

Ten Principles of Post Oil-Peak Planning

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About this time last year I gave a presentation on Peak Oil at the Atlantic Planners' Institute conference in St. John's, Newfoundland. For most of the people in the room, it seemed to be the first introduction to the issue.

Then, this summer, I gave another presentation in Vancouver. I didn't know how dialed-in everyone was, so the first thing I asked was, "Show of hands... when I say 'Peak Oil' or 'Hubbert Peak,' who here has no idea what I'm talking about?" And the entire room was like, "well, duh." I might as well have asked them if they'd heard the Earth goes around the Sun.

So that's pretty remarkable, how fast this issue has become common knowledge. In eight months I went from being the bearer of bad news, to accidentally insulting everyone's intelligence by suggesting it was news at all.

The modern planning profession came into being just over a hundred years ago, at almost exactly coincident with the dawn of the petroleum era. By extension, North American planning has lived its entire life so far with a certain set of background assumptions. The key assumption is that energy is cheap and abundant and there's more of it every year. And when you get right down to it, planning has been about dealing with the effect of this. Industrial cities, urban growth, urban sprawl, traffic congestion—these are all basically side effects of cheap energy.

When that cheap energy is gone, the assumptions and the principles of planning are going to be turned on their ear. So that's what this show is about.

1. The Laws of Thermodynamics

First Law of Thermodynamics:

Energy cannot be created or destroyed. It can be changed from one form to another.

(e.g. thermonuclear fusion ↔ sunlight ↔ chemical potential energy ↔ momentum ↔ heat)

Second Law of Thermodynamics:

Change tends towards increasing entropy.

- In any transaction, some energy is “lost” as heat.
- Eventually, the entire universe will reach a state of total entropy (uniform low-grade heat. a.k.a. “heat death”)

The laws of thermodynamics are basic physical laws that describe how energy behaves. They're like the Two Secular Commandments. You can't really have an intelligent conversation about energy issues unless you know these. Not that that stops a lot of people... but anyway.

The First Law says energy can't be created or destroyed. Back in the 1990's, a lot of people got real excited about the hydrogen economy, how it was going to free us from fossil fuels, it's everywhere (in the form of water), you could drive your car with no consequences. A lot of the hype tended to gloss over the fact that to get hydrogen—molecular hydrogen, the stuff you can use as a fuel—you first have to invest energy in making it. Water is what's left of hydrogen after the useful energy has been taken out. But marketing people and PR flacks don't know physics.

The Second Law refers to entropy. Every time you change energy from one form to another—for instance, you use electric power to crack water into hydrogen fuel—you lose some of it, basically forever. It isn't destroyed, it's actually dissipated as heat, but that heat can't do useful work--it's too dispersed. It's like a tax that Nature charges you every time you spend energy. Eventually, in billions of years, all the energy in the universe will be dissipated like this—an entire universe of low-grade, uniform heat that can't make anything happen. Cosmologists call this “heat death.”

First Law of Thermodynamics:

There is no free lunch.

Second Law of Thermodynamics:

Taxes and (eventually) death are inevitable.

Now, these laws are kind of hard to remember, so I translated them into simple terms.

No free lunch; death and taxes. That's your first two laws of thermodynamics.

(And they call *economics* the "dismal science.")

2. Protect farmland *at all costs*.

- Arable land is **the most basic tool of energy capture for human consumption**.
- And they're not making any more of it.
- Subdividing is almost as bad as paving or stripping topsoil. (Difficult/costly to assemble enough 60'x100' lots to make a working farm.)



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In the twentieth century, we've been able to produce huge amounts of food thanks to mechanized farming and artificial fertilizers. This has helped us forget that when it comes to capturing energy for human consumption—I mean, to run our bodies and keep us alive—the basic tool is farmland. No farmland equals no civilization.

We'd do well to remember that because right now we think farmland is worthless. I mean we literally treat it like dirt. We strip the topsoil, we let it erode, we beat it to death with chemicals—all kinds of awful abuse.

Even subdividing it is bad—and that's just drawing imaginary lines on it. You take a farm and cut it into a bunch of suburban lots and put sewer pipes in, and suddenly it's not a farm, it's a hundred little "building lots" with "development potential." You just try assembling enough land to make a farm when it's held by a hundred different people who each thinks his piece is worth thirty grand, not including the house. Eventually it'll straighten itself out but in the meantime it can get real ugly.

Farmland is arguably even more precious than clean water. I mean, dirty water at least evaporates and falls from the sky as clean water. Ta-daaa! But you wreck good soil and that's it—it's not going to regenerate anytime soon. Most of the good soil in North America was deposited by glaciers, plus centuries of buffalo crap. The dustbin of history is full of civilizations that went down because they let their farmland erode.

A word on biofuels

Using farmland to produce biofuels is **“unsustainable, subsidized food burning.”** *(Pimentel 2001)*

Without fossil fuel inputs “...there is **not enough land to fulfill the needs for food and energy** when biomass is used as an energy source.” *(Nonhebel 2004)*

EROI for non-cellulosic biofuels ranges from **0.78 to 1.45** *(Farrell et. al. 2005)*

This is as good a time as any to bring up biofuels. Biofuels are the new hydrogen, frankly. I think right now most of the discussion on renewable energy hinges on the question, “Can I run a car on it?” If the answer’s no, we lose interest real fast. And if it’s yes, then apparently all other issues are negotiable.

But we’ve got six and a half billion people on this planet, and using farmland to grow motor fuels just smells like a really super dumb idea. A lot of people who are a lot smarter than me have done the math and concluded that there just isn’t enough land to do both at our current levels. Something’s gotta give.

You’ll notice that the energy return on investment is really low for biofuels—certainly for the grain-based biofuels that all the rage right now. (Actually that’s not a hundred percent fair. It’s higher for things like cellulosic ethanol, on the order of 8:1, so in that respect it’s not so bad but there are technical problems. But if you’re going to use grassland to grow switchgrass to make ethanol, that’s still land that could be used to graze cattle. Either way, you’re talking about using a finite supply of productive land to feed the car.)

The other reason I think people like biofuels because it gives the government an excuse to throw money at a core constituency. During the 1990’s, under Clinton in the U.S., everyone was into high technology, brainy West Coast hipsters with cool glasses. So hydrogen was the big thing. Now under Dubya, it’s all about hosing cash at agribusiness in the red states. Once you take this into account it explains a lot.

A word on biofuels

Oil used by transportation sector, worldwide, 2003:
15,035,200,450 bbl (**= 92.8 trillion MJ**) (EIA 2006)

Gross (not net!) energy yield per hectare, biofuels

Low estimate: **57,600 MJ/ha** (Patzek 2004)

High estimate: **108,800 MJ/ha** (Cellulosic - Farrell et.al. 2005)

Land required to replace transport oil with biofuel equiv.:

850 million - 1.6 billion hectares*

Total arable land on Earth:

1.5 billion – 2.4 billion hectares (FAO 1998; Wolf 2003)

* Assumes average 1 crop/year; multiple crops/year offset by proportion of land left in fallow periods

Okay, do the math. Let's assume we'd use biofuels only for transportation purposes. That's fair, transportation is almost entirely petroleum-dependent; we can substitute wind and solar and nuclear for a lot of other things but cars and trucks burn oil. Right now we use 15 billion barrels of oil a year for transportation.

So how much land would it take to grow that much biofuel? Well, Dr. Alex Farrell and his colleagues at Berkeley did a review of different experiments and he gets—well, I won't read you the numbers but you do the math. I'm assuming an average of one crop a year. In a lot of places you'd get two or three, but then you also have to figure that you're going to have to leave a lot of land fallow each year to keep from totally exhausting it, so assume it averages out to something like one crop per hectare per year.

By the way, these numbers of how much energy you get in biofuels—that's GROSS yield, not net. So you'd have to subtract the amount of energy that went into the fertilizers, labour, machinery etc. to produce the crop in the first place. But just for the sake of argument we're going to tie one hand behind our back and pretend that expenditure doesn't exist.

And then you look at how much arable land there is on Earth and you do some fourth-grade arithmetic and you realize that it would take between one-third and, well, all of the arable land on Earth and more to produce enough biofuels just for our current transport needs. Never mind future growth, like all those people in China who are buying cars each year for the first time. Never mind the other stuff we use oil for. Never mind heating and industry. Never mind running the farm machinery and producing pesticides and the natural gas inputs in the form of fertilizers.

Okay. Look.

There are studies that suggest *theoretically* enough land for food and biofuel production. (See Penning de Vries 1995, Wolf *et.al.* 2003)

These studies make optimistic assumptions, including high availability of external inputs (nitrogen fertilizer.)

Without N inputs (currently made from natural gas!), **yield per hectare drops to 35%-50%.** (Wolf 2003, quoting Spitters 1987,1990)

Today, under near-ideal conditions (cheap fertilizer & transportation) **800 million people are chronically malnourished.** (Nonhebel 2004, quoting WHO 2003)

Past experience is not reassuring.

Now, I can't prove absolutely conclusively with numbers that biofuels will be a disaster and produce mass starvation. There are studies that suggest that it could be done.

But those studies make a lot of optimistic assumptions. For instance, a lot of them are predicated on a "high input" farming system—which means lots of artificial nitrogen fertilizer. From a thermodynamic standpoint, fertilizer is an energy subsidy. That's why we make fertilizer out of natural gas, and if we didn't use gas, we'd have to use some other energy source. There's no free lunch, even if you're a plant.

And without those inputs—which, obviously, are based on a non-renewable and depleting resource—we'd get much smaller yields and need between two and three times as much arable land to feed the same population.

Faith in technology is fine, up to a point. But when that faith gets to where we assume the right to create problems that we have no idea how to solve, because we tell ourselves that someone else down the road will figure it out—I have a big problem with that.

Today, we produce insane amounts of food. It's so cheap and there's so much of it you literally can't make a living as a farmer. We can ship food all the way across the world so if there's a famine over there we can use our surplus from over here. Climate change is only just starting. It's just about the most absolutely perfectest world you imagine from a mass food production standpoint and still there's almost a billion people who are starving.

How will productive land be used when the rich want it for motor fuels and the poor need it for basic food?



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Ultimately this is the big question. And frankly it's a rhetorical question. We already know what happens. When poor people need something and rich people want it, rich people get first crack at it. Period.

That's why today, something like forty percent of the grain in the world goes to feed livestock instead of people—because the developed world likes to eat a lot of meat. That's the market for you. The market doesn't care about "need," it only cares about the ability to pay. Whether it's for biofuels or Big Macs, don't try to tell me it'll work any differently.

I can't prove it with numbers but 80% of the facts and 110% of my gut tells me that if we go into biofuels in a big way then seriously bad stuff is going to happen. It'll exhaust what's left of our soil when we should be trying to restore it with sustainable agriculture practices. Not to mention the water it'll use, which is a whole other commodity that's not exactly in ample supply. We'll have appropriated all that capacity for the enjoyment of a small minority while millions or billions of people starve.

3. Moving people/stuff around is really hard.

*Norman French
(11th century)*

travail (tra-VYE)
1. labour, work;
2. torture

*Early Middle
English (14th
century)*

travailen (truh-VALE-en)
1. labour, work;
2. to make a (difficult) journey

English (modern)

travel (TRAV-uhl)
1. to make a journey

Moving around on the surface of the Earth is really hard. A lot of people don't know that. Why would they? They have cars and trucks and airplanes to do all the work for them.

The word "travel" actually comes from the French word "travail" which meant work and still does; it also, interestingly enough, meant torture.

Along the way it came to also mean making a journey. Chaucer's pilgrims in *The Canterbury Tales* were "travailen."

Today travel is something you do for fun. All connotations of hardship are, for the most part, gone.

3. Moving people/stuff around is really hard.

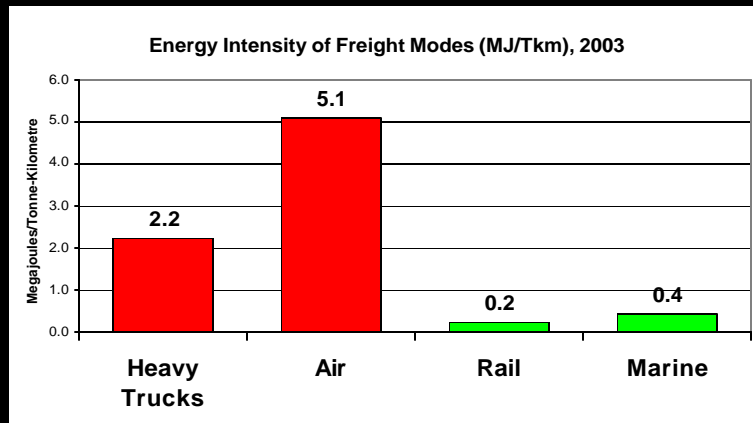
- The most basic function of a city to **minimize the amount of moving around we have to do.**
- 20th-century cities/suburbs were built as if the cost/difficulty of travel was trivial...
- ...because with fossil fuels, it was!
- Cities will have to be (re)built according to the old principle.

But the basic function of a city is to minimize the amount of moving stuff around everyone has to do. They're located at strategic locations, on watercourses and shorelines, where goods and buyers can get to them as easily as possible. Not to mention the logistics of defending your wealth. And inside the cities, the buildings were stuck right together; everything was as close as possible.

The very fact that cities existed, even in the Middle Ages, shows you how important this is. The average fourteenth-century townsman may have been filthy, backward, benighted, superstitious and illiterate, but he wasn't stupid. He knew how hard it was to move stuff around—so hard that it was actually worth living in utter squalor, up to your knees in your own crap, and getting decimated by plague every couple of generations, just to avoid having to move stuff around. I mean, talk about your lousy options.

Of course, in the twentieth century, moving around became so trivial and easy, and even fun, that everything is all spread out. It didn't have to be this way—we now know enough about sanitation and public health and germ theory that we could have made dense but livable places.

Cities in the future are going to have to move closer to the old principle, of putting things close together. Space will be more of a luxury; we'll have to make better use of it.



Source: Natural Resources Canada, Transportation End-Use Model, February 2005

Just thought I'd throw this in. Some travel modes use a lot more energy than others. Trucks and airplanes, in particular, are not only big energy hogs, but they run on petroleum and it's difficult or impossible to make one that will run on anything else.

On the other hand, ships and trains are a lot more efficient. Plus, they can run on all kinds of different fuels. We're going to be seeing a lot more of them in the future. Cities with good rail connections are going to have an advantage. So will seaports and river ports, assuming they're not so low and flat that they get clobbered by climate change. Actually, Saint John is a pretty ideal location when you look at it that way. The Loyalists settled here for a reason.

4. All new development should pass the \$500-a-barrel test.

- Global Peak sometime before 2020, probably before 2010, possibly already past.
- Anything built today will spend most or all of its life in a post-Peak world of worsening energy shortages.
- **“How useful will this development be when oil is \$500 a barrel?”**



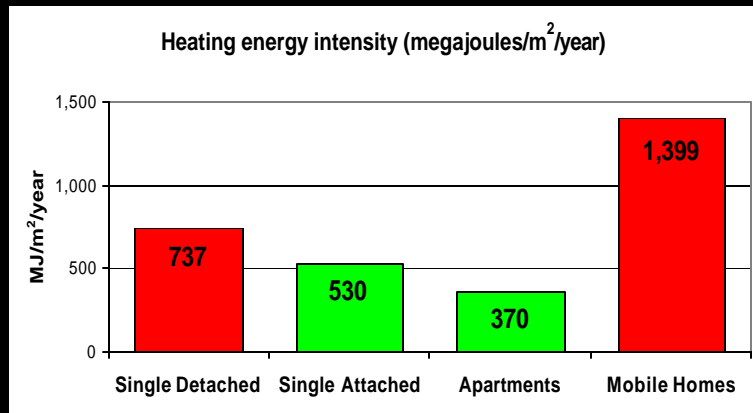
There's a broad consensus among most knowledgeable people that we can expect a global Peak sometime before 2020. (The handful of projections that suggest it later—e.g. the USGS and the EIA—have a bunch of weird questionable things about them so I'm not counting them. If you must know, the USGS suggests a peak in 2037, which is still pretty soon. But I consider them outliers. We can talk about it after the show if you like.)

There are even some who have suggested that we passed peak in late 2005 and that we're now in the early stages of decline. They may be right. We'll see soon enough.

In any case, what this means is that anything built today is going to spend most (if not all) of its service life in an environment where energy in general and oil in particular is a lot more expensive and scarce than it is today. And it has to be evaluated on that basis, not on today's conditions. So that big-box retail Power Center maybe seems like a good idea today, under current conditions when people can be expected to drive in from four counties to shop. But raise the cost of gasoline enough—double or triple it, let alone ten times—and that parking lot is going to be empty a lot of the time.

On the flip side, for a long time it was “not worth it” to build a wind farm because the energy it produced would have a certain dollar value which, it was assumed, would be comparable to today. But if you acknowledge that after the Peak, energy is just going to get more expensive, then building a wind turbine today is really getting in on the ground floor. If you're smart, you'll use today's \$50-a-barrel energy to build a turbine or a solar panel that will produce energy that's worth \$100, \$200 and \$500 over its lifetime.

4. All new development should pass the \$500-a-barrel test.



Source: Statistics Canada, 2001 Canadian Census;
Natural Resources Canada, Energy Use Handbook, 2003 (data for 2001)

Some types of building are inherently more energy-efficient than others. Single-detached houses and mobile homes are total energy hogs. This is because they have so much more surface exposed to the elements. Doesn't matter when energy is so cheap you can just crank the furnace. But in Canada at least, building single-detached houses instead of, say, townhouses makes about as much sense as wearing gloves instead of mittens in winter—and for exactly the same reason.

Unfortunately, 57% of Canada's existing housing stock is single-detached houses, mostly in big suburbs. This is going to turn out to be a serious contender for Worst Idea Ever.

What makes it all the more difficult is that people currently like single detached houses and builders like building them. Once the builder sells it, it's not his problem anymore. What it will cost to heat them in ten or twenty years is so not taken into account.

You may have gotten the idea that I'm not a big fan of free-market ideology. This is a really good illustration of why. The Market told everyone to build single-detached suburban houses, with absolutely no consideration for what happens when the cost of heating doubles or triples. Let alone the transportation issues. At least we should stop building the damn things. I think it's safe to say that today we have all the suburban houses we will ever want.

5. Globalization will give way to re-localization

- Globalization is based on **global stability & low transport costs** (i.e. negligible compared to savings in labour costs)
- These are (were) temporary!
- “...doubling in oil prices since 2003 has **raised average freight rates by almost 40%**” *(Rubin & Tal 2005)*
- “...doubling in transport cost can lead to as much as a **50% decline in world trade volumes**” *(Rubin & Tal 2005, quoting Limao & Venables 2001)*
- at \$100/bbl, transport costs **erase 45 years' worth of tariff reductions.** *(Rubin & Tal 2005)*

Okay, I take that back. Building lots of single-detached houses in a northern climate is actually the Second Worst Idea Ever. The Big Booby Prize goes to sending all our manufacturing capacity to China. Like, literally the other side of the world. You can't go any farther away and still be on Earth.

Last year I talked about how globalization is based on it being cheaper to ship stuff halfway around the globe than to pay people closer to home to make it. At a certain point, when fuel costs go up enough, the balance tilts and it starts to make sense to make stuff in at least your own hemisphere.

Well it turns out this is already happening, even at \$60-\$70 a barrel. Jeff Rubin and Benjamin Tal are analysts at the CIBC and they published a report that describes how a lot of manufacturing that formerly happened in China is now moving to Mexico. They lay out how even a modest increase in fuel prices—and don't kid yourself, \$100 a barrel really is a modest increase, compared to where oil can and eventually will go—\$100 a barrel would totally reverse the effect of the past half-century of tariff reductions.

So if you extrapolate this, it's not a stretch to expect manufacturing to return to North American cities.

5. Globalization will give way to re-localization

- Global industrial activity will be affected by energy shortages.
- Proximity to markets will become a major advantage.
- **Expect some manufacturing to return to North American cities, and plan accordingly.**
- Railroads, seaports and riverfronts are also key.

Now before you get too rosy a picture about the impending phoenix-like rebirth of Flint, Michigan and all that... at a global scale, rising energy prices will probably result in less industrial activity overall. You use energy to make stuff and you can compensate by being more efficient but at some point there's just less and less energy to make stuff. So at a global scale, industry is likely to decline.

But since proximity to markets will become such a relative advantage, places that currently have next to no manufacturing—like, say, most of the rustbelt cities that used to be industrial centers in Canada and the U.S.—will get more than they have now. Less overall, but a different distribution. Again, railroads and seaports are going to be a big advantage.

If common sense has any say in the matter, we'll be manufacturing different things than we do now. I wouldn't place any bets on the auto sector or the Boeing plant. But companies that make buses and trains, wind turbines, solar panels, bicycles, plus a lot of basic necessities, are going to have good reasons to set up in Cleveland or Hamilton or Moncton.

Your economic development department should really be getting on the stick here.

6. Adaptation = 90% conservation + 10% new supplies

- We will use solar, wind, etc...
- ...but they will not supply what we are used to.
- Not even close.
- **REDUCING ENERGY DEMAND** will make up the lion's share of our strategies.

- This will involve some hard choices.
- Some people will go to great lengths to pretend no change is necessary and/or that someone else should make the sacrifices.
- Remember the "controversy" over climate change?

I actually pulled this 90% number out of the air--I don't mean it literally. What I mean is, the vast majority of our coping strategies are going to have to involve using less energy. A lot less.

I want to stress this point because a lot of people are still imagining that we'll get enough energy from wind and solar and tidal and nuclear power to make up for what we currently get from petroleum. More specifically, they're expecting that we'll be able to run cars on it, or some fuel derived from it.

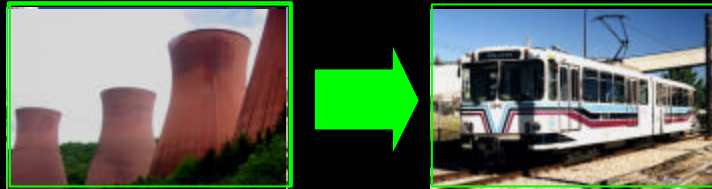
But transportation in general and private automobiles in particular are really the most wasteful part of our energy budget. We're going to have to trim a lot of fat and boy, this is where the fat is. A big guy weighs 100 kilos; a small car weighs 1000. The car is ten times as heavy as the person driving it. So in a single-occupant vehicle, even if it's a super-efficient hybrid which most of them obviously aren't, at least ninety percent of the energy goes to moving the vehicle itself. That's not even counting the energy that's lost to heat in the engine. If you count that it's worse, cars are like 1% to 3% efficient in terms of moving payload.

A major challenge—arguably the biggest one we face—will be getting people to accept this. Denial and wishful thinking are formidable opponents. "But hydrogen! But tar sands! But technology! There's gotta be something. Come on, man, I know you're holding!"

We can use the existing motor fleet more efficiently, by carpooling and even organizing commercial jitney services, collective taxis like they have in Morocco and Thailand and all over the developing world. With cell phones and satellite technology, you can make a pretty impressive "smart jitney" system. Given our existing built form, we're going to have to. But it isn't going exactly going to be the total freedom everyone's used to today. We're junkies and this is going to be like going on methadone.

7. Electricity-based systems are more resilient than combustion-based systems.

- A diesel bus burns oil; if there's no oil, you're out of luck.
- But electricity can come from wind, solar, hydroelectric, nuclear—whatever's available.
- There is still no free lunch, but it's nice to be an omnivore.



Having enough energy is one thing. But what form that energy comes in, and whether it's a form you can use, is important too. If you have an oil furnace and there's no oil, you can't just substitute natural gas. You can't pull into the gas station and say, "Fill 'er up with coal."

Now, most of the oil on Earth is located in the Middle East. If something happens to cut off that supply—there's a lot of things that can happen, pick one—a lot of our existing system goes down. It's not a resilient system.

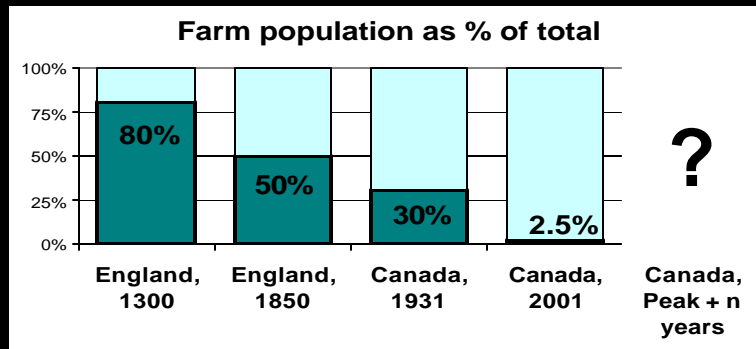
There are a lot of alternative energy technologies and we're going to have to use all of them to keep up anything like our current standard of living. Nuclear, coal, wind, solar, tidal, everything. And most of the alternatives are good at producing electricity.

So if we have houses that are heated with electricity, and electric streetcars in the cities and electrified railroads between cities, and this kind of thing, we build a lot of flexibility into the system. We get power from the grid and when the wind is blowing it's from wind farms and when the sun is shining it's from solar panels and when it isn't we get nuclear plants to take up the slack. The end user doesn't care, it's electricity, it doesn't matter where it came from. Electricity is omnivorous and omnivores have a lot more options in life.

Everyone should be building electrified streetcars and light rail along their major transit corridors. There's no reason not to start this today. In small towns people go, "Oh, streetcars are fine for Toronto but in here in Moncton there's no point, it won't work." We really have to get past that. If you must, don't think of it as light rail. Think of it as a bus that runs on electricity. And keeps running even if someone blockades the Straits of Hormuz.

8. Triage and Palliative Care

- **Urban population is limited by agricultural output**
- Fossil fuels allow very high productivity in a very large (i.e. world-wide) hinterland
- Without fossil fuels, agriculture becomes much more local and labour-intensive



Okay, so far it's been the good news. This next part is kind of depressing.

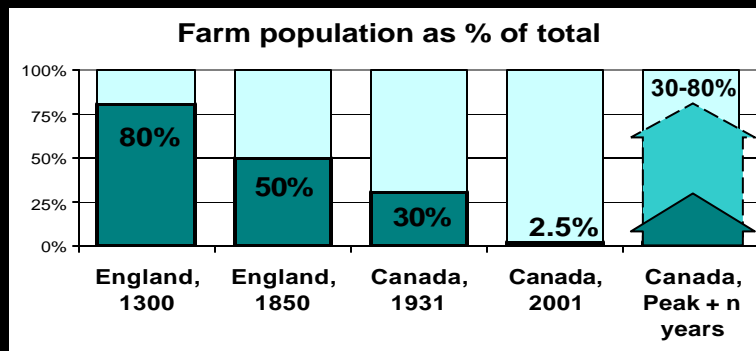
City populations are tied to how much food farmers can produce. For most of history, it took a lot of farmers to produce enough extra food to feed even a small urban population. In 1300 in England, something like eighty percent of the population lived on the land. And that was a high point of medieval urbanization.

Since then, the proportion of farmers has fallen steadily. Especially in the twentieth century. Even in 1931, we were starting to use fossil fuels to do farming. In Canada one person in three still lived on a farm. Today, with fully industrialized farming, only one Canadian in forty lives on a farm.

The thing is, without fossil fuels to make those insanely high yields, farming is going to be a lot more labour-intensive. And farmers and farm labourers, as a practical matter, can't live in the city or even the suburbs. So what happens?

8. Triage and Palliative Care

- As fossil fuels deplete, there will necessarily be more people on farms and fewer people in cities.
- This, in terms of relative to today; in terms of rural populations outweighing urban populations; and probably in absolute terms (i.e. fewer people in total!)



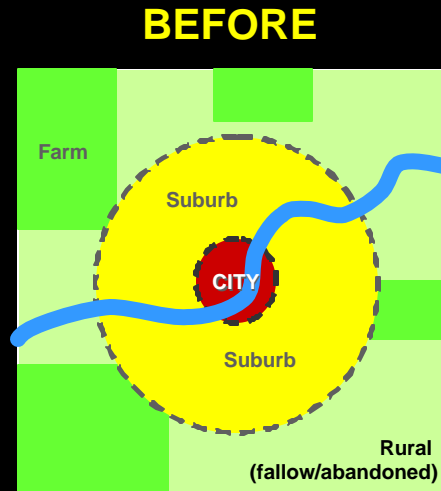
Well, it's not a stretch to imagine that our urban population is going to be a lot smaller. Smaller in lots of ways. Smaller in absolute terms than they are today, and smaller relative to the rural population, certainly. And quite possibly, a smaller slice of a smaller population overall. You have to remember, forty years ago—just before the Green Revolution, when we started seriously using massive amounts of fossil fuels to boost agriculture—the human race numbered about half as many people as today.

Now, it may be possible to support 6.5 billion people on non-industrial agriculture. Maybe. But without fossil fuels, a lot more of those people are going to be farmers.

8. Triage and Palliative Care

- **Cities will eventually be much smaller (i.e. 70% or less of today's population.)**
- Many places will be abandoned*, depending on how energy-intensive they are to run.
- Suburban homeowners have made a bad investment.

*Abandoned as *urban/suburban settlements*, i.e. reduced to rural densities



And so a lot of people are going to be leaving the cities and the suburbs. If we're lucky and oil depletes in a nice steady gradual way with no sudden disruptions, this might be a generational thing. Just as, over the twentieth century, farm kids grew up and moved to the city because they had better prospects there, we could see a lot of people whose kids head out to live and work on farms because that's all there is.

On the other hand, there are all kinds of apocalyptic scenarios that could make it happen very fast. Trust me, slow is better.

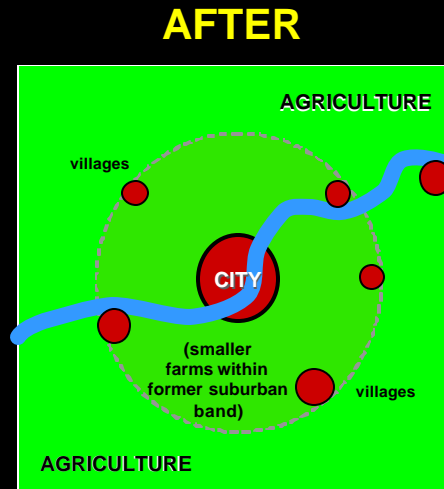
But one way or another, a big part of our existing cities are just going to be abandoned, and the suburbs are going to be the first to empty out. Not because it's a pain in the ass to live there without a car—although it certainly is that—and not because it's going to cost a lot to heat these houses, and not because the bank has repossessed the house with the mortgage in default. There'll be a lot of that. But the most basic reason is that there won't be as many people in cities and suburbs, period.

So here you've got your basic city with a big wide suburban band, and some farmland outside of town but most of it is abandoned. You know, it's just sitting there waiting to be carved up into the next Bungaloid Acres subdivision.

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- **Cities will eventually be much smaller (i.e. 70% or less of today's population.)**
- Many places will be abandoned*, depending on how energy-intensive they are to run.
- Suburban homeowners have made a bad investment.

*Abandoned as *urban/suburban settlements*, i.e. reduced to rural densities



And eventually, most of that suburban ring will be mostly abandoned. You'll have your central core, consisting mostly of the pre-World War II city. The old part of town likely has what I call "good bones"—a contiguous street network, dense built form, Main Street, all that. Plus, since it was the first part to be settled, that means it was probably the best location in the area. That's a good rule of thumb. If an urban settlement existed before the automobile era, it's a good location for after it's over. It worked then, it'll work now.

And you'll probably have some little villages on the edge of the old suburbs. I've got them on the edge in this drawing because, of course, it's right next to the surrounding farmland. There'll be a good reason to be there. It's gonna be weird, little farmers' villages occupying old McMansions on cul-de-sacs.

And the suburban area in between will be largely abandoned. Eventually it'll probably come back into production as small farms. Like I said earlier, it'll be tough to assemble enough 6000-square-foot suburban building lots to make a working farm. It'll take a long time for people to realize that their house is just not going to go back up to the \$300K they paid for it. On the other hand, if enough of these places are repossessed by a relatively small number of banks, that'll make things easier. They'll get together and swap defaulted lots and try to make some lemonade out of this huge pile of rotting suburban lemons.

By the way, some people think I'm this incredible jerk for saying these things. Like, how can I be so callous and unmoved by the prospect of mass starvation and millions of people going bankrupt. All I can say is, as much as I personally dislike the suburbs, I don't look forward to this. I'd like things to change, but not like this. If someone can lay out a plausible scenario whereby this stuff doesn't happen, I'm all ears. Haven't heard it yet.

8. Triage and Palliative Care

TRIAGE:

Avoid committing too many resources to urban/suburban areas with no long-term future...

PALLIATIVE CARE:

...but commit enough to minimize hardship and ease the transition.

Anyway, once you realize that one-third or more of the dwellings in our cities are going to be abandoned no matter what we do, whole swaths of suburbia with next to no one in them—then you start talking about triage.

Triage is a term from emergency medicine. It's French for "sorting" When you have mass casualties from a war or a natural disaster and only so many doctors and nurses, you start looking at patients and saying, "This guy is gonna die no matter what happens, there's nothing we can do for him," and "This lady's badly injured but if we act fast we can save her." You put your resources where they'll matter. Come to think of it, that's what they did decades ago with redlining. They just wrote off whole parts of town. Of course they did it on really stupid criteria, cutting off investment to perfectly useful neighbourhoods. But the principle is the same.

And that's what we're going to have to do. I'm talking about triage on places, not people. There will be the temptation to start committing resources to areas that, in the mid- to long-term, have no future. We're going to have to be very firm and say, Look, if the ship is sinking and there's not that many lifeboats, we can't let you take your luggage into the boat. I know you had certain expectations when you bought your ticket but things are different and we're all going to have to make sacrifices.

And palliative care is what you do for someone, or in this case somewhere, that's dying. You ease their pain. People still live in these doomed areas and will for some time. So we want to do something to keep it running at a basic level—things like jitney systems to help them get to work—but without committing a lot of resources or making it so easy that they have no reason to start thinking about leaving. It's a fine line to walk.

9. Be prepared for both gradual depletion and sudden shortages.

- Assuming no major wars, disruptions, embargoes etc, production will likely decline by 1%-3% per year. This is the best-case scenario, and gives us time to adapt somewhat.
- But two-thirds of the remaining oil is in the Middle East.
- Production could be decimated overnight. It wouldn't take much.
- e.g. overthrow of House of Saud; war with Iran; blockade of Straits of Hormuz; etc. etc. etc.
- Peak Oil calls for **both a long-range plan and an emergency plan.**

A lot of people say, "There's gotta be some alternative energy source, we just have to find it." At this point I doubt it. To me, the proof is that for over thirty years we've had every incentive to find an alternative. In 1973 we realized that we in the West depend on a resource that we don't control. We've had to do all kinds of ugly things to keep getting it. There's climate change and there have been several wars, at least one of which is still going on and not likely to end anytime soon. Meanwhile we've had three decades of incredible wealth, a highly-educated population and relative global stability. And we haven't found anything new. That, to me, speaks volumes. Thirty years of near-ideal conditions for figuring stuff out—and nothing.

So I think it's inevitable that after the Peak, oil production will decline and there won't be enough alternative energy available to compensate. We'll have to undertake a long-range plan to adapt. The Hirsch Report suggests that we need to start preparing 20 years in advance. Well, it's already too late for that, given that most projections put the global peak sometime before 2020. But we should start preparing now for an ongoing and gradual decline. Better late than never, but better sooner than later.

But at the same time, our oil supplies are very precarious. Most of them come from a small corner of the world. One incident in Saudi Arabia could seriously choke back supplies overnight. And for that scenario you're basically looking at an emergency plan. How do you keep the city running when there's no oil, or very little? How do you get food to people? How do you keep the hospital running? You have to think in terms of a Hurricane Katrina level event, happening basically everywhere. The International Energy Agency has a report called "Saving Oil In A Hurry", and it covers methods to reduce oil use in transport when you have to. It's a good starting point.

Ten

10. Paradigms change overnight. *Be ready for it.*

- As planners, we are used to being ignored.
- **In any moment of crisis or indecision, whoever has a plan will be listened to.**
- Make sure you have one.

This last point is important because it only really comes up once in a generation.

As planners, we're used to people not listening to us. We'll advise Council or the Province that such-and-such is a bad idea or a good idea, and often they just sort of nod politely and ignore our advice. It's because they feel very confident in their worldview. It's easy, under those circumstances, to get used to the idea that you're always going to be marginalized.

The thing is, it happens throughout history that when there's a crisis, there's often a moment where the people in charge suddenly realize they have no idea how to deal with the situation. It happened in the 1930's, the Great Depression, when almost overnight the business leadership--the people who thought government should have nothing to do with the economy--realized that their model wasn't working. And the liberals and the progressives, who had been marginalized and laughed at through the Roaring Twenties, suddenly everyone looked at them and said, "Okay, we give up. We don't know what to do. Let's try it your way." So you got the New Deal.

On the flip side, at the same time, of course you had Germany and the same kind of economic difficulty, and their response there was to elect this marginal crank named Adolf Hitler.

So there's a moment when the old set of assumptions breaks down and often, what happens next depends on who's ready with a plan.

10. Paradigms change overnight. *Be ready for it.*

- As planners, we are used to being ignored.
- In any moment of crisis or indecision, whoever has a plan will be listened to.
- Make sure you have one.
- **If it's not you, it may be someone else...**



So the point I'll leave you with is this: Peak Oil is coming, maybe now, maybe in ten or fifteen years but no later. And when the feces hit the ventilator, you have to be ready with a plan to deal with it. Because if you don't, someone else will, and it may be someone who does not share your core values. So get busy.

Ten Principles of Post Oil-Peak Planning

1. The laws of thermodynamics: no free lunch, death and taxes.
2. Protect arable land at all costs. (And don't waste it growing biodiesel.)
3. Moving stuff around is really hard. The basic purpose of a city is to avoid doing so.
4. Every new development should pass the \$500-A-Barrel Test.
5. Globalization was a flash in the pan. Peak Oil will drive *re-localization*.
6. Adaptation is 90% conservation. We will use a lot less energy, period.
7. Electricity is omnivorous and adaptable. There'll never be much, but (almost) always something.
8. Perform triage and palliative care on areas that cannot or will not adapt.
9. Prepare both a long-range plan and an emergency plan.
10. Paradigms change overnight. *Be ready for it!*

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