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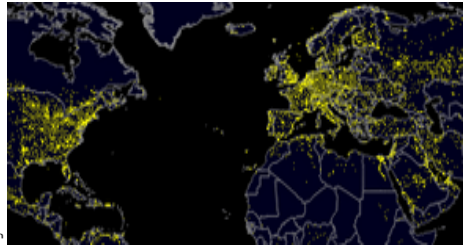
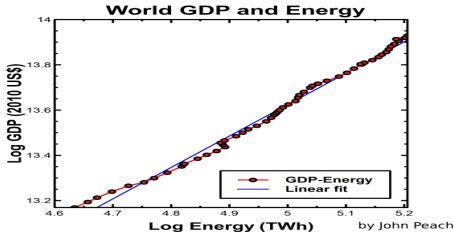
Lyis Forestry

February 26, 2024

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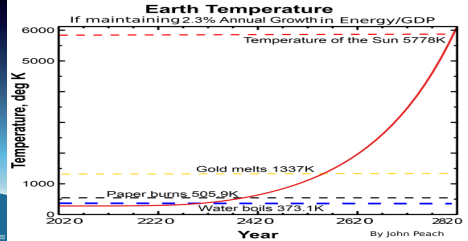
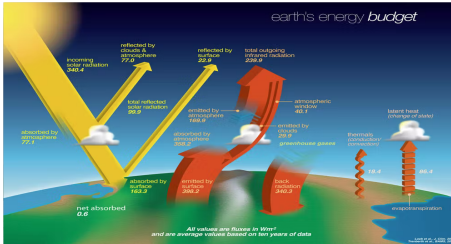
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# GDP/Energy Growth Dangers



GDP growth depends on energy.

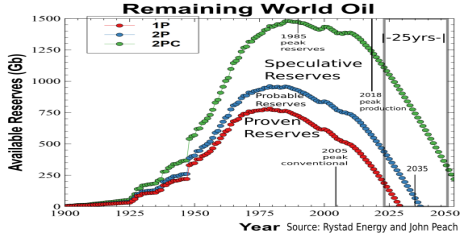
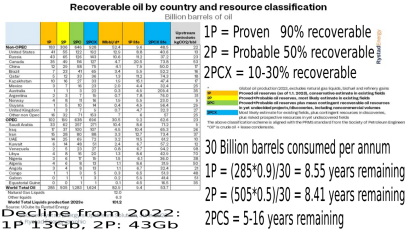
Energy produces heat.



Heat radiance to space limited

If growth maintained oceans boil.

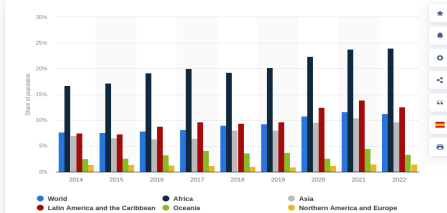
# The Urgency of Global Oil Depletion



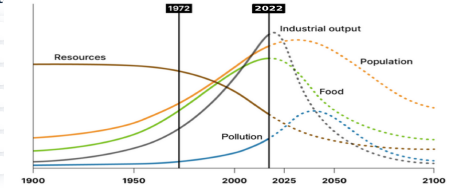
8 year global oil reserves remain.

Oil reserve project low point 2035ish

Prevalence of severe food insecurity worldwide from 2014 t



Lowest global food prices in 2015



This figure shows the BAU 1 scenario which has tended to follow the data relatively well. Source: Meadows et al (1972), Earth4all

Limits to growth indicates we in decline



# Challenges in Transitioning to Renewables

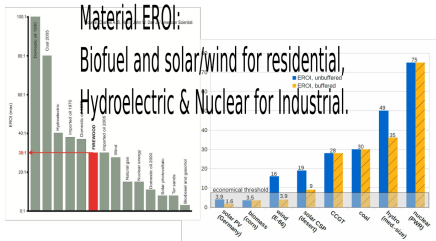
Table A9. Total metal quantity required to manufacture one generation of technology units, with a 28 day power buffer for wind and solar to phase out fossil fuels compared to 2019 global production

Metal	Element	Total including 28 day buffer stationary power storage (million tonnes)	Global Metal Production 2019 (million tonnes)	Years to produce metal at 2019 rates of production (assuming the 28 day buffer) (years)
Aluminum	Al	353.5	63.14	5.6
Copper	Cu	6 161.1	24.20	254.6
Zinc	Zn	48.2	13.52	3.6
Magnesium Metal	Mg	0.5	1.12	0.4
Manganese	Mn	306.0	20.59	14.9
Chromium	Cr	9.2	37.50	0.2
Nickel	Ni	1 251.2	2.35	532.4
Lithium	Li	1 274.2	0.095	13 388.3
Cobalt	Co	292.9	0.126	2 324.6
Graphite +	C	11 466.2	2.73	4 201.2
Molybdenum	Mo	1.5	0.277	5.4
Silicon (Metallurgical)	Si	67.35	3.43	19.7
Silver	Ag	0.198	0.03	7.5
Platinum	PE	0.0027	0.000190	14.1
Vanadium	V	923.96	0.096	9 622.4
Zirconium	Zr	2.61	1.34	2.0
Germanium	Ge	4.16	0.000130	32 024.3
<b>Rare Earth Element</b>				
Neodymium	Nd	1.14	0.024	47.8
Lanthanum	La	5.97	0.036	166.8
Praseodymium	Pr	0.265	0.0075	35.4
Dysprosium	Dy	0.212	0.00030	712.1
Terbium	Tb	0.023	0.00026	81.4
Hafnium	Hf	0.000293	0.000066	4.4
Yttrium	Y	0.000293	0.014	0.0



Mineral supply limited.

Renewables are unreliable.



EROI Basics, Service decline

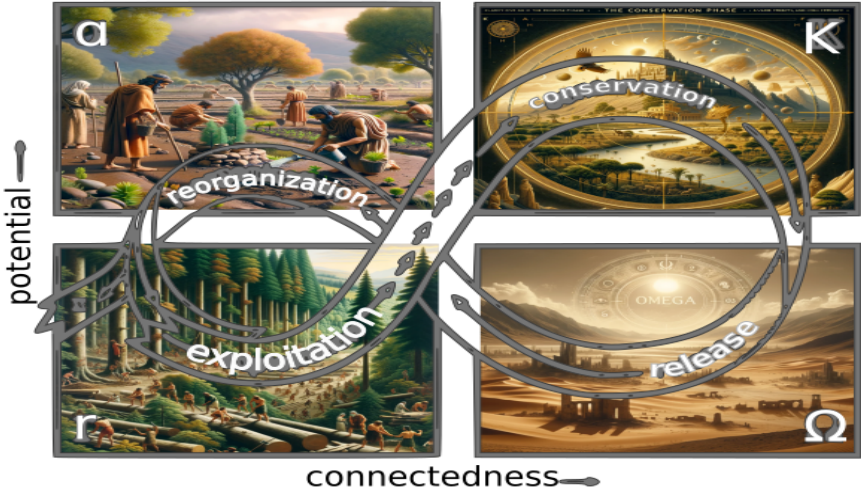
- EROI 14, enough to pay for arts (90s)
- EROI 12, enough to pay for healthcare (2010s)
- EROI 9, enough to pay for a school system (2020s?)
- EROI 7, enough to pay truck drivers, farmers (2030s?)
- EROI 5, enough to truck commodities other than fuel (2040s?)
- EROI 3, enough to truck the fuel
- EROI 1, enough to dig a hole to look at fuel

By EROI biofuel & hydro reliable.

As EROI decline, service decline.

# Resilience Theory: Bronze Age Example

## Collapse, Resilience, and Transformation in Complex Societies



Civilizations that Remember to plant trees and manage energy survive.

# Most Probable Future Lifestyles: Mass Dreams Study



Urban Salvage Economy



Rustic Amish annual agriculture



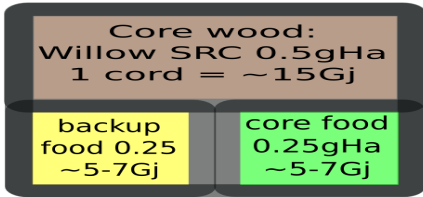
Indigenous hunter gatherers



Food forest communities

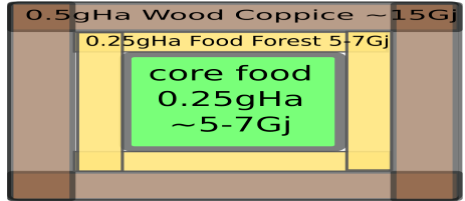
# Understanding Carrying Capacity

Active 75kg human food ~4-5Gj/year



Carrying Capacity Breakdown

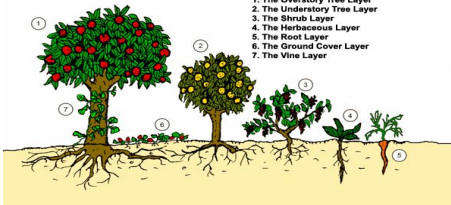
Active 75kg human food ~4-5Gj/year



Concentric Example

## The Seven Layers of Every Forest

1. The Overstory Tree Layer
2. The Understory Tree Layer
3. The Shrub Layer
4. The Herbaceous Layer
5. The Root Layer
6. The Ground Cover Layer
7. The Vine Layer



Forest food production



Short Rotation Coppice Firewood

# Aligning with Provincial Policy Statement

- the Ontario PPS has provisions for rural settlement areas called hamlets and villages.
- They also state that biogas facilities need to be separated with a Minimum Distance Separation formulae (250m-1km).
- A Hamlet is equivalent to a rural church of 60 people, which needs 72ha, or 478m radius, 6 minute walk community.
- A Village is equivalent to around 360 people, which needs 432ha, or 1.2km radius, 15 minute walk community.

# Rural Hamlet Village Settlement Example: Irish Block 24



1ha Hamlet x7 & 1ha Village Centre, 98% Agricultural, up to 419 residents

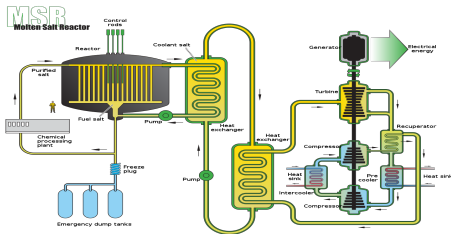
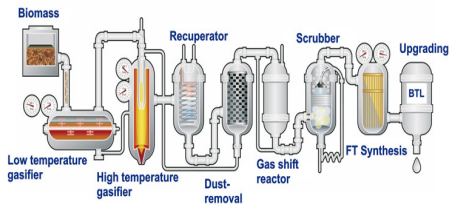
# Sustainable Energy Production



Solar/Wind for Residence/Hamlet



Bio-CNG for Village from waste



FT BioGasoline for Neighbourhood

Thorium Nuclear at Municipal

# Alignments with Bruce County Plan

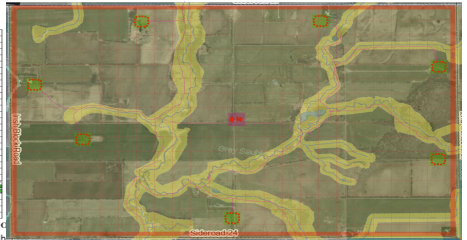
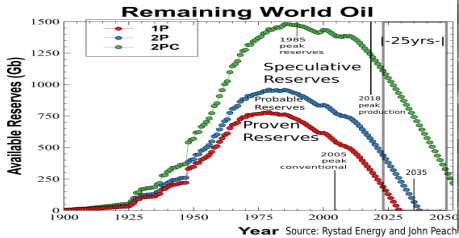
- Conserving Good Agricultural Land
  - ✓ 98% Agricultural
- Enhancing Natural Environment Quality
  - ✓ Food Forests, Cradle-to-Cradle Fertilizer
- Fostering Economic Prosperity through Sustainability
  - ✓ Local Food, Energy & Industry
  - ✓ Decentralized services
- Building Resilient Communities
  - ✓ Resilient subsidiarity
  - ✓ Optimal economies of scale



# Moving Forward Together

- Allowing sustainable hamlets and villages in Bruce County.
- Consider radio, fiber optic, and rail county responsibilities.
- Include Carrying Capacity considerations in official plan.
- Resolution to promote sustainable hamlets and villages in PPS.  
i.e. Letter to Ministry of Municipal Affairs and AMO.

# Discussion



Time for smooth transition limited

Sustainable Hamlets/Villages



Rustic Amish annual agriculture



Food forest communities