Collapse 101

Gail Tverberg, Age of Limits, May 25, 2013
Why does collapse happen?

Population Growth

Finite Earth

Depletion and Pollution

Note: Images from Wikipedia
On a finite world, populations ebb and flow:

Cycles can be very sharp, if population finds a new energy resource.

Note: Chart from dieoff.org shows reindeer population on Reindeer Island based on work of David R. Klein, Univ. of Alaska
Close balance level

- Population has to be very low
  - Need to stay in balance with local predators
  - For primates like chimpanzees, gorillas ~ 100,000 to 200,000

- What close balance would look like
  - Eat raw food
  - A few simple tools – don’t overpower predators
  - No use of fire
  - Probably no clothes
  - Shelters: Caves; sticks pulled together
  - Live only where climate is “right”
Human population rises rapidly, the way a population that finds a new resource grows.

Source: Dieoff.org based on work of David Klein.
Humans had three great “leap forwards” in energy use

1. Discovery of control of fire, 1,000,000 + ago
2. Discovery of agriculture ~ 10,000 years ago
3. Ability to use fossil fuels ~ 200 years ago
Each new discovery had a huge impact

- **Use of fire**
  - **Cook food**
    - Eat wider range of foods
    - Cut chewing time
    - More food energy for brain – Made humans smart?
  - **Better tools**
    - Heat treated stone blades sharper
  - **Used in hunting**
  - **Expand habitat to cooler areas**
- **Expanded population from 150,000=> 7 million**
  - 50 fold increase, over long period
- **Wiped out many predator species**
Population grew with each discovery

- Control of fire
- Agriculture
- Global exploits
- Fossil fuels
What does history of collapses say?

- Overshoot and collapse studied by many
  - “Secular Cycles” by Peter Turchin and Sergey Nefedov
- Population typically found a new resource
  - Cleared land for farming
  - Or began using irrigation
  - Current situation: Began using fossil fuels about 1800
- Problems developed over 200+ years
  - Combination of rising population, depleting resources, more pollution (salt from irrigation)
- Civilizations eventually disappeared
  - Replaced by others elsewhere
In collapse scenarios, problems appeared as **FINANCIAL PROBLEMS**

- Greater wage dispersion
- Greater use of debt
- Government had problems collecting enough taxes
  - Tainter calls problem “complexity,” but complexity has cost
- Revolts, epidemics, resource wars

- Quite different from what many think of as “peak oil”
General Shape of Collapse

Based on *Secular Cycles* by Peter Turchin and Sergey Nefedov.
Limits we are reaching now

Financial Issues
- Species loss
- Water shortage
- Air pollution
- Soil issues
- Entropy

Political Issues
- Oil prices
- Food prices
- Oil supply
- Population
- CO₂ Level

Disease Susceptibility
Future world energy supplies: How “financial collapse” estimate fits in
Three distinct view of the future events

- **Business as Usual**
  - Climate change high/low
  - Chief concern is CO2; climate change

- **Peak Oil View**
  - Liquids are the big issue
  - Renewables might possibly increase fuel supply
  - Might also help climate change

- **Financial Collapse**
  - Issue is Financial Collapse, due to high fuel prices
  - Renewables added to grid make fuel prices higher yet
Financial collapse: Reason for high prices (oil, natural gas, fresh water, etc.)

- Price becomes more expensive as more is extracted

  Reason: We extract the cheapest-to-extract first
- Wages don’t rise correspondingly
- Limit is what customers can *afford*
Why rising oil prices are a problem

- Wages don’t rise, as oil price rises
  - Less money for discretionary expenditure
    - Cars
    - New homes
    - Charitable giving
  - Layoffs in the above sectors
- More debt defaults
  - Bank bailouts needed

- Governments especially at risk
  - Lower taxes; higher expenditures
My view: Financial Collapse Scenario
Financial Collapse Scenario

- Problem is a financial collapse – lack of “demand”
  - Governments can’t collect enough taxes
  - Too many people unemployed
  - Looks like Greece, Spain, Argentina
  - Or Syria and Egypt

- Problem is not a lack of oil in the ground
  - Problem is that oil is high-priced
  - Also, that the particular country is not competitive in the world market
  - Adding high-priced renewables makes the situation worse
A big issue is collapsing governments
- Takes energy/money to maintain government
- Better off parts want to secede
- Lots of services provided => Very difficult to maintain

Least expensive government: Local dictator

Money loses value if government collapses

International trade may be disrupted
Former Soviet Union is an example of a Financial Collapse
Even if a country does not collapse itself, it can be hurt by others collapsing elsewhere

- Oil exporter collapses from low price
  - Reduces exports on the world market

- Banks affected by failure of banks overseas
  - May lead to local bank failures
  - Credit availability may be affected

- Less world trade—harder to get spare parts for essential manufacturing
  - Example: Computers
Financial collapse affects all types of energy supplies at once

- Problems
  - Fewer jobs
  - Less money for goods of all kinds
  - Less credit availability
  - Perhaps no central government; banks closed
  - Perhaps money available, but nothing to purchase

- People can’t afford oil, gas, or electricity
  - High priced new renewables make the problem worse
    - Electric prices higher; government deficits higher
  - Deforestation may become a problem
Financial collapse: Timing could be very soon

- Europe, Japan, US especially vulnerable
Financial collapse is likely to affect population as well.
Even recently, population continues to rise.
If fossil fuel use declines, world population will likely decline

- Fossil fuel use enables many basic things:
  - Tractors
  - Herbicides and pesticides
  - Modern fences
  - Most irrigation
  - Most metal making
  - Making of modern metal alloys
  - Most transportation
  - Hydroelectric, wind turbines, solar PV panels

- There is no “reverse gear” on our economy
Issues are not the same as many “peak oil” people have imagined

- Oil prices may not be high
- Solution may not be “using less”
- Electricity may not work as a substitute
- Collapse may occur before oil decline begins
Why is my view different from Hubbert’s?

- Hubbert only forecast shape of oil decline, if another fuel took over first
- This avoids the collapse issue!

Source: M. King Hubbert, Nuclear Energy and the Fossil Fuels, 1956.
Oil in the ground means nothing, if people can’t afford it
How does climate change fit in?

- Water Shortage
- Ocean Acidification
- Soil Quality
- Loss of Fish
- Loss of Bees
- Climate Change
- Population Growth
- Financial Problems
- High oil Price
- High food Price
- Antibiotic Resistance
- Entropy
Fossil fuel forecasts used in climate change estimates are very high
If realistic fuel estimates were used, CO2 forecasts would be much lower.

Off-shoring manufacturing raises emissions

World Fossil Fuel Carbon Dioxide Emissions

Billion Metric Tons Carbon Dioxide

- Actual
- Fitted 87-97
Climate change scientists are confused

- Models don’t consider energy and other limits

- Economists suggesting solutions almost equally confused
  - Electric cars use coal quicker, leave more oil for China/India
  - Carbon sequestration raises costs, pushes along collapse
  - Carbon taxes encourage more manufacturing in China

What can we do?

- Get as much positive out of each day as we can
  - Look for beauty in nature
  - Develop simple hobbies
  - Spend time with family
  - Don’t obsess over the future

- Take positive steps
  - Start a garden
  - Build a network of friends
  - Learn skills that might help if job loss

- Keep larger-scale plans cheap, easy to implement
  - Car-sharing plan in cities
  - Alternatives that worked years ago—boats, canals
What can we do? (cont.)

- Don’t count on money to be available/worth as much in the future
  - Buy needed tools now
- Flexibility is important
  - Things are likely to change
  - It may be necessary to move suddenly
- Seek help from religion, meditation
  - Man’s story has been miraculous to date
  - Perhaps more miracles are ahead
  - Focus can be on comforting verses and songs, helping others
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