Global Village Construction Set: Tools for Sustainable Living

Marcin Jakubowski, Ph.D.

Open Source Ecology (OSE)
Founder

4.23.08

Presented at
University of Columbia, Missouri
USA

The Global Village Construction Set (GVCS) is a Tool Set for Sustainable Living

- It's about access to building Building Blocks for living sustainably
  - Any community interested in self-determination should be able to provide all of its essential needs

- How does GVCS apply to you, now?
  - Sustainable living
  - Self-employment, right livelihood, localization
  - New infrastructures for communities

- Unique feature - *Open Source Engineering for Sustainable Living*
  - GVCS is public domain development for everybody's benefit
  - Open Source Engineering is the only route known to a non-monopolistic economy

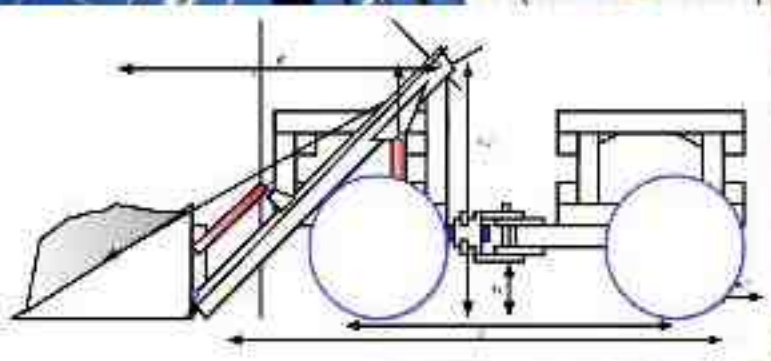
The Global Village Construction Set Provides Essential Needs from Local Resources

- It's about building *Building Blocks*
  - Akin to Lego Blocks or life-size Erector Set, *but for an entire economy*









- Small set of items
  - Only 17 items

- Provides a wide range of services
  - Focuses on a working infrastructure for a sustainable community

- These tools are capable of producing the entire productive economy from on-site resources

Open Source Engineering Creates Access by Bringing Down the Cost

- Typical price reduction for living infrastructure: 5-10 times

- Comparative economics:

  - CEB and Sawmill $2k in materials for both
  - Solar concentrator, turbine, backup burner, heat storage - $5k
  - LifeTrac...
    - plus rototiller, loader, backhoe, tree digger, forks, trencher, cement mixer, planting auger, tree spade, tree puller, hammer mill, and sawmill - a whopping $8k
  - Fabrication - Multimachine, Torch Table, and Welder - $3k
  - Food - almost free in a permaculture garden

  ---> You can *Buy out at the Bottom* - total independence provided - starting at $18k - but you still need some land

  ---> Compare to an average *New Suburban McMansion* - permanent dependence included- starting at $250k

The Global Village Construction Set is Relevant to Town, Country, and Individual Homes

- It's not about running away from society into *sustainable communities* but about creating *self-sufficient communities* anywhere

- If access to knowhow increases and cost of sustainable technologies decreases, sustainable living will be feasible

- Here is a scenario for Global Villages of tomorrow - a new 40 acre development:

  - Add an in-residence farm manager
  - Add an in-residence Community Fabricator, and:
    - *All food, fuel, energy, cars, and technology produced on site via Community-Supported Agriculture and Manufacturing (CSA & CSM)*

    - *the trick: access to GVCS - integrated, low-maintenance technology set*

or

Open Source, Lifetime Technology is a *Prerequisite* for Sustainable Living

- Your cost of living is the sum of the cost of all products and services - or technologies - that you buy

  - We need access to human-centered liberatory technology - tools that make us free

- Production and consumption is based on scarcity, monopoly, and planned obsolescence, *which determine your cost of living*

  - Open Source Lifetime Design is the antidote to all of these!

Open Source Production Relies on Open Design and Flexible Fabrication

- Modern industrial system:

1 - Proprietary product designs are guarded by company lawyers
2 - Centralized production facilities utilize specialized equipment
3 - Unskilled labor
4 - Producer gets very little value - typically slave labor
5 - Overproduction determined by remote speculators
6 - Marketing
7 - Capital flows upwards

- Open source production:

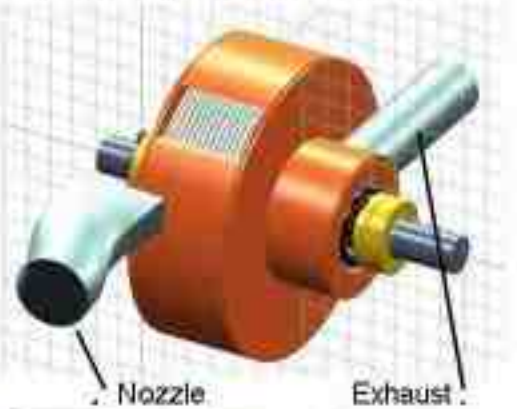
1 - Repository of open source design provides blueprints for everyone's use
2 - Distributed Flexible Production facilities utilize multipurpose machinery
3 - Skilled labor
4 - Producer captures full value of their skill
5 - On-demand production determined by local needs
6 - Social networks of exchange
7 - Wealth is distributed

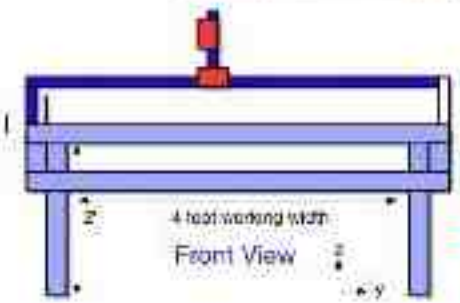
---> Can a new system of production emerge?

The Open Source Fab Lab Consists of 6 Main Tools

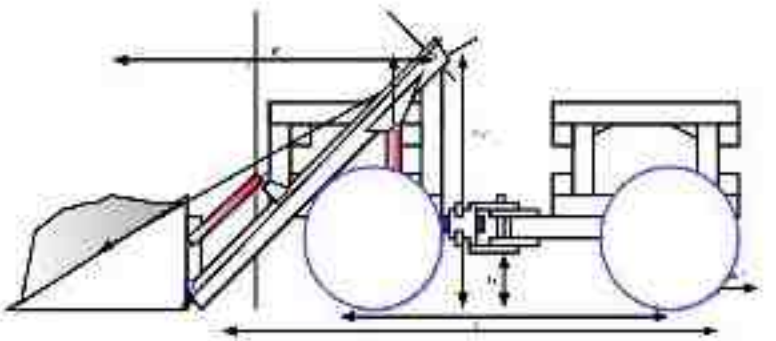
- Multimachine, xyz torch table, electronics fabrication, metal casting and welding, laser cutter, and plastic extruder
  - 3 of these tools can make the entire GVCS

Multimachine





XYZ Table



Electronics Fabrication

Laser Cutter
Metal Casting and Welding
Plastic Extrusion

GVCS is an Infrastructure for a New Civilization Based on Open Source Economics

- GVCS is partly a *set of technologies* for meeting essential needs

- It is also the *means of production*

  - Community Supported Enterprise
  - At-cost production for everyone's benefit

- It is moreover the *means of replication* for enterprise and communities

  - Open Business Model

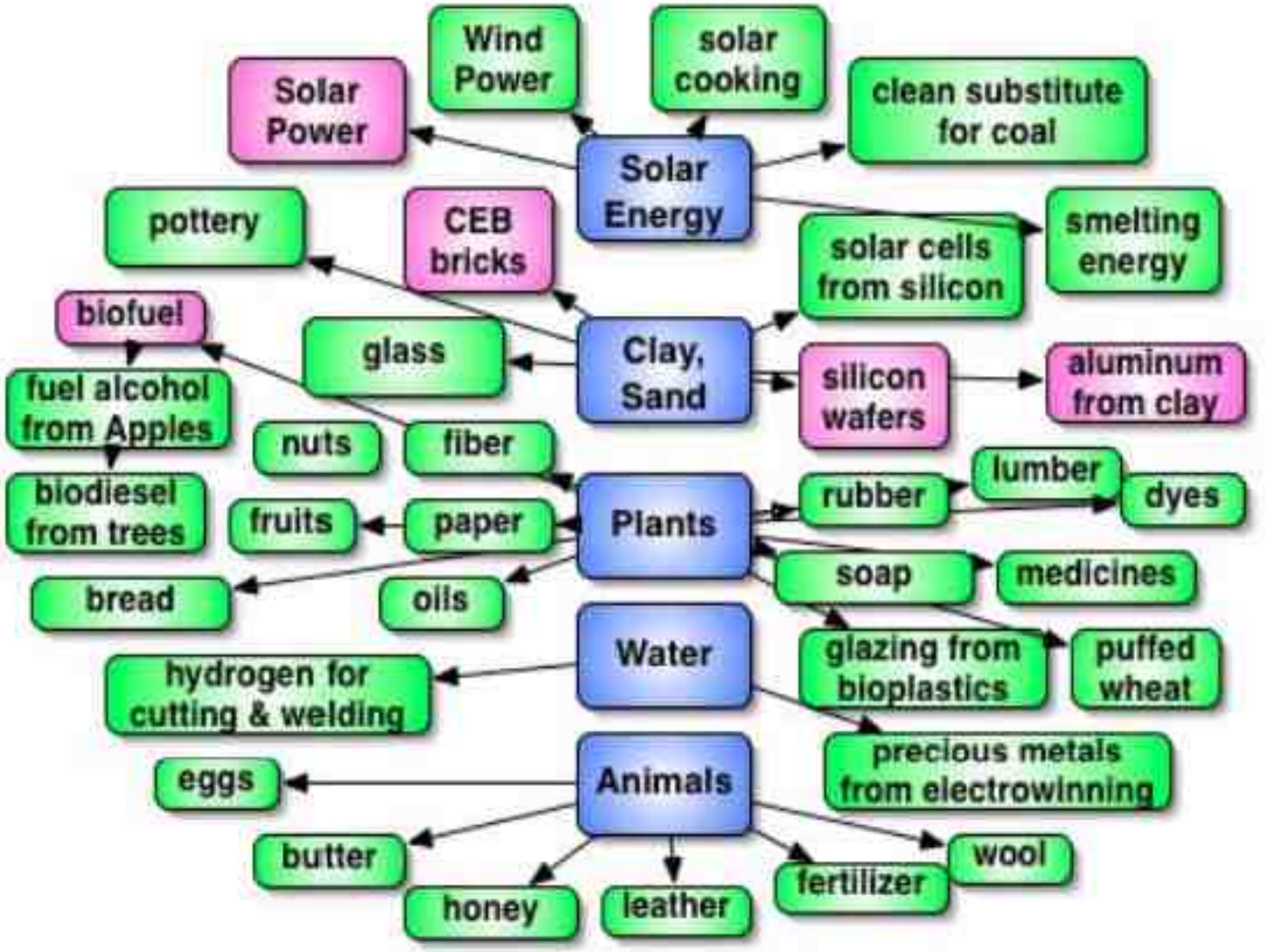
  ---> *Distributive Economics*

or

LOW COST MAKES REPLICATION FEASIBLE

Abundance of Resources is Found Almost Everywhere

- Take a small parcel of land and the GVCS and you have:



- If this were possible in your backyard, then forget about all wars, taxes, corruption, and other ills related resource scarcity

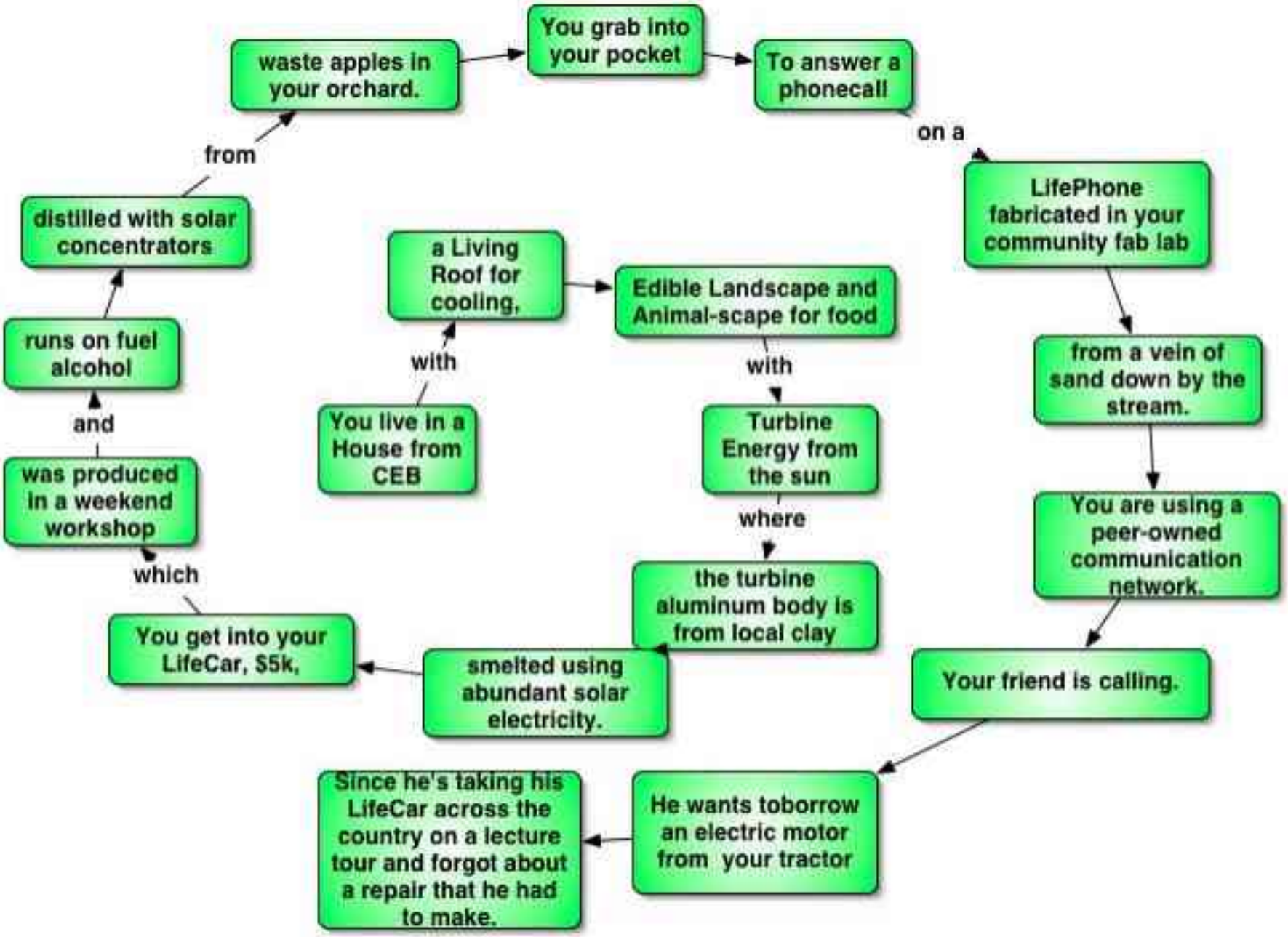
Solar Energy is the Key to Abundance in Our Life

- 10,000 times more solar energy intercepts the Earth than we presently use in the entire world economy

- Energy is the #1 issue of geopolitical importance
- Energy makes all the products on the last page possible

-> Abundance of energy on a local scale makes the local economy possible, with no ill geopolitical consequences

A Minute in the Life of a Global Village Shows Wise Use of Local Resources



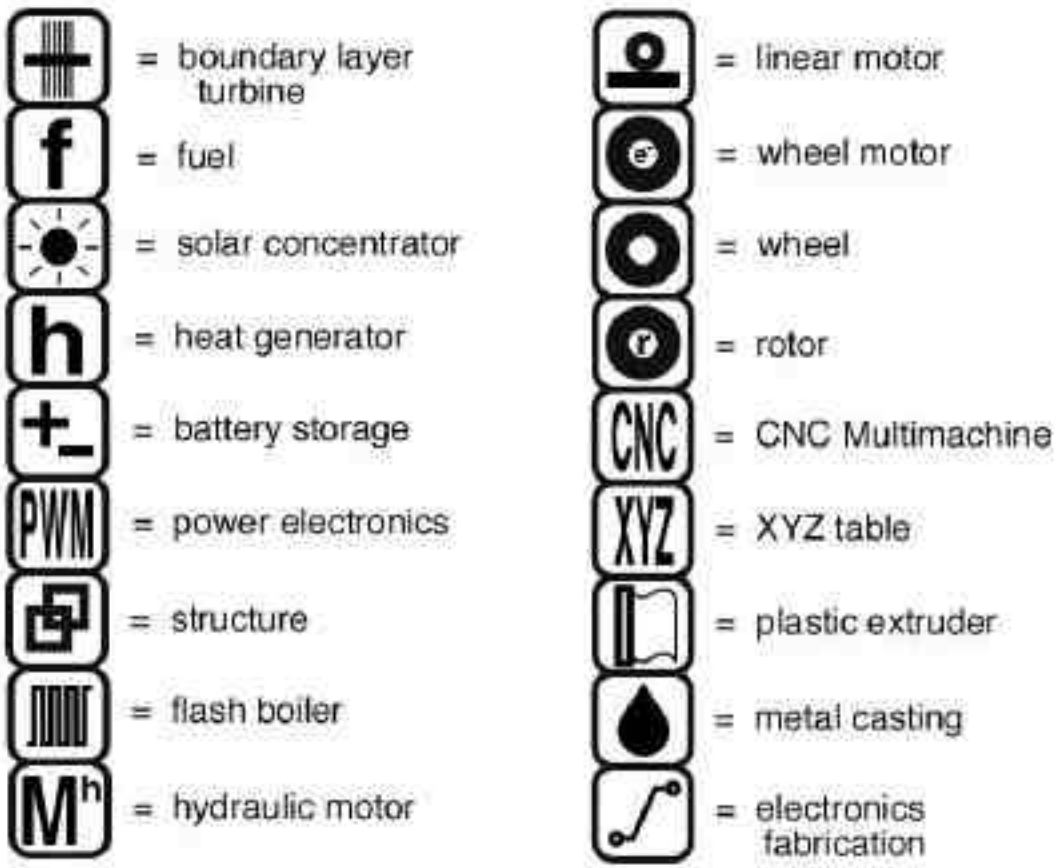
Technology Follows Modular Design Described by Open Source Technology Pattern Language

- If you want to understand the language of technology, you must understand its vocabulary of patterns[1]

- Each technology in the GVCS can be represented by icons

- All technologies may be depicted graphically as combinations of icons

- Icons cover almost all electronics and electromechanical devices



Technologies May be Represented Symbolically as a Combination of Icons

- Pattern Language describes form and function[1]
  - *helps foster technological literacy*

frame

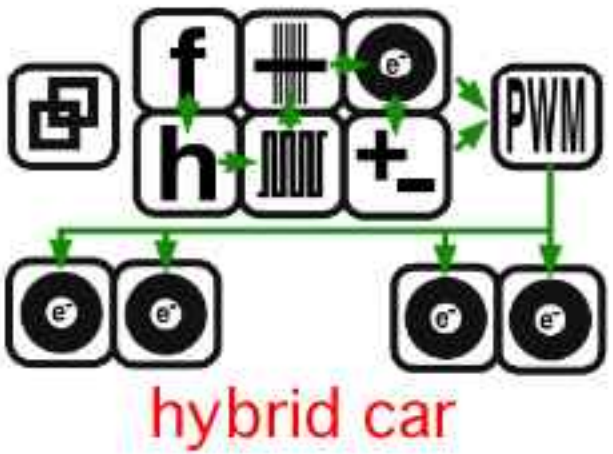
CEB

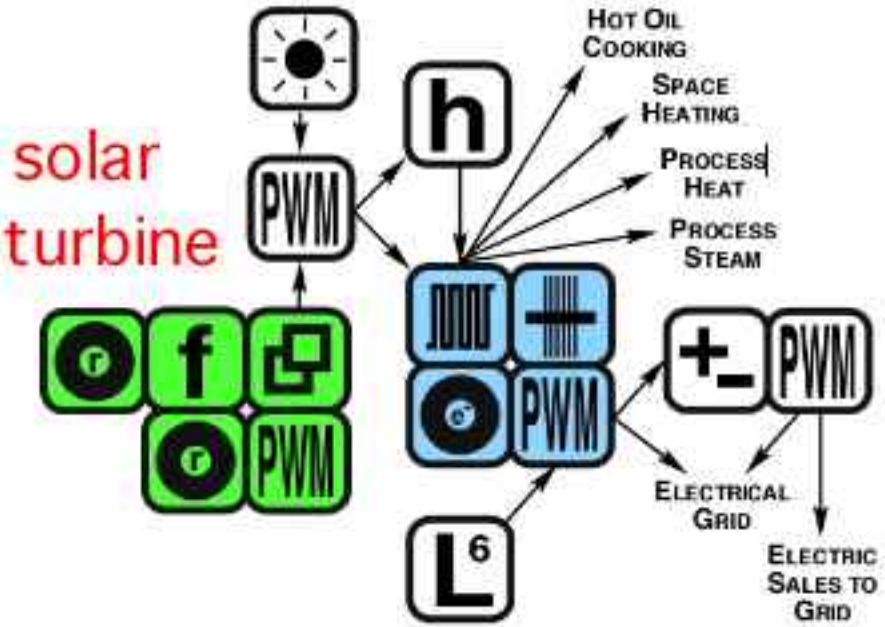
main cylinder

hopper cylinder

sawmill

Different Devices Have Many of the Same Components

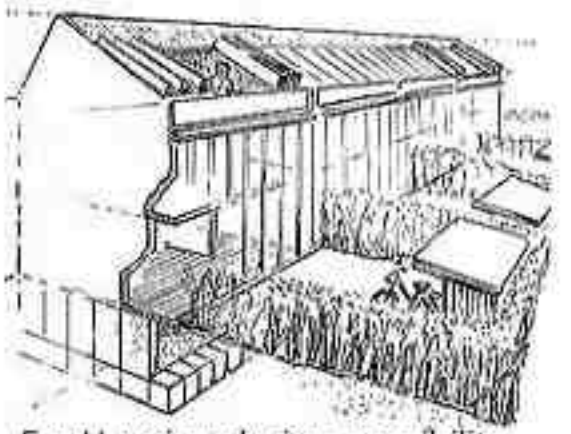




- Solar turbine includes all the parts that make up a hybrid electric car
  - structure
  - *fuel source*
  - *turbine engine*
  - *electrical generator*
  - *electronic controls*
  - ...
- Icon language indicates that parts may be interchanged between different devices

Four Main Features of Lifetime Design Promote Low Cost and High Utility

- Design for disassembly
  - Creates infinite lifetime for products
- Modularity
  - New functionality may be added without having to buy a new machine
- Scalability
  - Size scales without major redesign
- Absolute simplicity
  - Cannot achieve the same function with fewer parts



EcoHousing design possibility

Sewage treatment plant

Modular, owner-builder option for construction, CMPBS

SolaRoof variable-R glazing tech

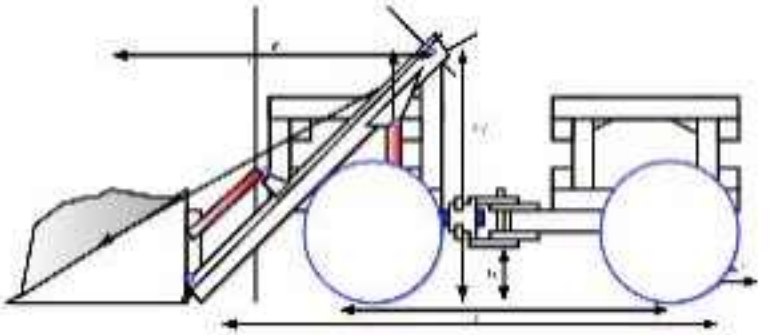
Design for Disassembly Avoids Fatal Repair Costs

- Sample story from experience: Massey Ferguson tractor, 60 hp

  - Maintenance costs - $3k/year

- LifeTrac - 80 hp - Open Source, articulated skid loader/agricultural tractor

  - Bolt-together assembly
    - *Life-size Erector Set in action*
  - Designed for a lifetime
  - Mainenance costs - $100/year



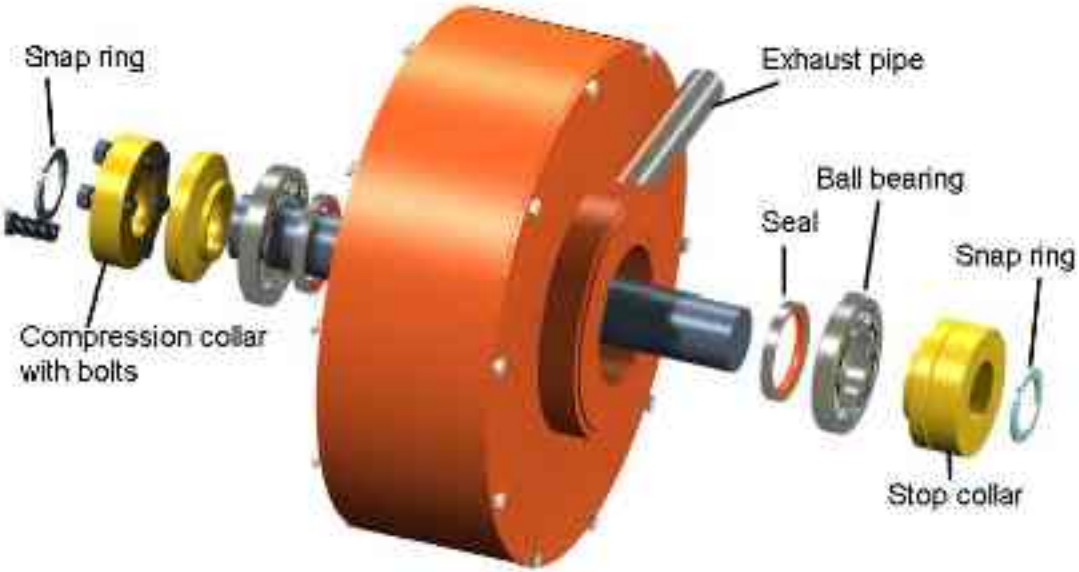
Modular Design Adds Functionality or Modifications as Needed

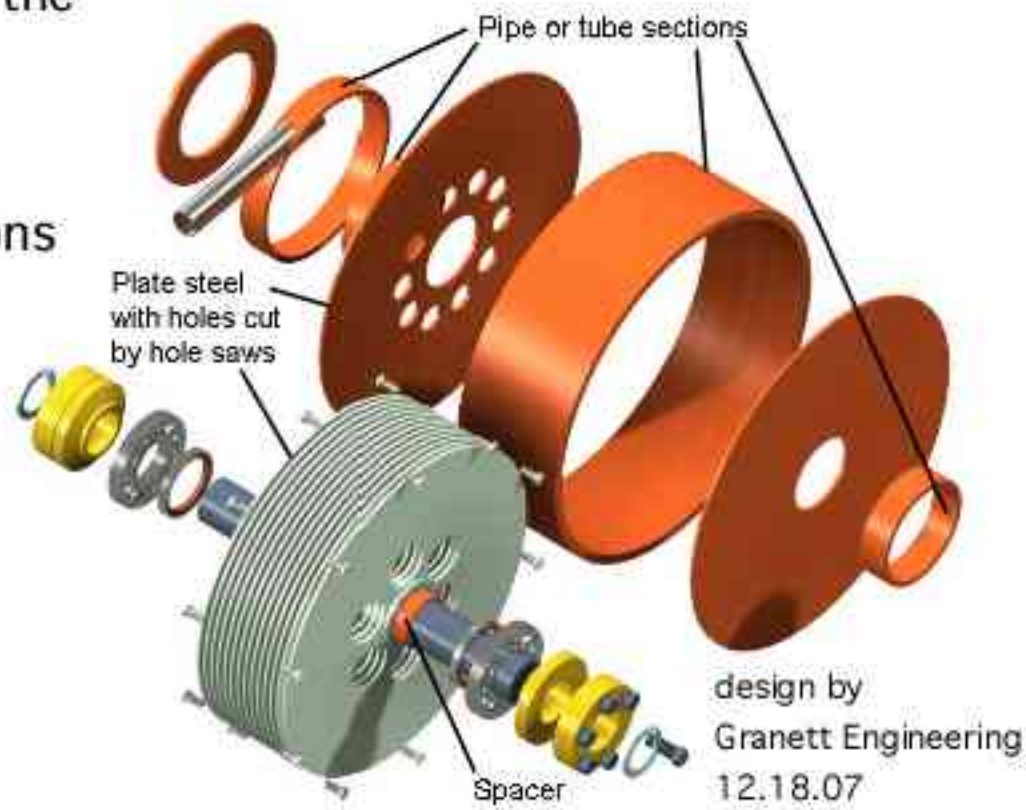
- Example - Green Forms from the Center for Maximum Potential Building Systems
  - Based on bolt-together XYZ corner joints

contrast picture?

Solar Turbine is an Example of Scalability

- Design allows:
  - More disks for increasing power
  - Larger disks
- Power may scale from 1- 100 kW for the same design
- Scalability extends range of applications
  - Remote power, power plants, cars, tractors, power equipment, solar turbine, CEB press, etc.

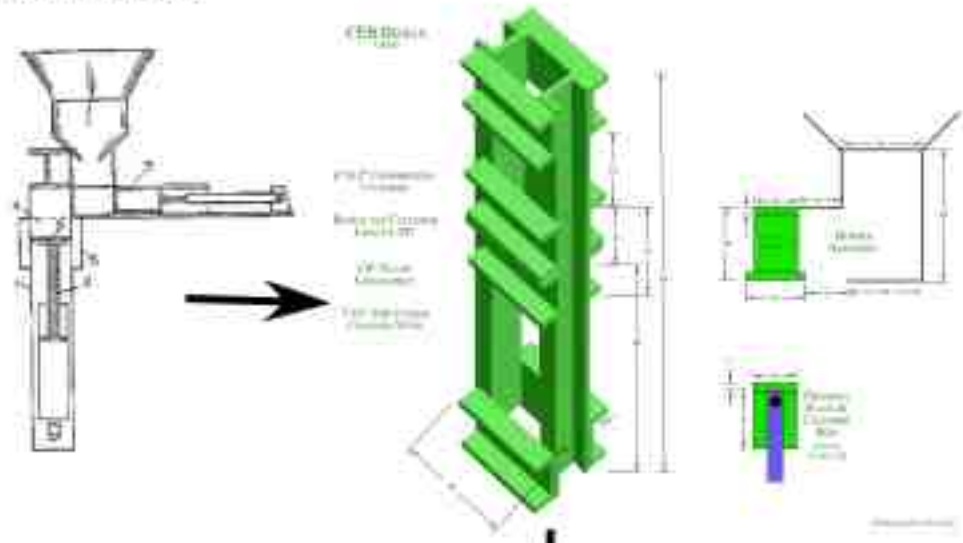




Example: the Liberator Compressed Earth Block (CEB) Press

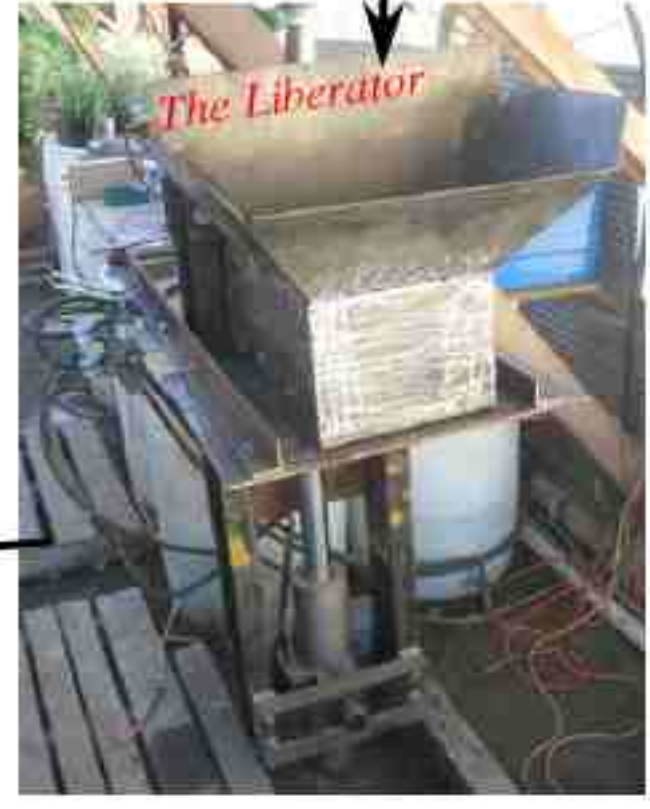
- The world's first Open Source, high performance (3-5 bricks/min) CEB press

  - *The Liberator*: costs *8x less than the competition; $1350 for parts only*



- No invention here, just Open Source design philosophy

  - Featured on Boing-Boing and Wired Magazine blogs



The Liberator is not Just Another Gadget

- Human-centered, lifetime, appropriate, liberatory technology by design
  - design for disassembly, parts easily accessible, open documentation, support community
    - *de facto lifetime warranty*

- Lifetime design
  - Design for disassembly - bolt-together construction
  - Can be unbolted to all parts in about 15 minutes (except hopper)

- Modular - functional part is separate from power source

- Scalable - 4-fold tandem version produces 1000 bricks/hour
  - competition costs $200k

- Simple
  - We challenge anyone to produce a CEB machine with fewer parts
  - Basic tools for DIY production - drill press, welder, torch
  - Automated CNC XYZ acetylene torch table development
  - Small scale: requires $3k equipment startup for optimal production
  - around 20 hours production per machine
  - lends itself to *flexible fabrication*

Economics of CEB Machine Manufacturing Are Based on Community Supported Production

Open Source software provides the basic model,
but is expanded to physical production:

- Collaborative, open, volunteer development process up to *optimized production facility*

- Products delivered *at cost* by the producer

  - Producer captures value of their skill

- Product is released in to the public domain

  - Product Release Fund takes development from prototype to product - *solves freeloader dilemma*

A Product Release Fund is Created to Turn Prototypes into Products

- There is a huge difference between a one-off prototype and a marketable product

- A Product Release Fund is created

  - Extends not only to marketable products, but *distributive production*

- Fund assures that products are delivered with quality control up to OSE Specifications

- We are exploring feasibility of the Fund as a value-capturing process beyond patent protection

The OSE Product Quality Label Defines *OSE Specifications*

- OSE Specifications are a metric of distributive production for regenerative development

  - This is a step beyond sustainability

- It covers 3 areas of the open production model

  - Design - open, optimized, ecological, lifetime, and evolving

  - Production - optimized production facility, viable enterprise, local production, utilization of local resources

  - Replication - explicit mechanisms for replication must be demonstrated:
    - education materials
    - training program
    - capitalization assistance
    - product testing
    - enterprise certification

Community Supported Manufacturing (CSM) is a Viable Business Model

- Development and startup costs are reduced for the producer

- Producer captures value strategically

  - Product Release Fund - may be deployed in distributed locations
  - Pre-orders prior to product release
  - Training others, branding

- At-cost production captures high value of skill

  - Diversification is both desirable and necessary

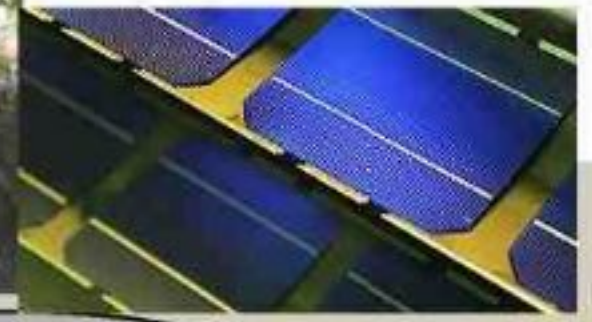
- The economy shifts to a different level

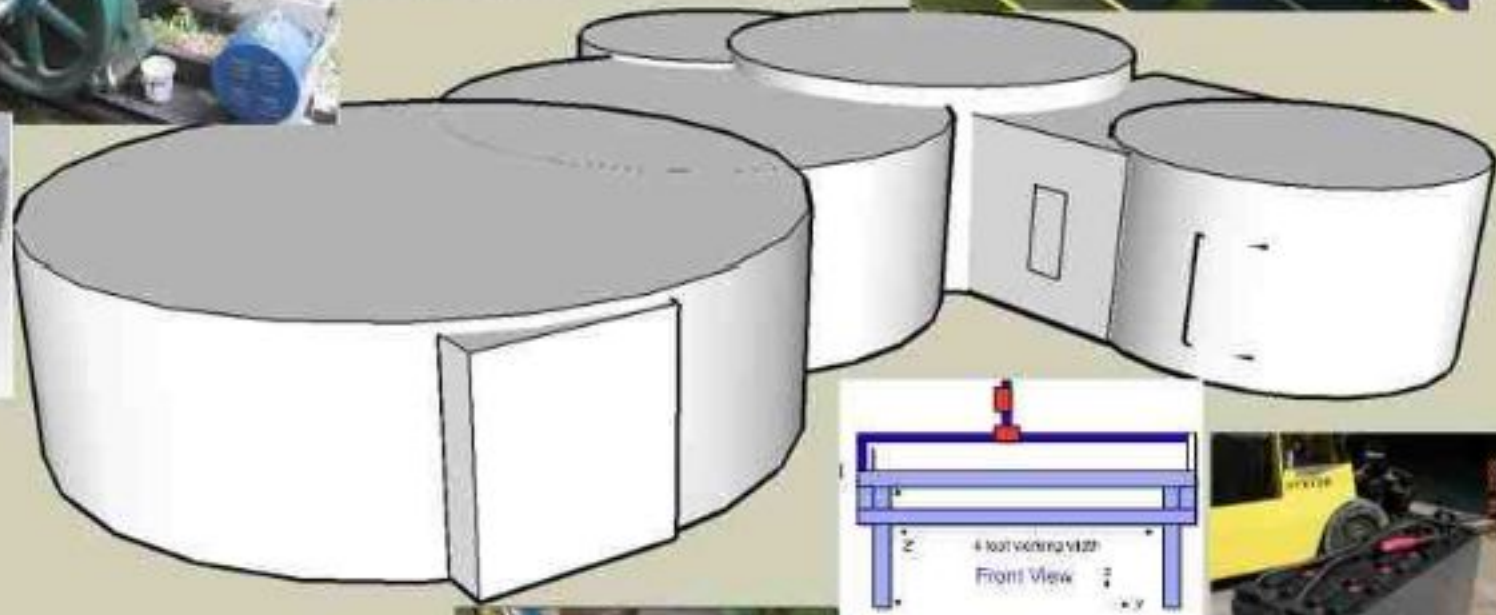
  - Benefit replaces profit
  - The social contract and dynamics change profoundly

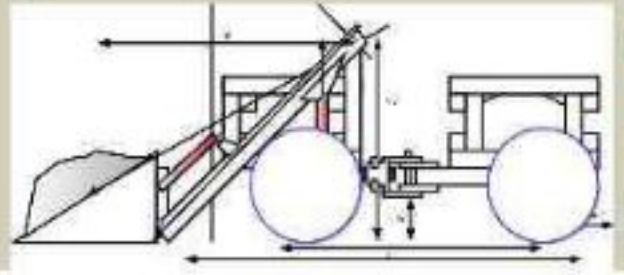
CEB Production is Our First Example of CSM

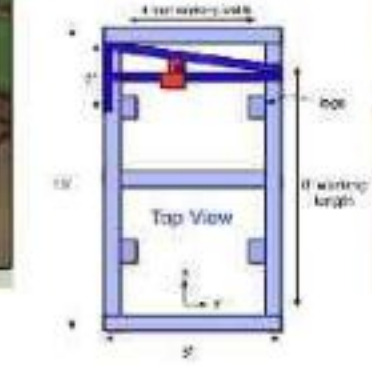
- Facility costs: <$20k, with $500 operating costs/year
  - Off-grid eco-industry, Liberator-built, focus on open source equipment









CEB Offers Many Local Enterprise Opportunities

- Brickworks
- Production of CEB machines
- Green development
- Enterprise incubation services

The Open Source Production Model is Radical

- Distributive production is nearly unheard of in a world of monopoly
  - Can *Product Release Funding* transcend patent protection?
- At-cost production is a rare occurrence
- Digital fabrication is utilized for appropriate technology

Bottom Line is Typical 5-10 Fold Cost Reduction

- Economics work in the favor of collaborative development as opposed to monopolistic production - *no cost of waste is passed on to the buyer*

  - Zero costs: competitive waste, R&D, capitalization, marketing, inventory
  - Producer captures high value of skill
  - Low overhead
  - Lifetime warranty and quality control

- How do we keep it that way?

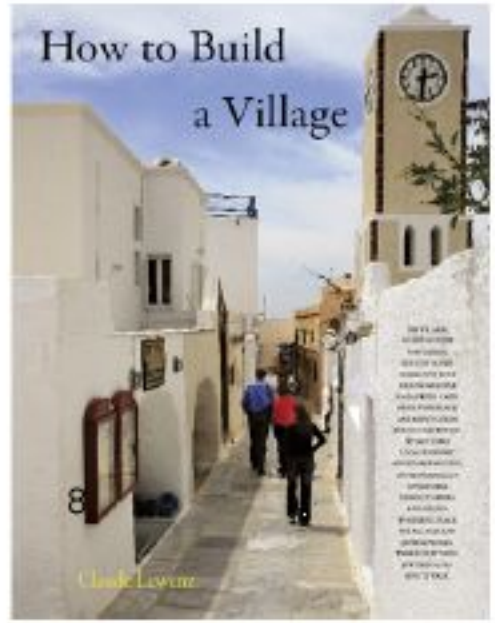
  - OSE is steward of Open Enterprise Label - OSE Label
  - Quality control specifications for distributive enterprise - OSE Specifications

- Bottom line:

  - Optimal production, developed collaboratively, knocks the socks off the competition

  -> We have seen these trends so far with the CEB press

The OSE Program Revolves Around the Enabling Technologies of the GVCS and their Application



- Step 1: Building the entire Global Village Construction Set, ~3 years; we're in beginnings of Year 2

  - We build a village as we go along

- Step 2: Local Economic Impact - 3-10 year period

  - Visible changes happen in local community

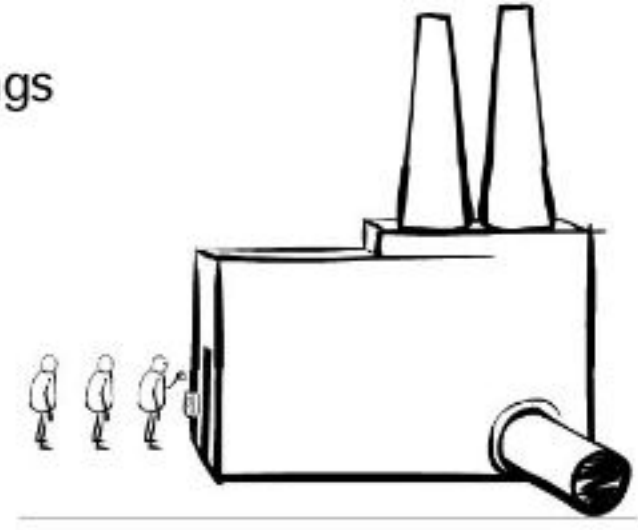
- Step 3: Replication of OSE facilities to other locations - after Year 3

  - Create sites of world heritage and transformation

By Building the GVCS, We are Reclaiming Global Sanity by Local, Sustainable Production

Unschool. Unjob. Produce.

- The entire economy rides on the back of *physical* production



- Start inventing - applying knowledge to making things

  - This is not about rocket science, but relevance to your life

- Start producing

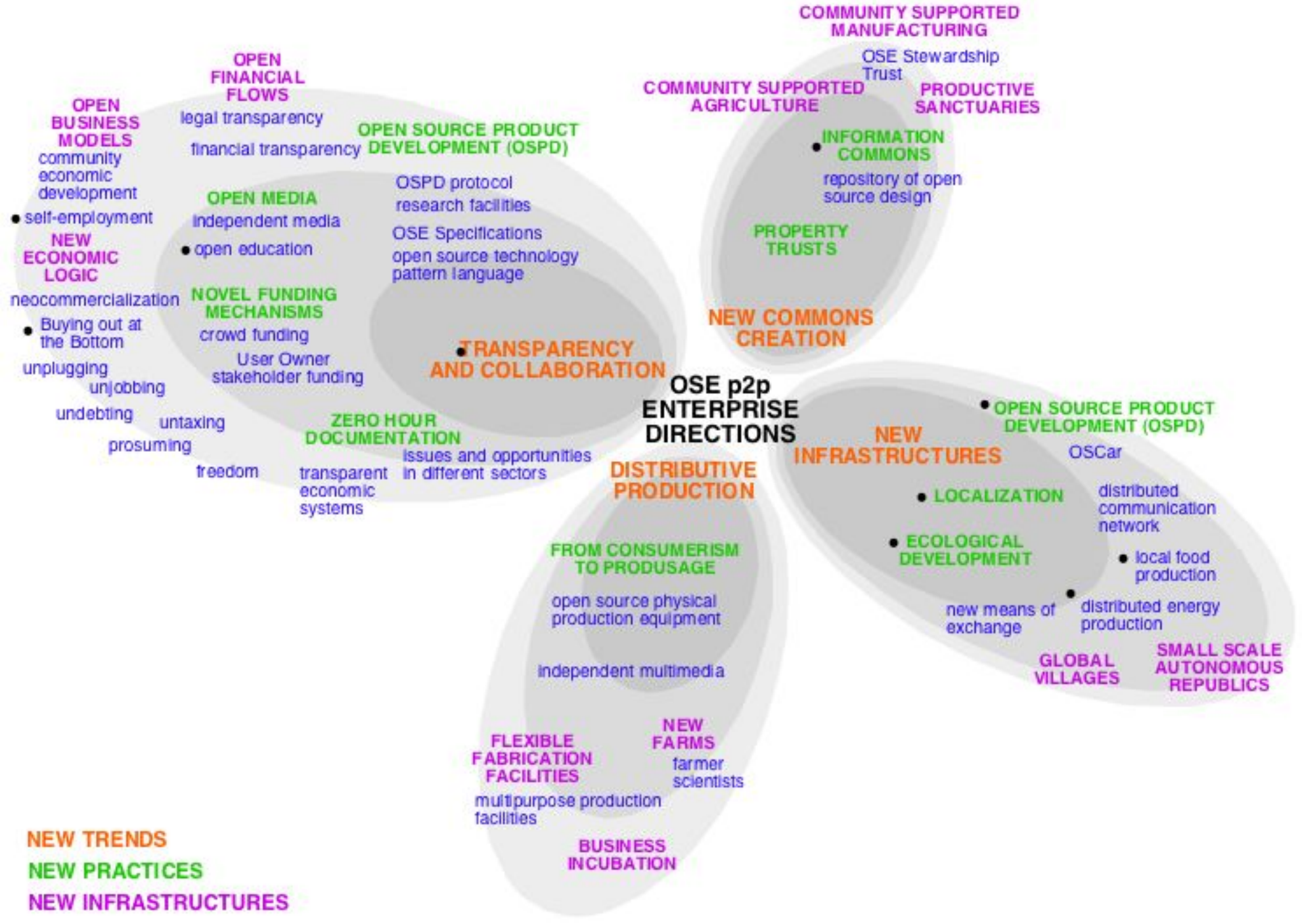
  - Quit your absolute dependence on the system
    - *Plant a potato. Build things.*

  ->Apply your learnings to your community

- Skills required for GVCS are high school math and physics, organizational work, ability to do research, and work with your hands

  - First, recognize that you have been swindled out of practical skills and technological literacy by mass cultural production

Much Good Work Remains to Be Done



Help Us Build the Global Village Construction Set

- Openfarmtech.org wiki for product development
- Student research
  - Projects, independent study, research papers
- Speaking engagements
  - Do you know others at Universities or other groups who may host a talk?
- Resource Development
  - Newly opened Kat Erdel Resource Development Center, Columbia, MO
    - *tel: 573.999.9970*
  - Product Release Fund development
- Public Relations
  - Brochure and press kit
  - Clear message on GVCS
- Organized work days at Factor e Farm

Further Information

- This presentation and supporting links are on-line at:

  http://openfarmtech.org/presentation.html

- The following links are also at the above address:

  - The Global Village Construction Set development site
  - Factor e Farm weblog, where you can follow on our daily developments
  - Wanted Items: resources and supplies that we need for our work
  - Information about the fundraising website for *Product Release Fund*
  - Student Research Projects and research that we would like to facilitate

- You can contact us for more information at

  ose@openfarmtech.org