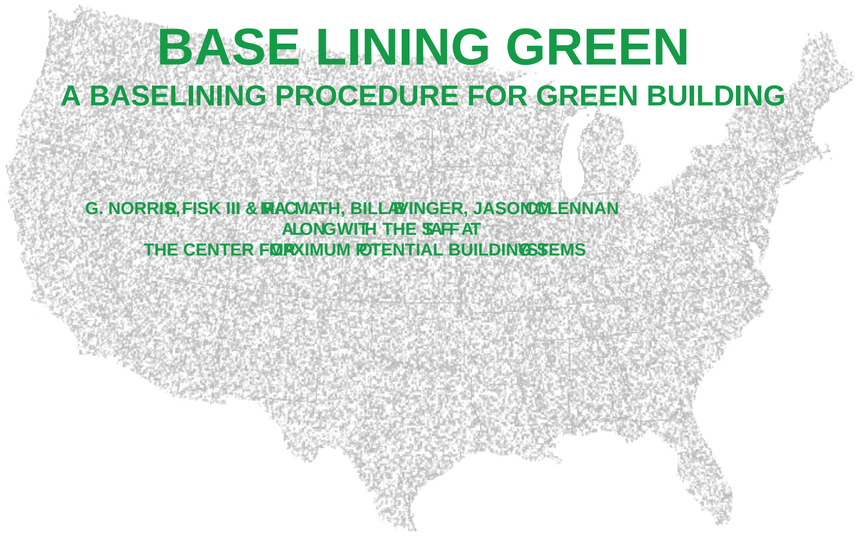
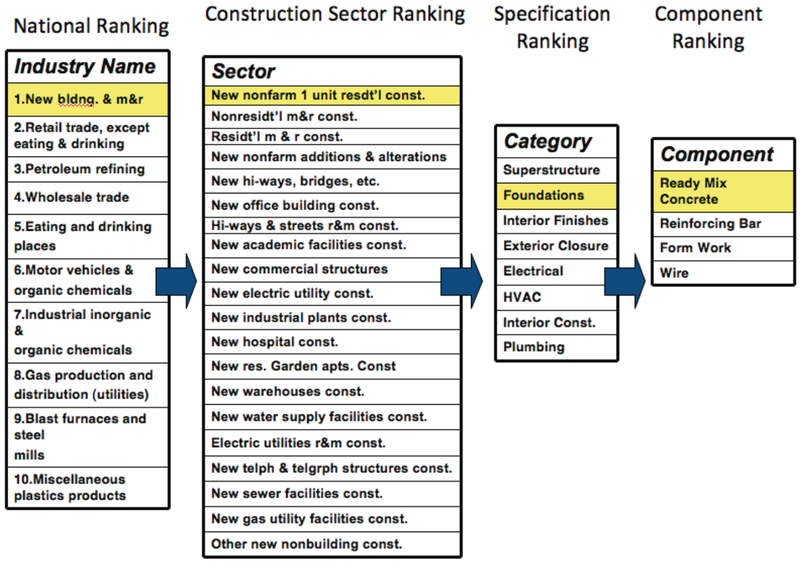


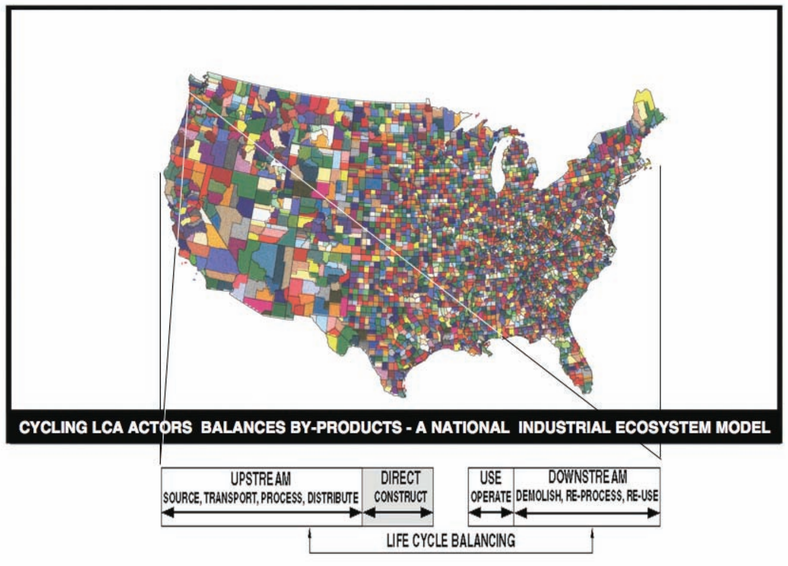
Image: Brooks Rainwater. *Local Leaders in Sustainability, A Study of Green Building Programs in Our Nation's Communities.* American Institute of Architects, 2007

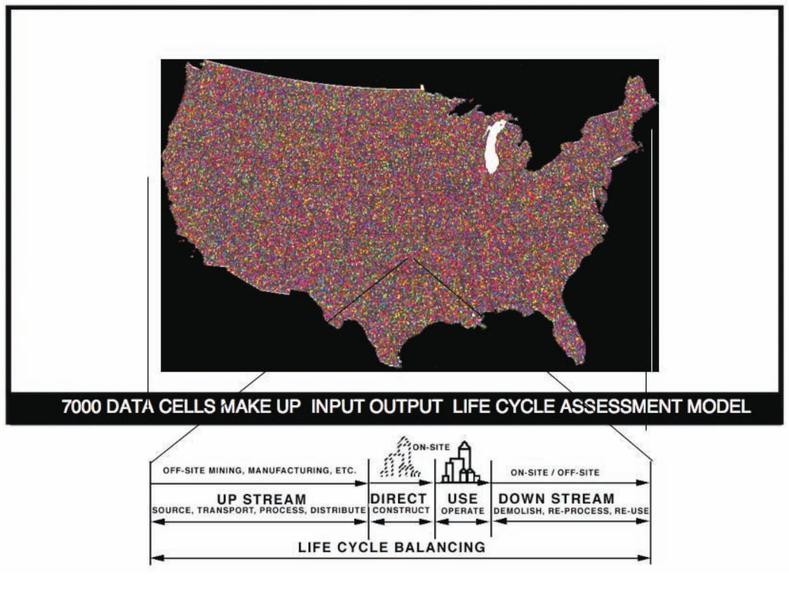
Rio Earth Summit 1992
Local, national and international action

BaseLine Green™:





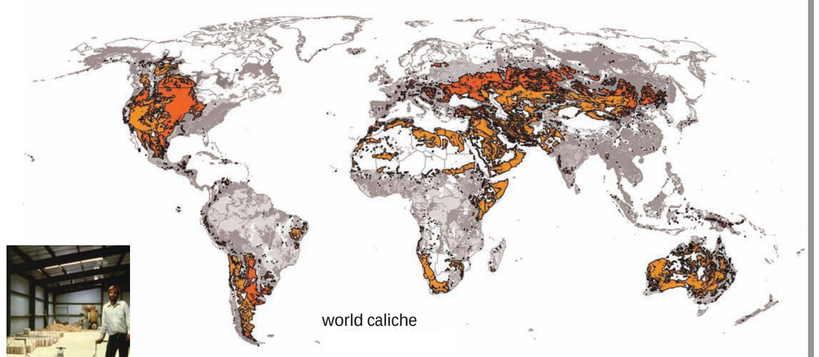




metasystems:

Caliche Building

torba beda
tafezza
catch
canto blanco
ucei
nari
beck-kolk
canapace calcaire
bhata
chebi-chebi
tepeta te
steppen kalk
dhandla
rimrock
tufa
croute calcaire
mbuga
travertine
giglin, jijilin
caatinga
paree
kafkalla havara


world caliche

caliche block maker

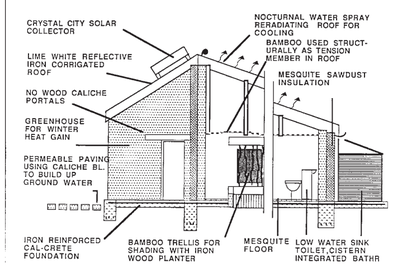

advanced green building demo


caliche block maker

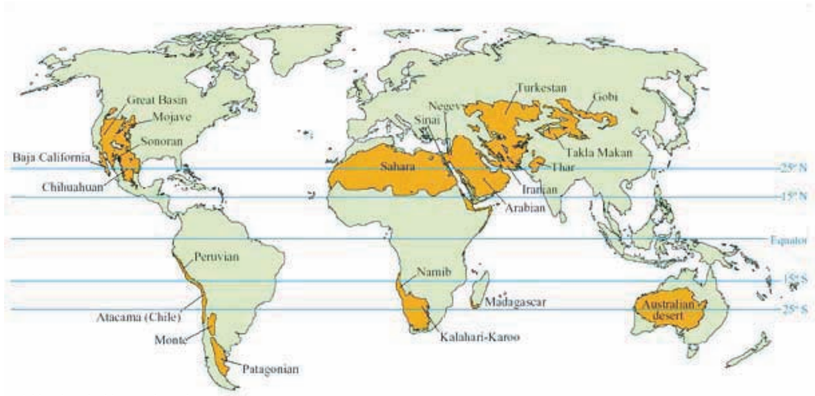

ingram school


making caliche brick

carrizo springs caliche/sawdust building



Farming In (Semi) Arid Zones



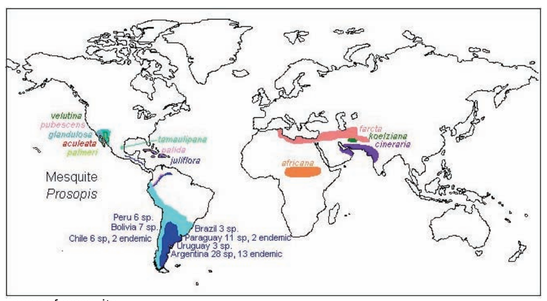
Arid and semi-arid zones shown in orange.


Photos, right
Demonstration farm,
Laredo, Texas

Mesquite


mesquite research


mesquite tree



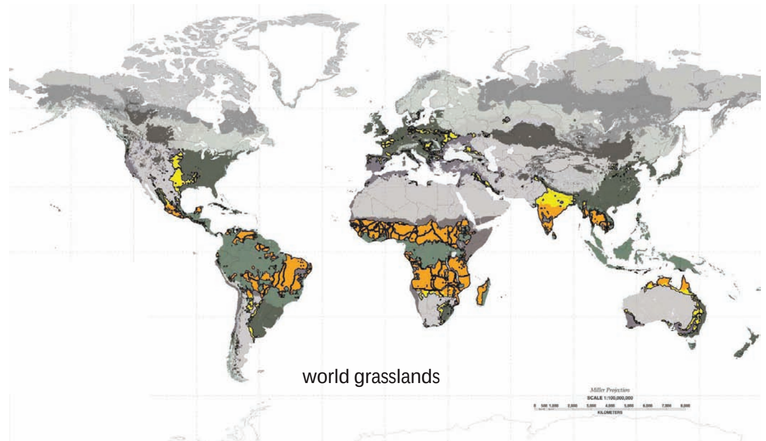
range of mesquite


mesquite pancakes

mesquite fuel


texas a&m solar decathlon 2005

Straw Building in Grasslands


world grasslands

straw bale construction


carpenter house

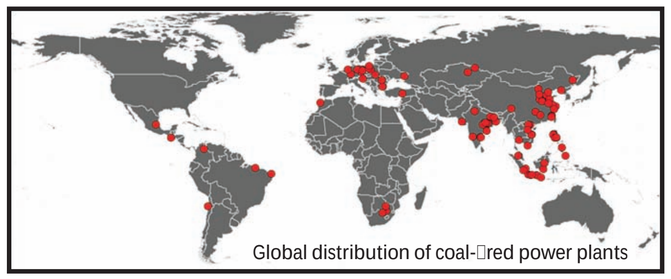

laredo demonstration farm


zucker house

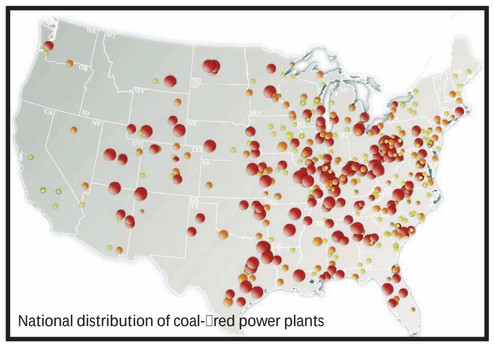

noland residence

metasystems:

□yash as a building material



Global distribution of coal-□red power plants

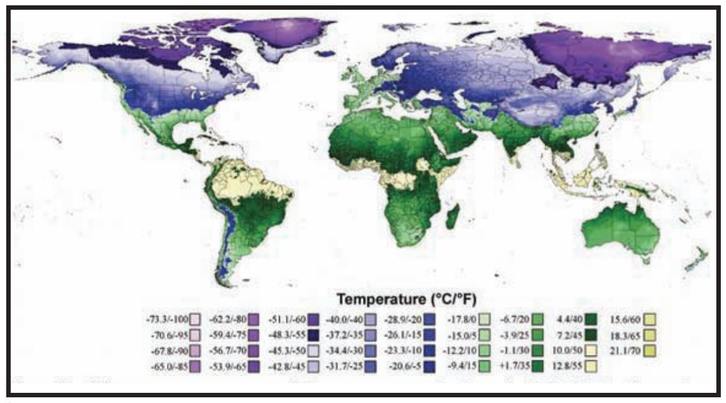


National distribution of coal-□red power plants

The United States Pentagon

Austin Resource Center for the Homeless (ARCH)

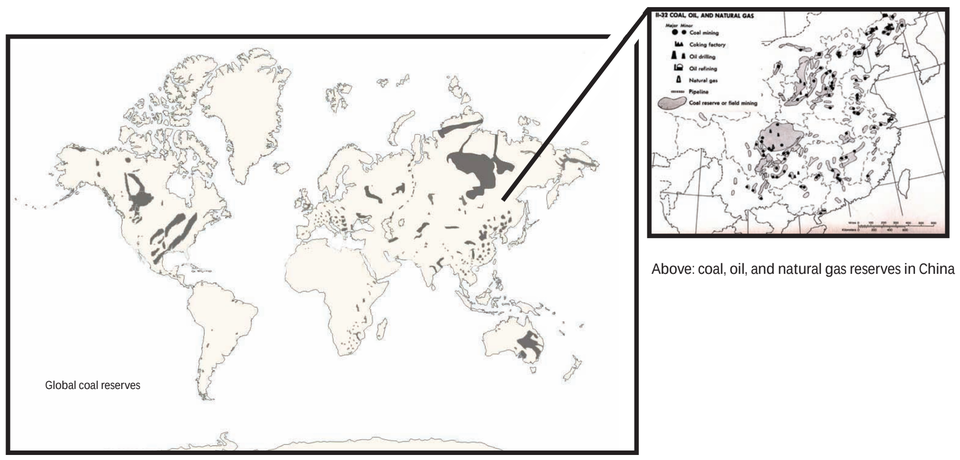
Low-cost Solar Water Heating



Thirty-year average extreme minimum global temperatures (1978-2007).
Green areas show climates appropriate for use of solar water heating systems.

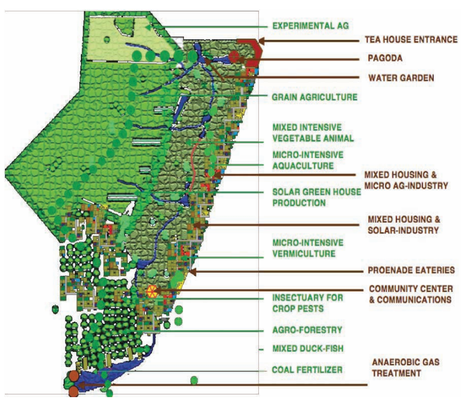
Solar hot water heating systems, Crystal City, Texas

coal as a raw mineral & fertilizer



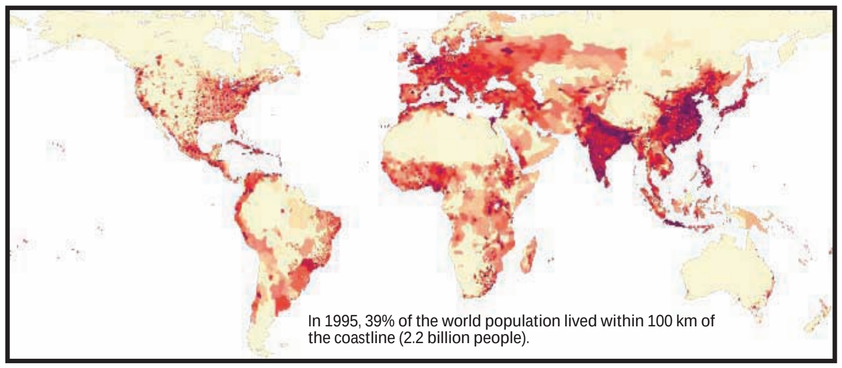
Global coal reserves

Above: coal, oil, and natural gas reserves in China

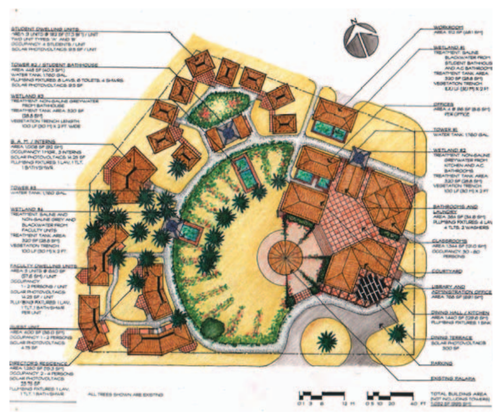


Photos,
Above: experimental coal fertilizer used to replenishing worn-out soil.
Right: site plan of Longju sustainable village, China

Saltwater Wetland Treatment

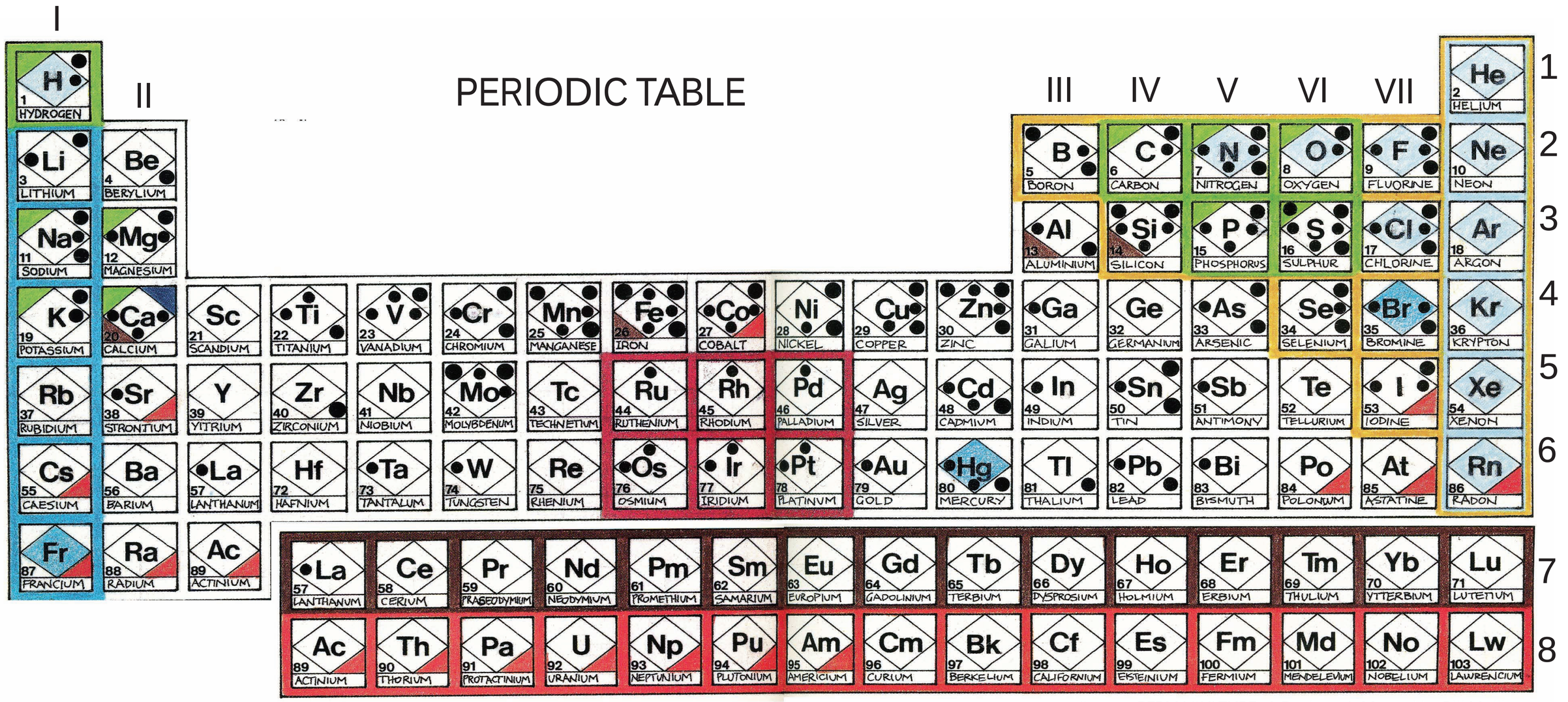


In 1995, 39% of the world population lived within 100 km of the coastline (2.2 billion people).



Above: Master Site Plan, School for Field Studies, Baja del Sur, Mexico
Right: (Above) Straw huts on SFS Site;
(Below) Saltwater Treatment Pond, SFS

Future Trend: Remineralizing the World



Source: PERMACULTURE- A Designer's Manual by Bill Mollison

KEY:

- MAJOR ELEMENTS of which soil is composed
- MAJOR NUTRIENTS in plant tissues & soils
- MAJOR ELEMENTS necessary to metabolic function in animals
- POISONS radioactive isotopes taken up by plants & animals
- TRACE ELEMENTS necessary to metabolic functions in plants
- TRACE ELEMENTS necessary to metabolic functions in animals
- POISONS metabolic poisons, dangerous to life forms
- ELEMENTS occuring in minute quantities in plants & marine & freshwater algae
- CATALYTIC ELEMENTS involved in metabolic function & hydrocarbon balancing
- ELEMENTS critical or limiting to phytoplankton, aquatic organisms
- ELEMENTS speci□cally concenterated by bacterial action, root association of plants. anaerobic bacteria

HYDRO CARBONS | NON-METALS | ALKALI METALS | INERT GASES | MAJOR CATALYST | RARE EARTHS | RADIO-ACTIVE

PLANTS/SOIL

Ca, Fe, Al, Si, H, Na, Mg, K, Ca, C, N, O, P, S, Mo, Mn, Zn, B, Ti, V, Ru, Rh, Os, Ir, Pd, Pt, Co, Ni, Cu, Cd, Hg

HUMANS/ ANIMALS

Ca, H, Li, Na, K, Mg, V, Cr, Mo, Mn, Fe, Co, Ni, Cu, Zn, C, Si, Sn, N, P, As, O, S, Se, F, Cl, I

AQUATIC LIFE

Li, Mg, Ca, Sr, La, Ti, V, Ta, Cr, W, Os, Co, Ir, Pt, Au, Cd, Hg, Al, Ga, In, Si, Sn, Pb, N, P, As, Sb, Bi, S, F, Cl, Br, I, H, Na, K, Mo, Mn, Fe, Cu, Zn, B, C, O, Se

MICRO ORGANISMS

H, Na, K, Mg, Ca, V, Mo, Mn, Fe, Co, Cu, Zn, B, C, Si, N, P, O, S, Se, F, Cl, Br, I, Mn, Ni, Cd, Hg

POISONOUS MINERALS

Cs, Fr, Sr, Ra, Ac, Th, Pa, U, Np, Pu, Am, Co, Po, I, At, Rn, Na, Be, Ti, Zr, Cr, Mn, Fe, Ni, Cu, Zn, Cd, Hg, B, Al, Sn, Pb, N, As, S, Se, F, Cl, Br

	City	State	Country	World
	Galveston	Texas	USA	
Water Treatment(RO)	(Tons)	(Tons)	(Tons)	(Tons)
Mg	0.09	38	486	
N	0.12	49	626	
Desalination				
Mg			2,303,610	19,196,752
N			27,500	229,170
K			700,012	5,833,431
P			157	1,309
Oil/Gas Wells				
Mg		10,954	36,513	82,985
N		14,123	47,077	106,992
Total in Tons	City	State	Country	World
Mg	0.322	10,992	2,340,609	19,279,737
N	0.416	14172	75,203	336,162
K			700,012	5,833,431
P			157	1,309

MgO Cement (tons) | Portland Cement o□set | CO2 World O□set

Mg ====> 445 million ===> 17.82% ===> 0.89%

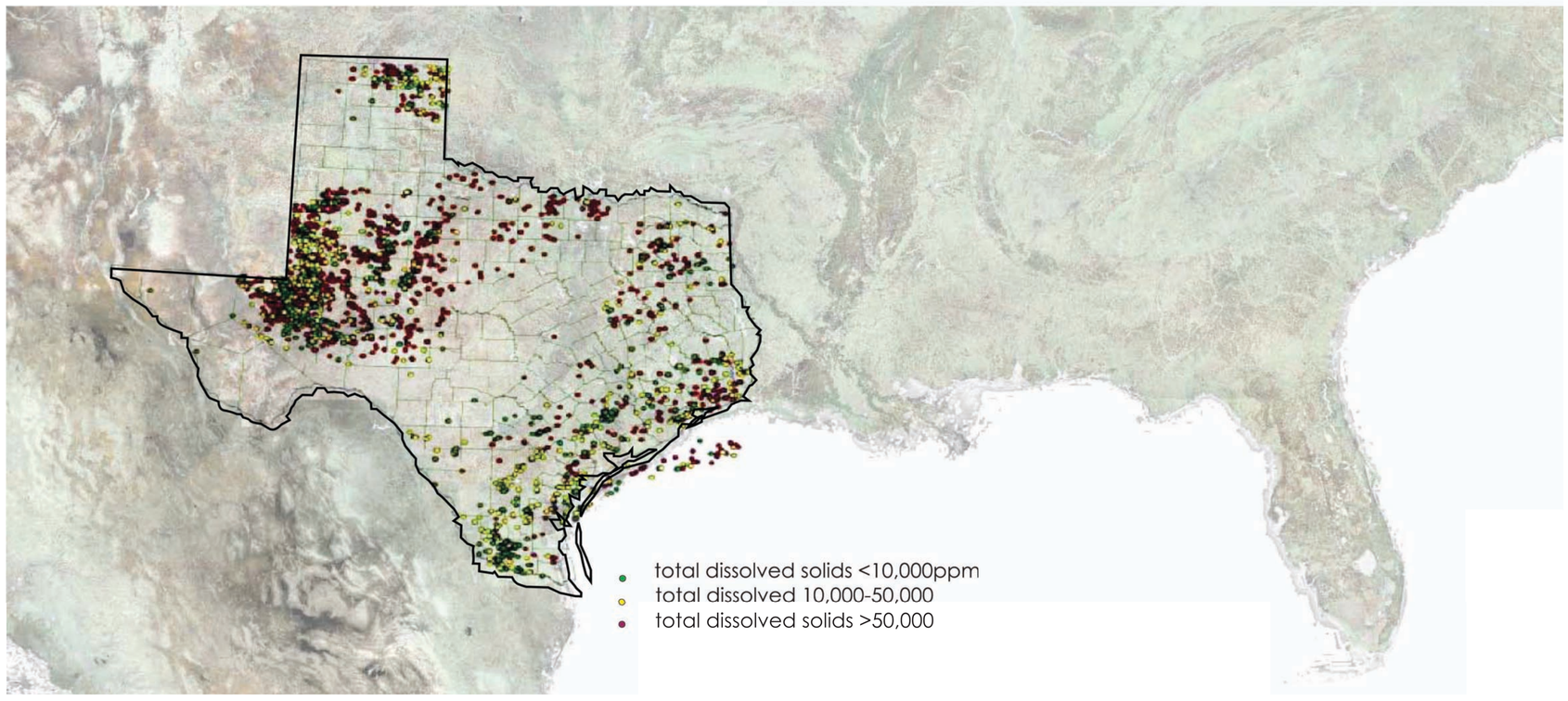
N ===> 336162 N + Bio Char ===> Fertilizer
K ===> 4841747 K2O + Bio Char ===> Fertilizer
P ===> 606 P2O5 + Bio Char ===> Fertilizer

Produced Water:

Refineries, Oil Platforms, & Pipelines in the Gulf of Mexico

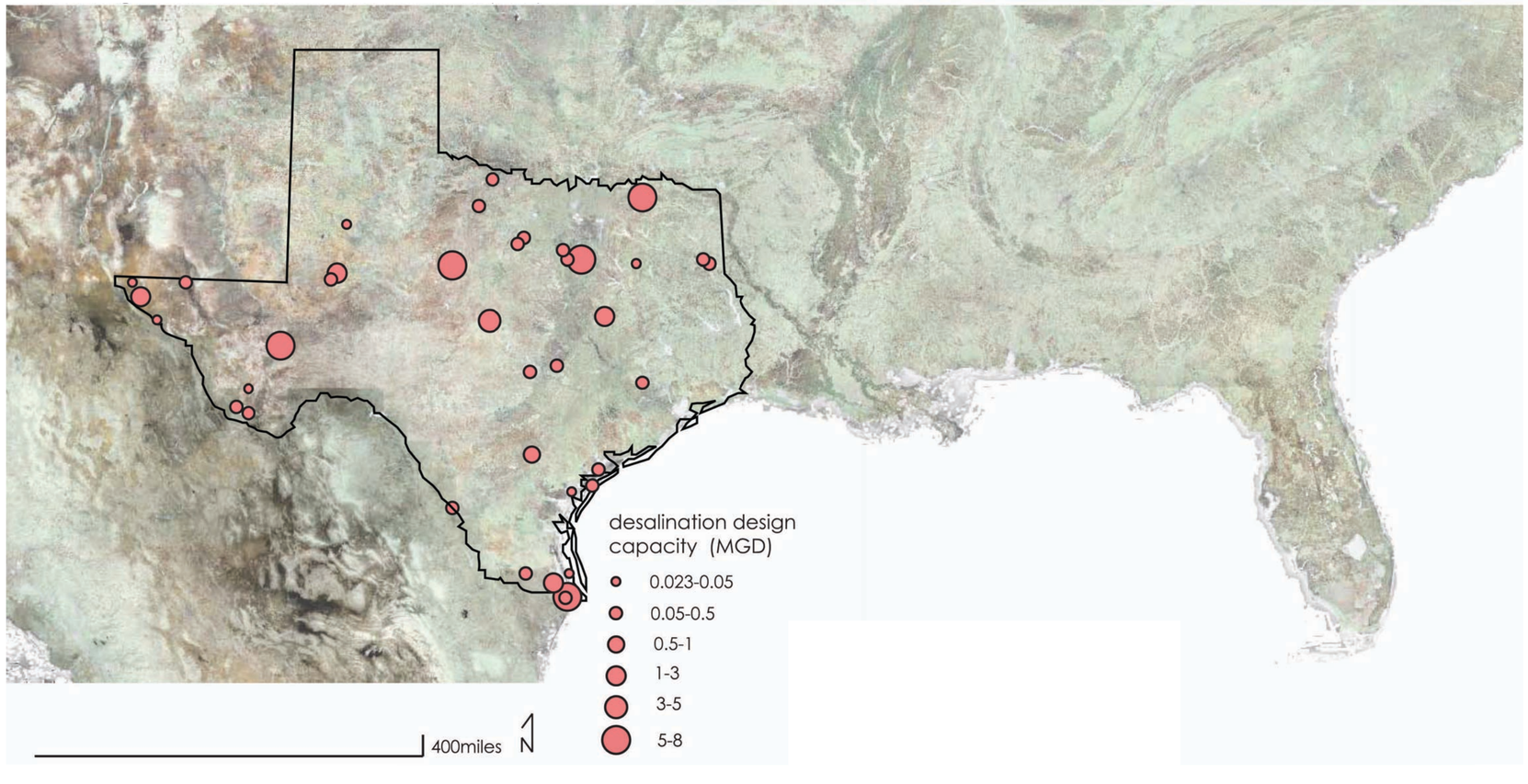
Produced Water Facilities in Texas

211 billion gallons of produced water per year



Desalination Plants in Texas

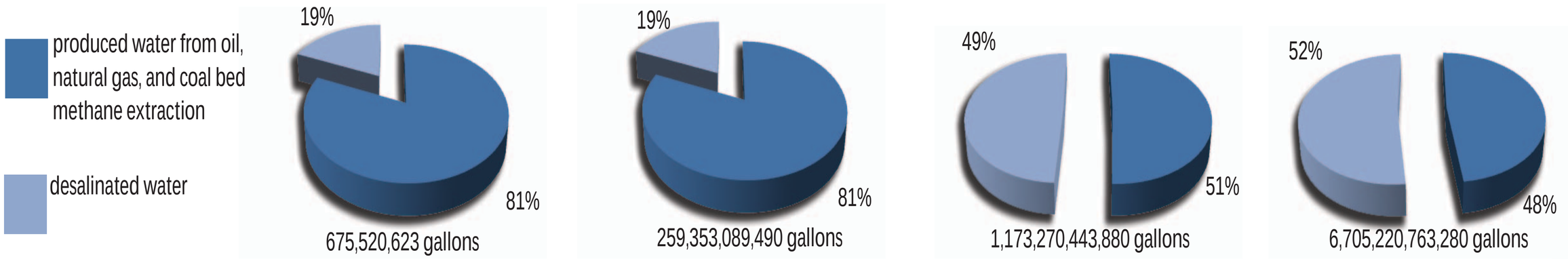
48 billion gallons of water are desalinated per year



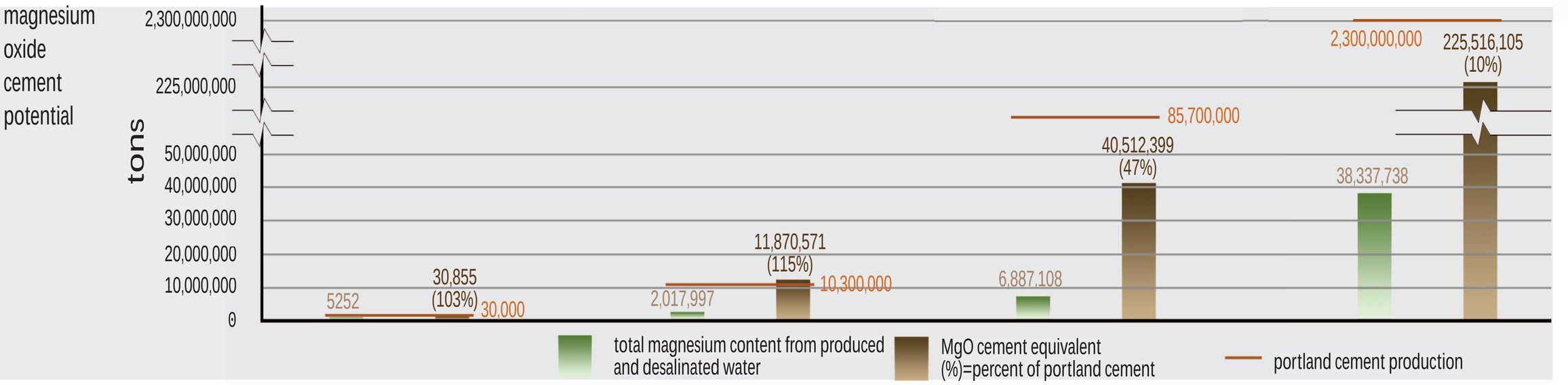
MgO Cement:

A Portland Cement Alternative made with By-Products of Desalination and Produced Water

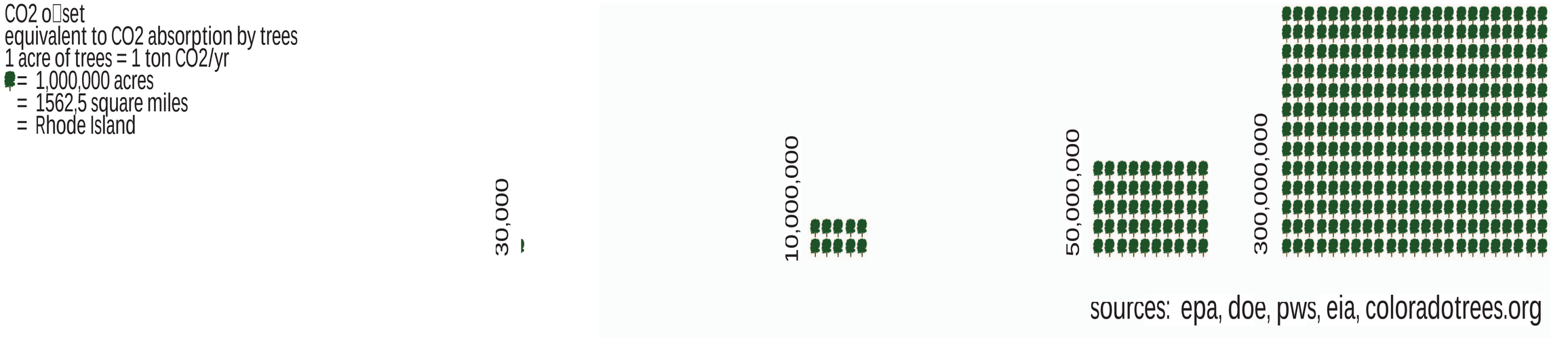
water cycle



mineral resources



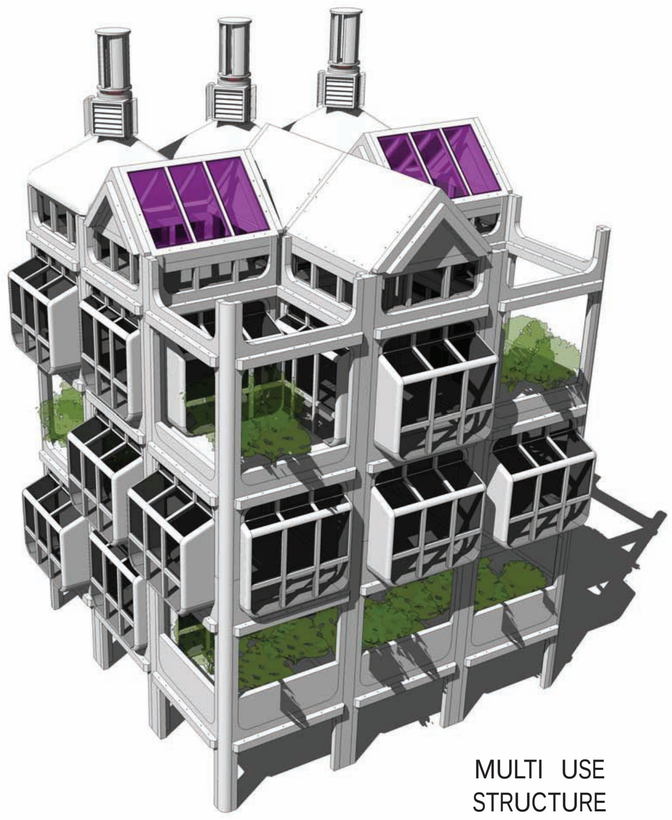
global warming



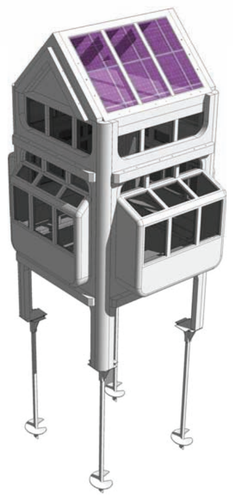
sources: epa, doe, pws, eia, coloradotrees.org

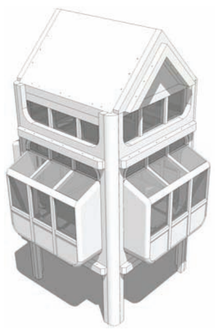
protoOne:

CENTER
UTILITY TOWER

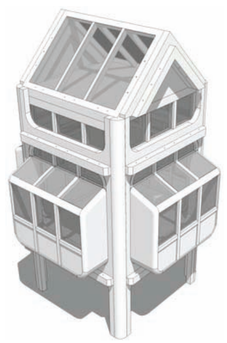


MULTI USE
STRUCTURE

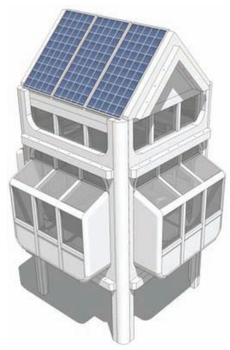




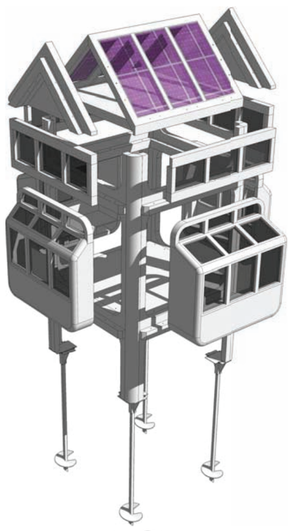
GABLE ROOF



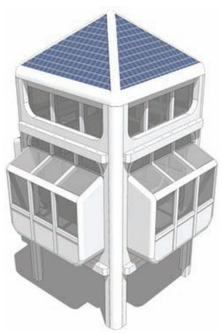
GABLE ROOF,
GREENHOUSE



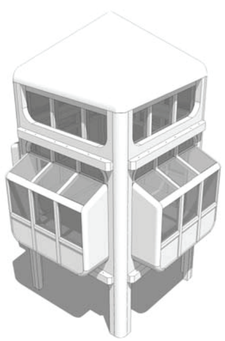
GABLE ROOF,
SOLAR PV'S



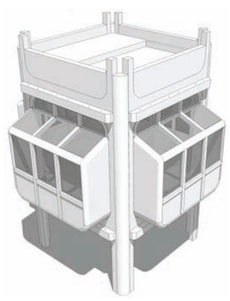
KIT OF PARTS



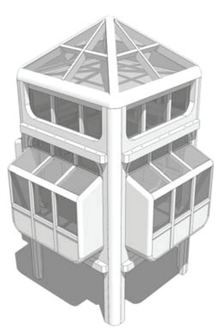
PYRAMID ROOF,
SOLAR PV'S



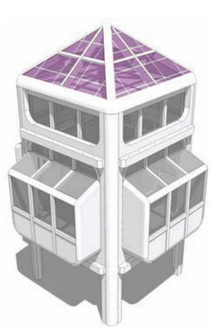
PYRAMID ROOF



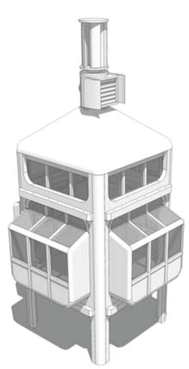
FLAT ROOF, WATER BAG
INSULATION



PYRAMID ROOF,
GREENHOUSE

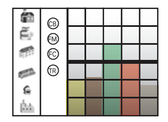
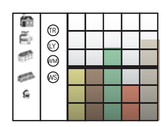
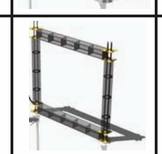
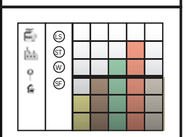
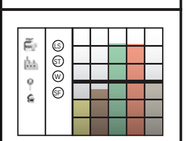
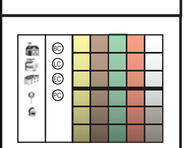
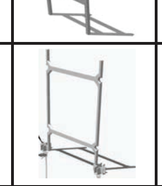
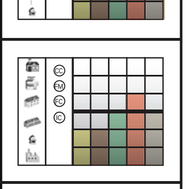
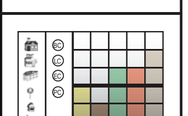


PYRAMID ROOF,
COLORED PV'S



PYRAMID ROOF,
WIND TURBINES

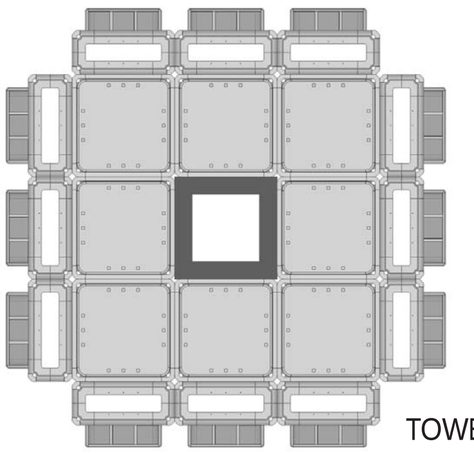
BUILDING SYSTEM MATRIX

MAXIMUM POTENTIAL BUILDING SYSTEMS				BUILDING TYPOLOGY	BASIC BUSINESS TYPES	NO. OF STORIES	RELATIVE WEIGHT	RELATIVE COST	EMBODIED ENERGY	AVAIL-ABILITY	PROTOCODE
S.NO	BUILDING DETAIL	MATERIAL BASE	TRADITIONAL USE								
1.		DURISOL BOND BEAM SYSTEM		RESIDENTIAL BUILDINGS COMMERCIAL BUILDINGS EDUCATIONAL BUILDINGS AGRICULTURAL BUILDINGS PAVILLION INDUSTRIAL BUILDINGS	(B) CLEARING/THINNING BUSS. (M) FLYASH CEMENT MANUFS. (C) FLYASH CEMENT SUPPLIERS (TR) LARGE TREE RECYCLING CO.	6 STORIES 5 STORIES 4 STORIES 3 STORIES 2 STORIES 1 STOREY	HEAVY LIGHT	EXPENSIVE AFFORDABLE	HIGH LOW	MORE LESS	
2.		WOOD BOX BEAM SYSTEM		RESIDENTIAL BUILDINGS COMMERCIAL BUILDINGS EDUCATIONAL BUILDINGS AGRICULTURAL BUILDINGS PAVILLION	(TR) LARGE TREE RECYCLING (Y) USED LUMBER YARDS (TM) WOOD TRUSS MANUFS. (WS) WOOD SHOPS	6 STORIES 5 STORIES 4 STORIES 3 STORIES 2 STORIES 1 STOREY	HEAVY LIGHT	EXPENSIVE AFFORDABLE	HIGH LOW	MORE LESS	
3.		METAL BOX BEAM SYSTEM		COMMERCIAL BUILDINGS INDUSTRIAL BUILDINGS PARKING & STORAGE PAVILLION	(S) LIGHT GAUGE STEEL CO. (ST) STEEL TRUSS MANUFS. (W) WELDERS (SF) STEEL FABRICATORS	6 STORIES 5 STORIES 4 STORIES 3 STORIES 2 STORIES 1 STOREY	HEAVY LIGHT	EXPENSIVE AFFORDABLE	HIGH LOW	MORE LESS	
4.		METAL LADDER BLOCK SYSTEM		COMMERCIAL BUILDINGS INDUSTRIAL BUILDINGS PARKING & STORAGE PAVILLION	(S) LIGHT GAUGE STEEL CO. (ST) STEEL TRUSS MANUFS. (W) WELDERS (SF) STEEL FABRICATORS	6 STORIES 5 STORIES 4 STORIES 3 STORIES 2 STORIES 1 STOREY	HEAVY LIGHT	EXPENSIVE AFFORDABLE	HIGH LOW	MORE LESS	
5.		STEEL LADDER BLOCK		RESIDENTIAL BUILDINGS COMMERCIAL BUILDINGS EDUCATIONAL BUILDINGS PARKING & STORAGE PAVILLION	(S) LIGHT GAUGE STEEL CO. (ST) STEEL TRUSS MANUFS. (W) WELDERS (SF) STEEL FABRICATORS	6 STORIES 5 STORIES 4 STORIES 3 STORIES 2 STORIES 1 STOREY	HEAVY LIGHT	EXPENSIVE AFFORDABLE	HIGH LOW	MORE LESS	
6.		TIMBER FRAME LADDER BLOCK		RESIDENTIAL BUILDINGS COMMERCIAL BUILDINGS EDUCATIONAL BUILDINGS AGRICULTURAL BUILDINGS PAVILLION PARKING & STORAGE	(TR) LARGE TREE RECYCLING (Y) USED LUMBER YARDS (TM) WOOD TRUSS MANUFS. (WS) WOOD SHOPS (C) CARPENTER	6 STORIES 5 STORIES 4 STORIES 3 STORIES 2 STORIES 1 STOREY	HEAVY LIGHT	EXPENSIVE AFFORDABLE	HIGH LOW	MORE LESS	
7.		SOLID CONCRETE LADDER BLOCK		RESIDENTIAL BUILDINGS COMMERCIAL BUILDINGS EDUCATIONAL BUILDINGS INDUSTRIAL BUILDINGS AGRICULTURAL BUILDINGS PARKING & STORAGE PAVILLION	(CC) CONCRETE CONTRACTOR (M) FLYASH CEMENT MANUFS. (C) FLYASH CEMENT SUPPLIERS (IC) INSULATION CONTRACTOR	6 STORIES 5 STORIES 4 STORIES 3 STORIES 2 STORIES 1 STOREY	HEAVY LIGHT	EXPENSIVE AFFORDABLE	HIGH LOW	MORE LESS	
8.		FOAM LADDER BLOCK SYSTEM		RESIDENTIAL BUILDINGS COMMERCIAL BUILDINGS EDUCATIONAL BUILDINGS AGRICULTURAL BUILDINGS PAVILLION INDUSTRIAL BUILDINGS	(CC) CONCRETE CONTRACTOR (M) FLYASH CEMENT MANUFS. (C) FLYASH CEMENT SUPPLIERS (IC) INSULATION CONTRACTOR	6 STORIES 5 STORIES 4 STORIES 3 STORIES 2 STORIES 1 STOREY	HEAVY LIGHT	EXPENSIVE AFFORDABLE	HIGH LOW	MORE LESS	
9.		GRANCRETE & RECYCLED POLYSTYRINE		RESIDENTIAL BUILDINGS COMMERCIAL BUILDINGS EDUCATIONAL BUILDINGS PARKING & STORAGE PAVILLION INDUSTRIAL BUILDINGS	(CC) CONCRETE CONTRACTOR (GS) GRANCRETE SUPPLIERS (RP) RECYLCED POLYSTYRENE (IC) INSULATION CONTRACTOR	6 STORIES 5 STORIES 4 STORIES 3 STORIES 2 STORIES 1 STOREY	HEAVY LIGHT	EXPENSIVE AFFORDABLE	HIGH LOW	MORE LESS	
10.		MGO CEMENT & MGO FOAM		RESIDENTIAL BUILDINGS COMMERCIAL BUILDINGS EDUCATIONAL BUILDINGS PARKING & STORAGE PAVILLION INDUSTRIAL BUILDINGS	(CC) CONCRETE CONTRACTOR (BM) BRINE MANAGEMENT (MS) MGO CEMENT SUPPLIERS (AC) AIRKRETE CONTRACTOR	6 STORIES 5 STORIES 4 STORIES 3 STORIES 2 STORIES 1 STOREY	HEAVY LIGHT	EXPENSIVE AFFORDABLE	HIGH LOW	MORE LESS	

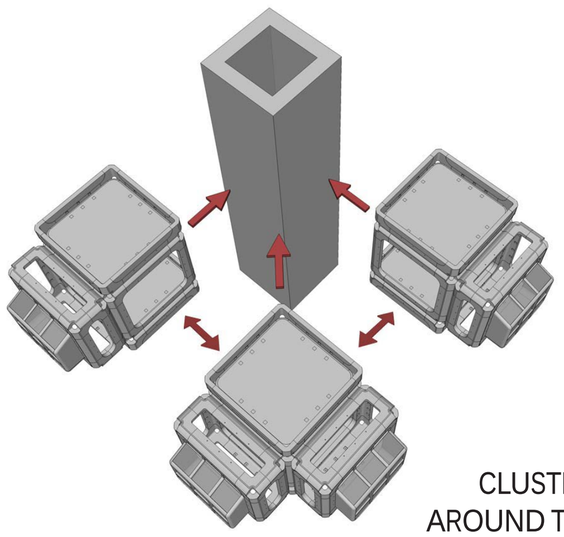
PACKER 2000 - SHREDDER PROCESS

protoTwo:

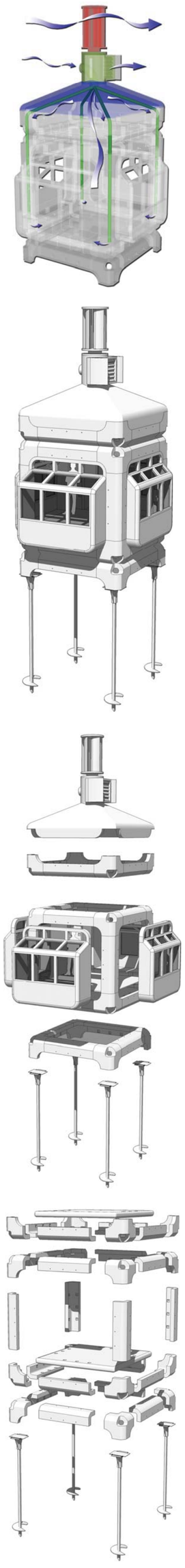
CENTRALIZED
UTILITY TOWER



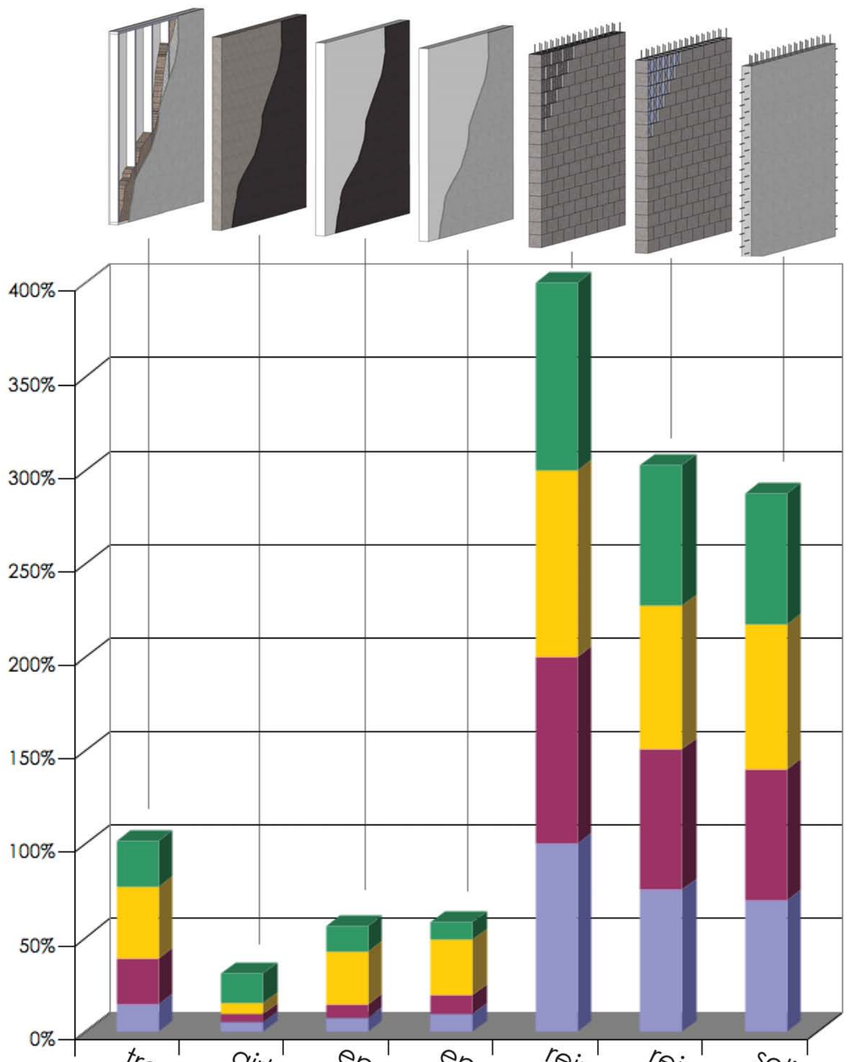
TOWER PLAN



CLUSTER
AROUND TOWER



KIT OF PARTS



LIFE CYCLE ANALYSIS BY WALL TYPE

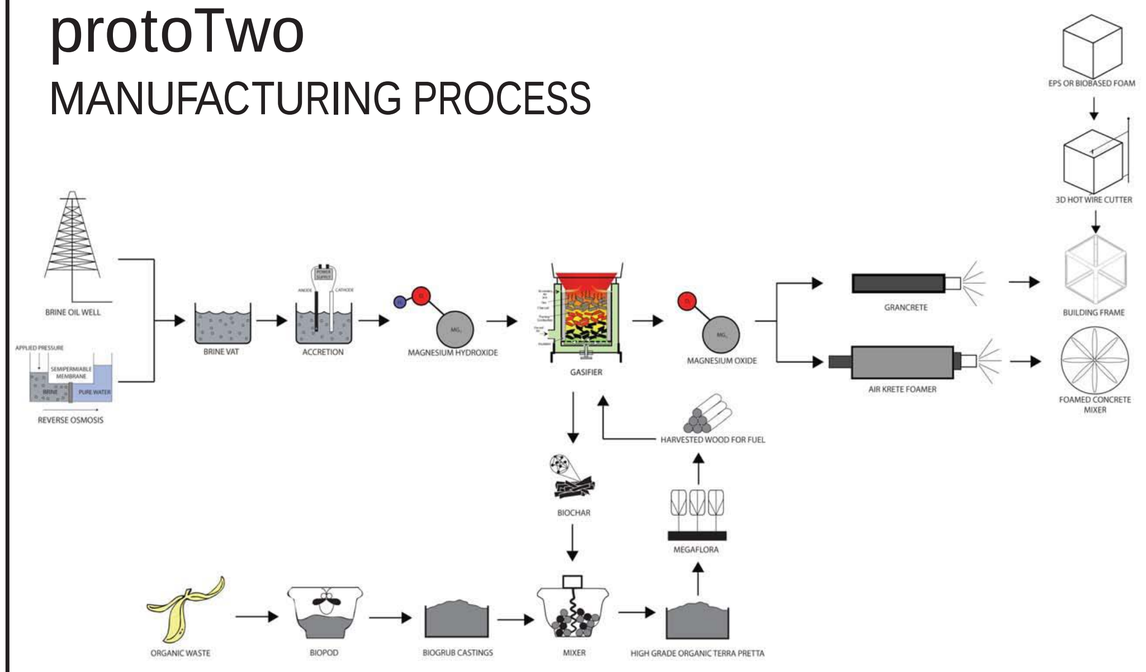
theRightenvironment

Calculations by Joep Meijer

Conclusions

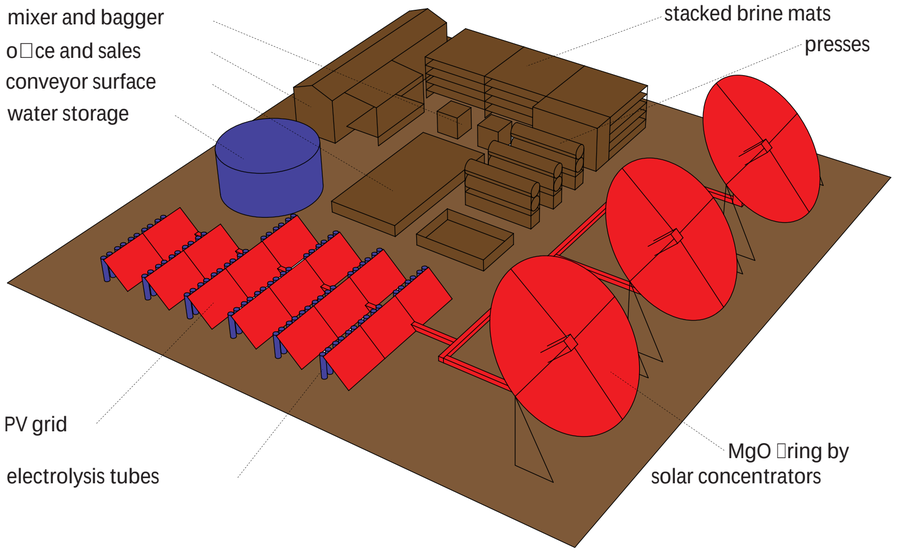
- Reinforced CMU and solid concrete are out-performed by all other alternatives.
- We assumed all Portland cement and no SCM
- Traditional wall uses much more material and environmental resources
- The new concepts use not only less material, but less energy and CO2 intensive binder
- Substitution of EPS seems to be a good strategy

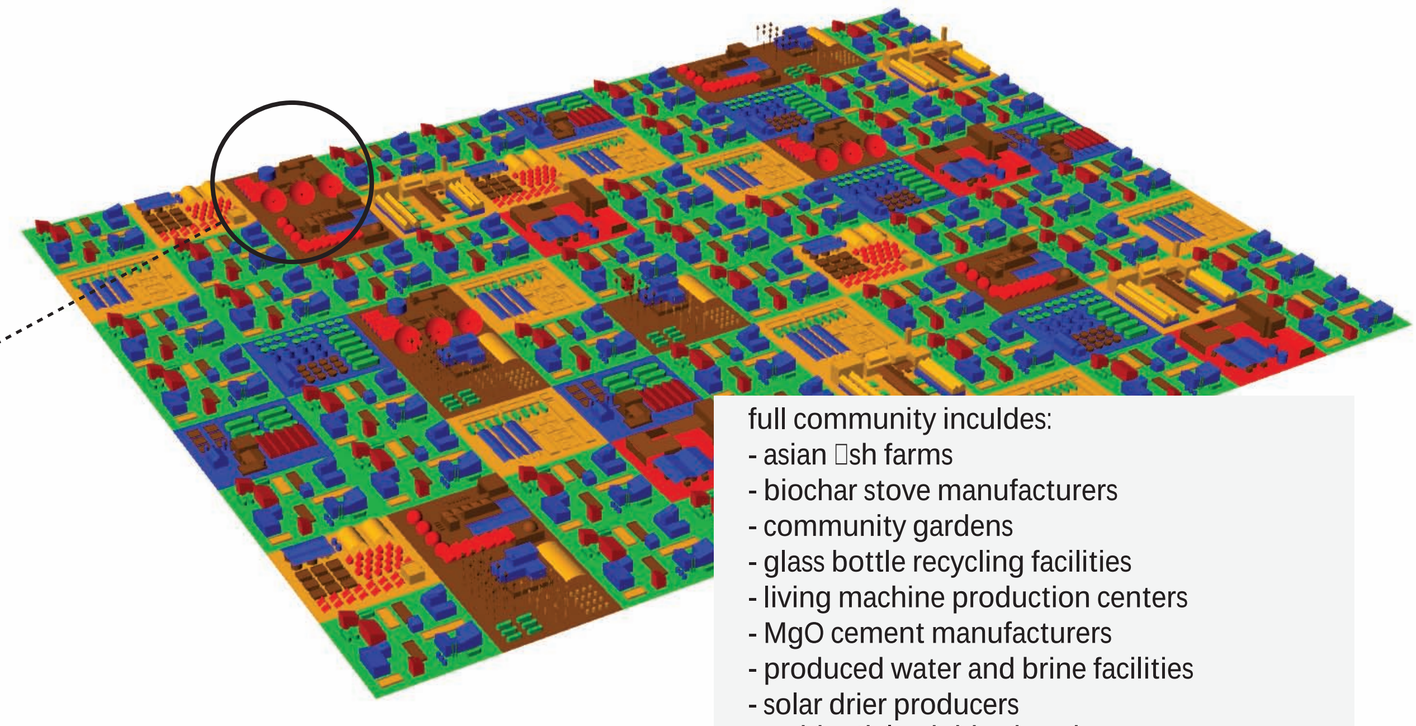
protoTwo
MANUFACTURING PROCESS



Neighborhood Industrial Ecosystem:

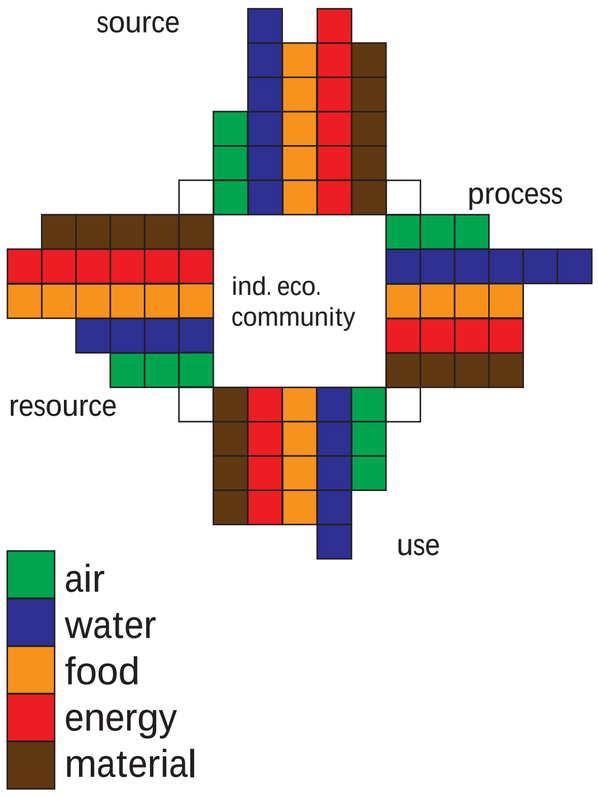
sample block: MgO cement manufacturer





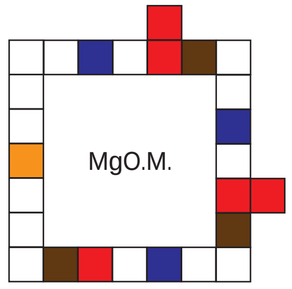
full community inculdes:
- asian □sh farms
- biochar stove manufacturers
- community gardens
- glass bottle recycling facilities
- living machine production centers
- MgO cement manufacturers
- produced water and brine facilities
- solar drier producers
- residential neighborhoods
- wastewater-treating living machines

EcoBalance diagram of full community



EcoBalance of the MgO cement manufacturer

source
- rain catchment & storage
- photovoltaic grid
- solar concentrators
- brine mats shipment receipt

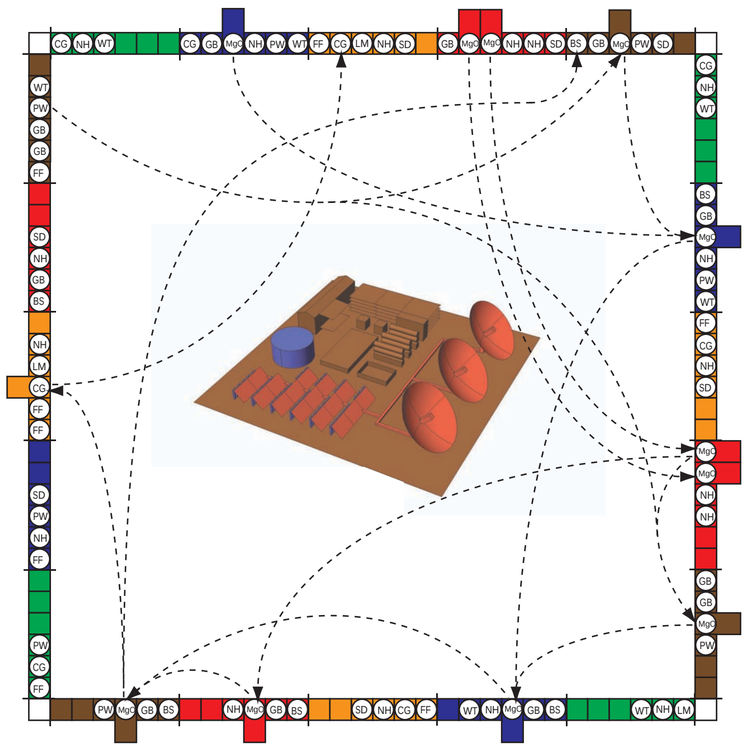


process
- electrolysis of water
- solar kilns concentrate heat
- PV power used in electrolysis
- brine mats pressed

use
- minerals, brine, and water mixed
- cement is □red in kilns

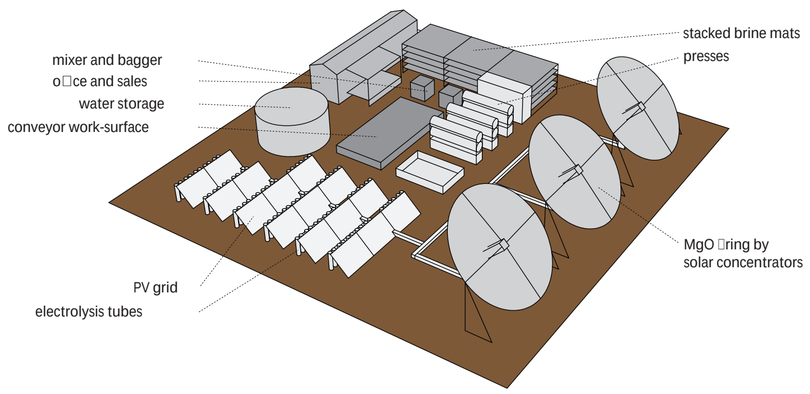
resource
- excess heat is transferred
- waste MgO used toremineralize soil

MgO cement manufacturer's resource life cycles within the industrial ecology community

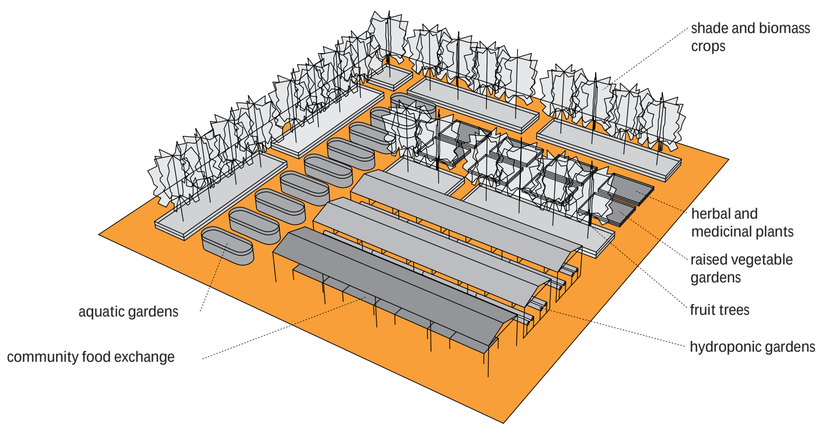


Neighborhood Industrial Ecosysems:

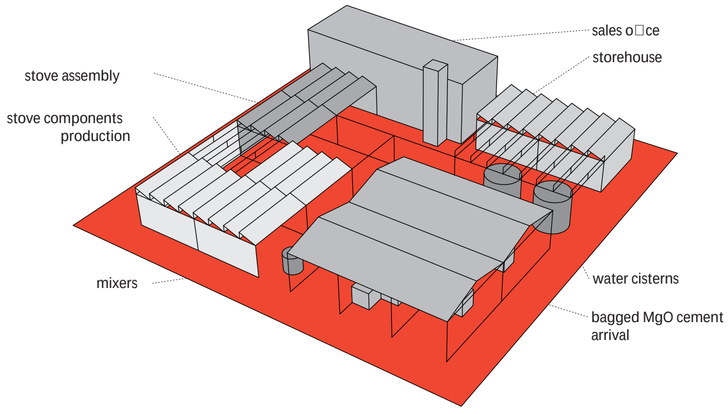
Mgo Cement Manufacture



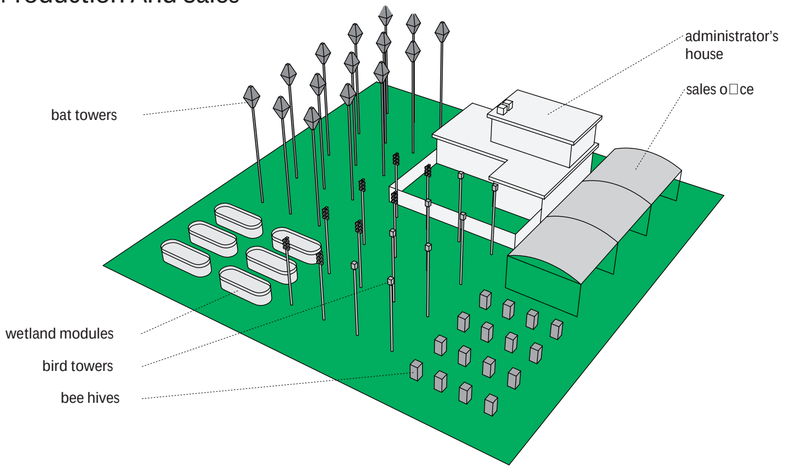
Community Gardens



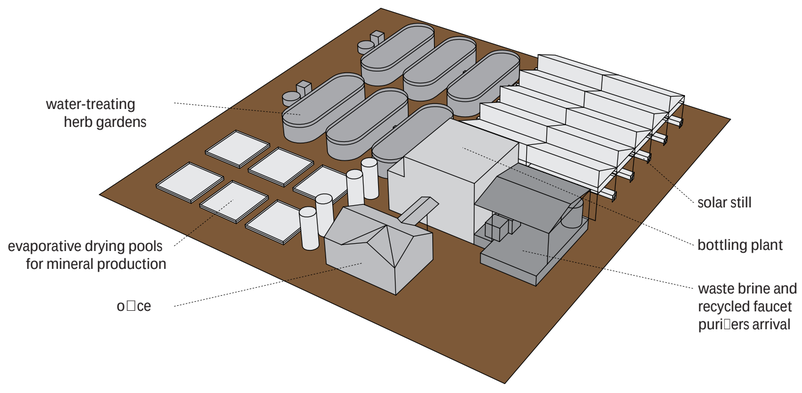
Biochar Stove Manufacture



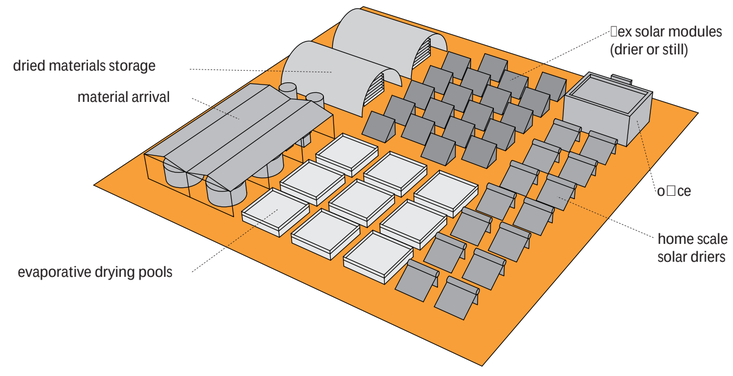
Living Machines Production And Sales



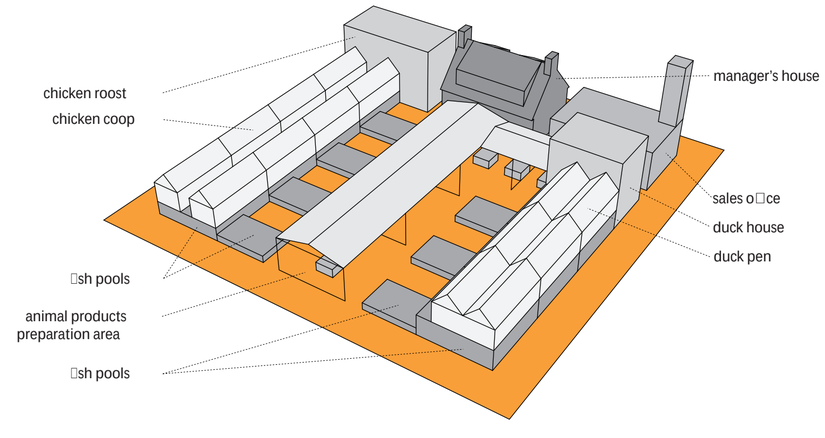
Produced Water Brine Production



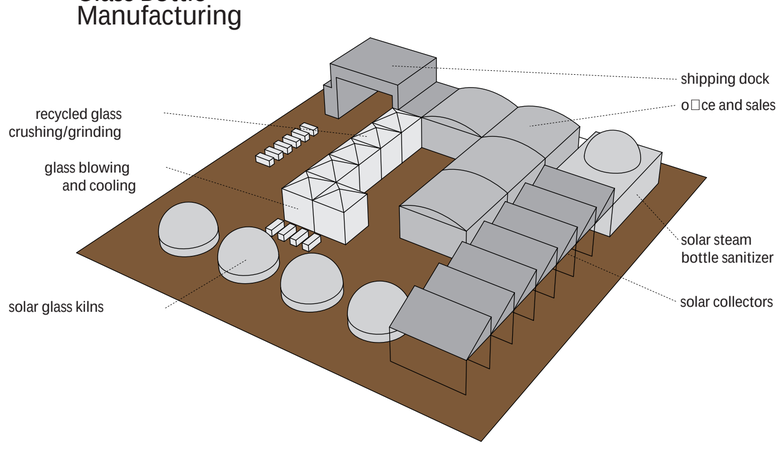
Solar Drier



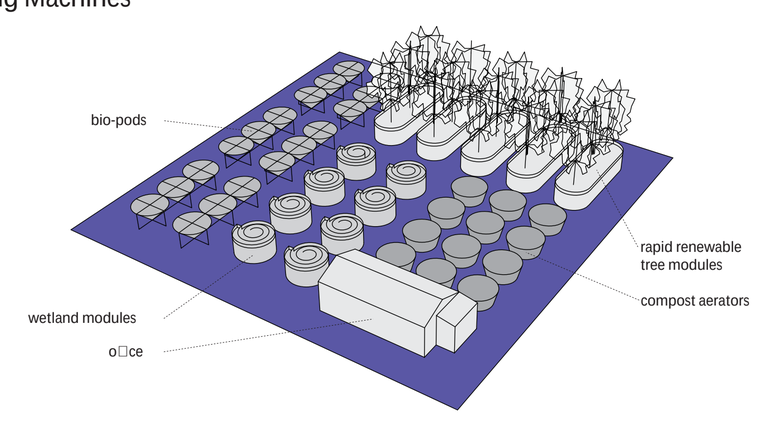
Asian Fish Farm



Glass Bottle Manufacturing



Wastewater-treating Living Machines

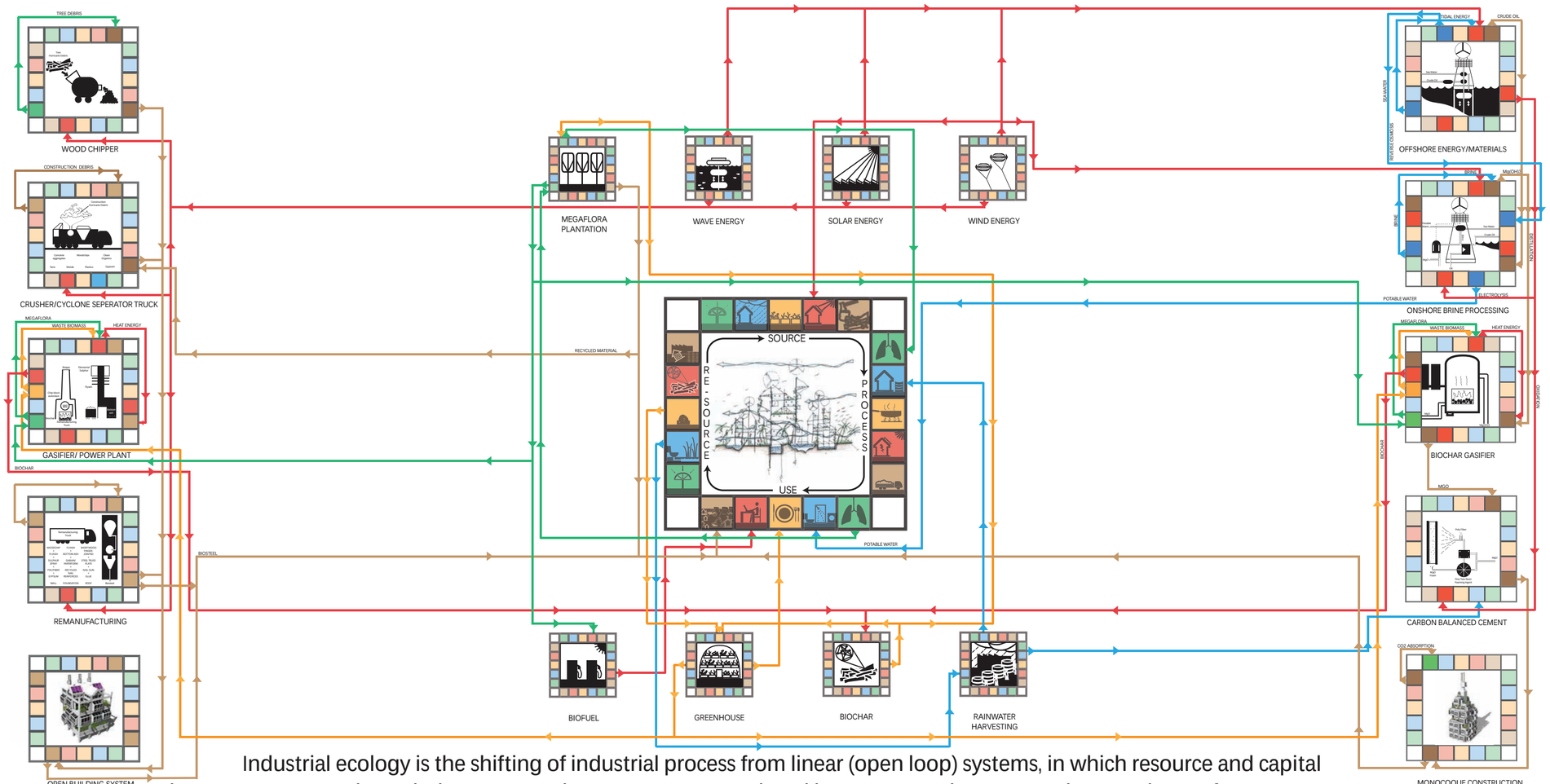


protoSystem™:

protoOne

Industrial Ecology

protoTwo



Industrial ecology is the shifting of industrial process from linear (open loop) systems, in which resource and capital investments move through the system to become waste, to a closed loop system where wastes become inputs for new processes.

(Definition from Wikipedia)

protoOne

protoTwo