SAN ¤ Sustainability Action Network 29 July 2008

Communications from SAN

1) Cover letter to the Lawrence City Commission
2) “Lawrence Peak Oil Resolution” by Sustainability Action Network
3) “Oil Depletion Protocol” by Dr. Colin Campbell

Supportive documentation included with our e-mail as PDF attachments

1) “Inevitable Peaking of World Oil Production” by Robert Hirsch
2) “Peak Oil Primer” by The Energy Bulletin
3) “Running On Empty” by Mark Hertsgaard, author, journalist, lecturer
4) “Two Energy Futures” by Jeroen van der Veer, Shell Petroleum CEO
5) “Peak Oil in a Nutshell” by Sustainability Action Network
6) “Introduction to Peak Oil” by Gail Tverberg of The Oil Drum
7) “Planning for Energy and Climate Uncertainty” by Post Carbon Cities
8) “Transition Initiatives Primer” by Rob Hopkins of Transition Towns
9) “Descending the Oil Peak: Peak Oil Plan” by Portland Peak Oil Task Force
10) “US House Peak Oil Resolution” co-sponsored by Rep. Dennis Moore

Significant web sites

Energy Expansion and Contraction – Dr. Colin Campbell
http://www.aspo-ireland.org/index.cfm?page=speakerArticles&rbId=6

Association for the Study of Peak Oil – ASPO
http://www.peakoil.net/

The Energy Bulletin
http://www.energybulletin.net/

Richard Heinberg
http://www.richardheinberg.com/

The Oil Drum - Energy and Our Future
http://www.theoildrum.com/

Oil Depletion Protocol – Dr. Colin Campbell
http://www.oildepletionprotocol.org/

World Oil Forecasts – 17 February 2008
http://www.theoildrum.com/node/3623

Global Oil Industry Overview
http://news.bbc.co.uk/2/hi/business/7090664.stm

Planning for Energy and Climate Uncertainty – Post Carbon Cities
http://postcarboncities.net/pcc-execsum

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Local Government's Role In The Transition To A Post-Petroleum World
http://globalpublicmedia.com/powering_down_america_local_governments_role_in_the_transition_to_a_post_petroleum_world

THE ATLANTIC COUNCIL
OF THE UNITED STATES

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The Inevitable Peaking of World Oil Production

Robert L. Hirsch

- *The era of plentiful, low-cost petroleum is approaching an end.*
- *Without massive mitigation the problem will be pervasive and long lasting.*
- *Oil peaking represents a liquid fuels problem, not an "energy crisis".*
- *Governments will have to take the initiative on a timely basis.*
- *In every crisis, there are always opportunities for those that act decisively.*

The era of plentiful, low-cost petroleum is approaching an end. The good news is that commercially viable mitigation options are ready for implementation. The bad news is that unless mitigation is orchestrated on a timely basis, the economic damage to the world economy will be dire and long-lasting.

Oil is the lifeblood of modern civilization. It fuels most transportation worldwide and is a feedstock for pharmaceuticals, agriculture, plastics and a myriad of other products used in everyday life. The earth has been generous in yielding copious quantities of oil to fuel world economic growth for over a century, but that period of plenty is changing.

In the following, we describe the nature of the problem, options for mitigation, and required timing. The exact date of peaking is not known; some think it will be soon, others think a decade or more. However, the date is almost irrelevant as mitigation will take much longer than a decade to become effective, because of the enormous scale of world oil consumption.

Background

Oil was formed by geological processes millions of years ago and is typically found in underground reservoirs of dramatically different sizes, at varying depths, and with widely varying characteristics. The largest oil fields[1] are called "super giants," many of which were discovered in the Middle East. Because of their size and other characteristics, super giant oil fields are generally the easiest to find, the most economic to develop, and the longest-lived. The world's last super giant oil fields were discovered in the 1960s. Since then,

[1] Oil fields are often composed of a number of individual oil reservoirs.

smaller fields of varying sizes have been found in what are called "oil prone" locations worldwide — oil is not found everywhere.

The world's last super giant oil fields were discovered in the 1960s.

The concept of the peaking of world oil production follows from the fact that the output of an individual oil field rises after discovery, reaches a peak, and then declines. Oil fields have lifetimes typically measured in decades, and peak production often occurs roughly a decade or so after discovery under normal circumstances. It is important to recognize that oil production *peaking* is not "running out." Peaking is the maximum oil production rate, which typically occurs after roughly half of the recoverable oil in an oil field has been produced. What is likely to happen on a world scale will be similar to what happens with individual oil fields, because world production is by definition the sum total of production from all of the world's oil fields.

Oil is usually found thousands of feet below the surface. Most oil fields do not have an obvious surface signature, so oil is very difficult to find. Advanced technology has greatly improved the discovery process and reduced exploration failures. Nevertheless, world oil discoveries have been steadily declining for decades, as shown below.

Oil Reserves

Oil reserves are in some ways like inventory in a business, but the analogy can be deceiving. "Reserves" is an estimate of the amount of oil in an oil field that can be extracted at an assumed cost. Thus, a higher oil price outlook often means that more oil can be produced. However, geological realities place an upper limit on price-dependent reserves growth.

Reserves estimates are revised periodically as an oil field is developed and new information provides a basis for refinement. Reserves estimation is a matter of gauging how much extractable oil resides in deep, obscure, complex rock formations, using inherently limited information. Reserves estimation is a bit like a blindfolded person trying to judge what the whole elephant looks like from touching it in just a few places. It is a far cry from counting cars in a parking lot, where all the cars are in full view.

The different estimators might calculate different reserves from the same data.

Specialists who estimate reserves use an array of technical methodologies and a great deal of judgment. Thus, different estimators might calculate different reserves from the same data. Sometimes self-interest influences reserves estimates, e.g., an oil field owner may provide a high estimate in order to attract outside investment, influence customers, or further a political agenda.

Reserves and production should not be confused. Reserves estimates are but one factor used in estimating future oil production from a given oil field. Other factors include production history, local geology, available technology, oil prices, etc. An oil field can have large estimated reserves, but if a well-managed field has past maximum production, the remaining

reserves can only be produced at a diminishing rate. Sometimes decline can be slowed, but a return to peak production is impossible. This fundamental is not often appreciated by those unfamiliar with oil production.

Production Peaking

World oil demand is forecast to grow 50 percent by 2025.[2] To meet that demand, ever-larger volumes of oil will have to be produced. Since oil production from individual oil fields grows to a peak and then declines, new fields must be continually discovered and brought into production to compensate for the depletion of older fields and to meet increasing world demand. If large quantities of new oil are not discovered and brought into production somewhere in the world, then world oil production will no longer satisfy demand. Peaking means that the rate of world oil production cannot increase; it does not mean that production will suddenly stop, because there will still be large reserves remaining.

World oil demand is forecast to grow by 50 percent by 2025.

The peaking of world oil production has been a matter of speculation from the beginning of the modern oil era in the mid 1800s. Initially, little was known about petroleum geology, so predictions of peaking were no more than rank speculation. Over time, geological understanding improved dramatically and guessing gave way to more informed projections, although the knowledge base involves numerous uncertainties, even today.

As indicated in Table I (see page 9), some forecasters believe that world oil production peaking might occur very soon. Others argue that we may have more than a decade of plentiful oil, which is the position of Daniel Yergin of Cambridge Energy Research Associates, as recently expressed in an op-ed piece in the *Washington Post*.[3]

Until recently, OPEC assured the world that oil supply would continue to be plentiful, but that position is changing. Some in OPEC are now warning that oil supply will not be adequate to satisfy world demand in 10-15 years.[4] Such declarations are in line with the widely discussed questions about Saudi Arabian oil reserves raised by Matthew Simmons in his recent book.[5] Even Dr. Sadad al-Husseini, a retired senior Saudi Aramco oil exploration executive, is on record as saying that the world is heading for an oil shortage;

About the Author

Robert L. Hirsch is a Senior Energy Program Advisor for SAIC. Previous employment included executive positions at the U.S. Atomic Energy Commission, the U.S. Energy Research and Development Administration, Exxon, ARCO, EPRI, and Advance Power Technologies, Inc. Dr. Hirsch is past chairman of the Board on Energy and Environmental Systems at the National Academies. He has a Ph.D. in engineering and physics from the University of Illinois.

[2] U.S. Department of Energy, Energy Information Administration, *International Energy Outlook – 2004,* February 2004.
[3] Yergin, D. *Technology and Higher Prices Drive a Supply Buildup.* Washington Post. July 31, 2005.
[4] Moors, K.F. *How Reliable are Saudi Production and Reserve Estimates?* Dow Jones Middle East Business Strategies. July 15, 2005.
[5] Simmons, M.R. *Twilight in the Desert – The Coming Saudi Oil Shock and the World Economy.* Wiley. 2005.

in his words "a whole new Saudi Arabia [will have to be found and developed] every couple of years" to satisfy current demand forecasts.[6] So the messages from the world's "breadbasket of oil" are moving from confident assurances to warnings of approaching shortage.

At some price, world reserves of recoverable conventional oil will reach a maximum because of geological fundamentals.

Types of Oil

Oil is classified as "Conventional" and "Unconventional." Conventional oil is typically the highest quality, lightest oil, which flows from underground reservoirs with comparative ease, and it is the least expensive to produce. Unconventional oils are heavy, often tar-like and are not readily recovered because production often requires a great deal of capital investment and supplemental energy. For that reason, most current world oil production is conventional oil.[7]

The Oil Price-Reserves Nexus

In the past, higher prices led to increased estimates of conventional oil reserves worldwide. However, this price-reserves relationship has its limits, because oil is found in discrete packages (reservoirs) as opposed to the varying concentrations characteristic of many minerals. Thus, at some price, world reserves of recoverable conventional oil will reach a maximum because of geological fundamentals. Beyond that point, insignificant additional conventional oil will be recoverable at any realistic price. This is a geological fact that is often not understood by economists, many of whom are accustomed to dealing with hard minerals, whose geology is fundamentally different.

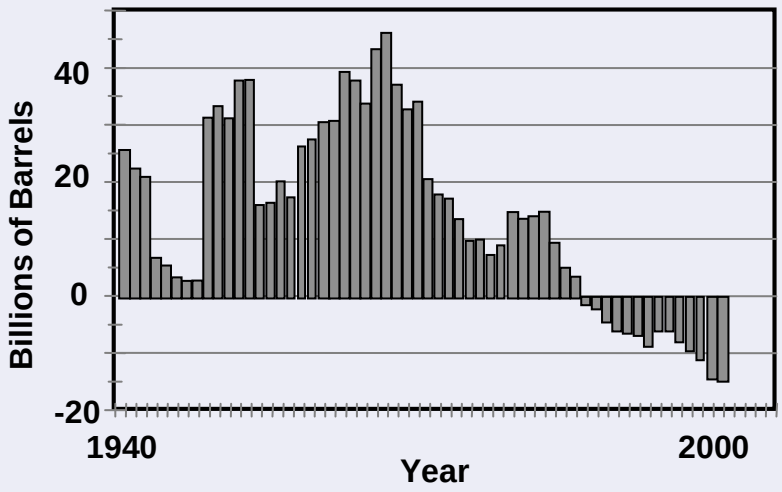

Figure 1. The net difference between annual world oil reserves additions and annual oil consumption has been declining for decades.

Oil companies and governments have conducted extensive exploration worldwide, but their results have been disappointing for decades. On this basis, there is little reason to expect that future oil discoveries will dramatically increase. The situation is illustrated in Figure 1, which shows the difference between annual world oil reserves additions and annual

[6] Haas, P. *The Breaking Point.* New York Times Magazine. August 21, 2005.
[7] U.S. Department of Energy, Energy Information Administration, *International Energy Outlook – 2004,* February 2004.

consumption.[8] The image is one of a world moving from a long period in which reserves additions were much greater than consumption, to an era in which annual additions are falling increasingly short of annual consumption. A related fact is that oil production is in decline in 33 of the world's 48 largest oil-producing countries.[9]

Impacts of Improved Technology and Higher Prices

Oil production is in decline in 33 of the world's 48 largest oil-producing countries.

Exploration for and production of petroleum has been an increasingly more technological enterprise, benefiting from more sophisticated engineering capabilities, advanced geological understanding, improved instrumentation, greatly expanded computing power, more durable materials, etc. Today's technology allows oil fields to be more readily discovered and better understood sooner than heretofore.

Some economists expect improved technologies and higher oil prices will provide ever-increasing oil production for the foreseeable future. To gain some insight into the effects of higher oil prices and improved technology on oil production, consider the history of the U.S. Lower 48 states. This region was one of the world's richest, most geologically varied, and most productive up until 1970, when production peaked and started into decline. Figure 2 shows Lower 48 historical oil production with oil prices and technology trends superimposed. In constant dollars, oil prices increased by roughly a factor of three in 1973-74 and another factor of two in 1979-80. In addition to these huge oil price increases, the 1980s and 1990s were a golden age of oil field technology development, including practical 3-D seismic, economic horizontal drilling, dramatically improved geological understanding, etc. Nevertheless, as Figure 2 shows, Lower 48 oil production still trended downward, showing no pronounced response to either price or technology. In light of this experience, there is no reason to expect that the worldwide situation will be different: Higher prices and improved technology are unlikely to yield dramatically higher conventional oil production.

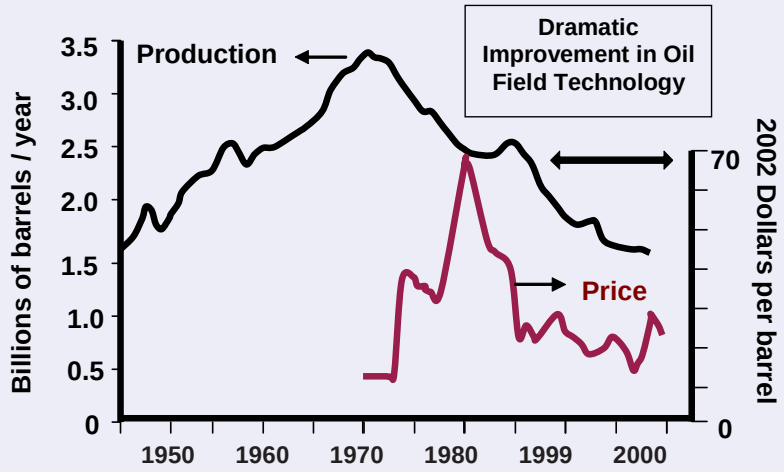

Figure 2. The decline of U.S. Lower 48 oil production was not reversed by large changes in oil prices or the dramatic improvement in oil field technologies.

[8] Aleklett, K. & Campbell, C.J. *The Peak and Decline of World Oil and Gas Production.* Uppsala University, Sweden. ASPO web site. 2003.
[9] O'Reilly, D.J., Chairman and CEO, Chevron Corporation. Washington Post. July 25, 2005.

Peaking of World Oil Production

Various individuals and groups have used available information and geological tools to develop forecasts for when world oil production might peak. A sampling is shown in Table 1, where it is clear that many believe that peaking is likely within a decade.

Mitigation

A recent analysis for the U.S. Department of Energy addressed the question of what might be done to mitigate the peaking of world oil production.[10] Various technologies that are commercial or near commercial were considered:

1. Fuel efficient transportation,
2. Heavy oil/oil sands,
3. Coal liquefaction,
4. Enhanced oil recovery,
5. Gas-to-liquids.

It became abundantly clear early in this study that effective mitigation will be dependent on the implementation of mega-projects and mega-changes at the maximum possible rate. This finding dictated the focus on currently commercial technologies that are ready for implementation. New technology options requiring further research and development will undoubtedly prove very important in the longer-term future, but they are not ready now, so their inclusion would be strictly speculative.

A scenario analysis was performed, based on crash program implementation worldwide – the fastest humanly possible. Three starting dates were considered:

1. When peaking occurs;
2. Ten years before peaking occurs; and
3. Twenty years before peaking.

Effective mitigation will be dependent on the implementation of mega-projects and mega-changes at the maximum possible rate.

The timing of oil peaking was left open because of the considerable differences of opinion among experts. Consideration of a number of implementation scenarios provided some fundamental insights, as follows:

- Waiting until world oil production peaks before taking crash program action leaves the world with a significant liquid fuel deficit for more than two decades.
- Initiating a mitigation crash program 10 years before world oil peaking helps considerably but still leaves a liquid fuels shortfall roughly a decade after the time that oil would have peaked.
- Initiating a mitigation crash program 20 years before peaking offers the possibility of avoiding a world liquid fuels shortfall for the forecast period.

[10] Hirsch, R.L., Bezdek, R. and Wendling, R. *Peaking of World Oil Production: Impacts, Mitigation, and Risk Management.* DOE NETL. February 2005.

The reason why such long lead times are required is that the worldwide scale of oil consumption is enormous – a fact often lost in a world where oil abundance has been taken for granted for so long. If mitigation is too little, too late, world supply/demand balance will have to be achieved through massive demand destruction (shortages), which would translate to extreme economic hardship. On the other hand, with timely mitigation, economic damage can be minimized.

Warning Signs

In an effort to gain some insight into the possible character of world oil production peaking, a number of regions and countries that have already past oil peaking were recently analyzed.[11] Areas that had significant peak oil production and that were not encumbered by major political upheaval or cartel action were Texas, North America, the United Kingdom, and Norway. Three other countries that are also past peak production, but whose maximum production was smaller, were Argentina, Colombia, and Egypt.

Examination of these actual histories showed that in all cases it was not obvious that production was about to peak a year ahead of the event, i.e., production trends prior to peaking did not provide long-range warning. In most cases the peaks were sharp, not gently varying or flat topped, as some forecasters hope. Finally, in some cases post-peak production declines were quite rapid, as in the U.K. for example (Figure 3)

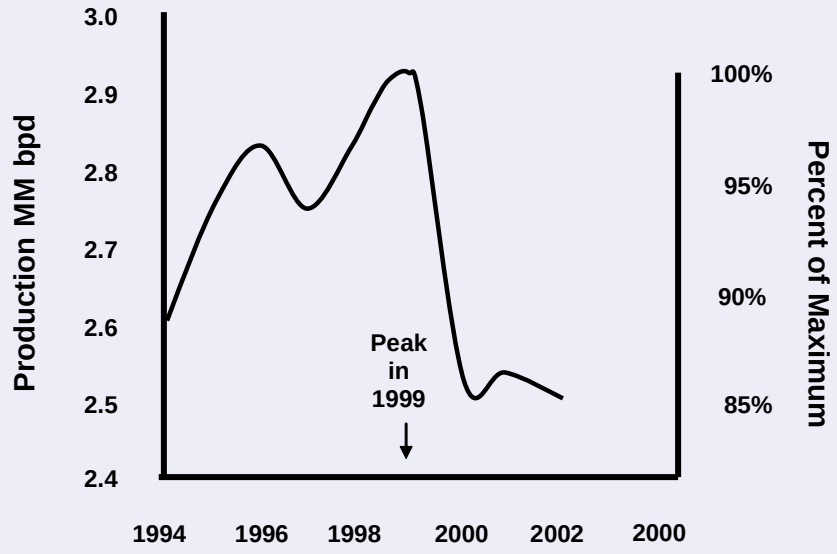

Figure 3. Oil production in the United Kingdom peaked in 1999 on very short notice. After the peak, the decline in production was very rapid.

It is by no means obvious how world oil peaking will occur, but if it follows the patterns displayed by these regions and countries, the world will have less than a year's warning.

It's Not Your Mother's Energy Crisis

Oil peaking represents a liquid fuels problem, not an "energy crisis" in the sense that term has often been used. Motor vehicles, aircraft, trains,

[11] Hirsch, R.L. *The Shape of World Oil Peaking: Learning From Experience.* To be published.

and ships simply have no ready alternative to liquid fuels, certainly not for the existing capital stock, which have very long lifetimes. Non-hydrocarbon-based energy sources, such as renewables and nuclear power, produce electricity, not liquid fuels, so their widespread use in transportation is at best many decades in the future. Accordingly, mitigation of declining world conventional oil production must be narrowly focused in the near-term.

Risk Management

It is possible that peaking may not occur for a decade or more, but it is also possible that peaking may be occurring right now. We will not know for certain until after the fact. The world is thus faced with a daunting risk management problem. On the one hand, if peaking is decades away, massive mitigation initiated soon would be premature. On the other hand, if peaking is imminent, failure to quickly initiate mitigation will impose large near-term economic and social costs on the world.

The two risks are asymmetric:

- Mitigation initiated prematurely would result in a relatively modest misallocation of resources.
- Failure to initiate timely mitigation with an appropriate lead-time is certain to result in very severe economic consequences.

The world is faced with a daunting risk management problem.

The world has never confronted a problem like this. Risk minimization requires the implementation of mitigation measures well prior to peaking. Since it is uncertain when peaking will occur, the challenge for decision-makers is indeed vexing. Mustering support for an invisible disaster is much more difficult than for one that is obvious to all.

Concluding Remarks

Over the past century, world economic development has been fundamentally shaped by the availability of abundant, low-cost oil. Previous energy transitions (wood to coal, coal to oil, etc.) were gradual and evolutionary; oil peaking will be abrupt and revolutionary.

The world has never faced a problem like this. Without massive mitigation at least a decade before the fact, the problem will be pervasive and long lasting.

Oil peaking represents a liquid fuels problem, not an "energy crisis" in the sense that term has been used. Accordingly, mitigation of declining world oil production must be narrowly focused, at least in the near-term.

A number of technologies are currently available for immediate implementation once there is the requisite determination to act. Governments worldwide will have to take the initiative on a timely basis, and it may already be too late to avoid considerable discomfort or worse. Countries that dawdle will suffer from lost opportunities, because in every crisis, there are always opportunities for those that act decisively.

Table 1: Projections of the Peaking of World Oil Production

Projected Date	Source of Projection	Background & Reference
2006-2007	Bakhitari, A.M.S.	Oil Executive (Iran)[1]
2007-2009	Simmons, M.R.	Investment banker (U.S.) [2]
After 2007	Skrebowski, C.	Petroleum journal editor (U.K.) [3]
Before 2009	Deffeyes, K.S.	Oil company geologist (ret., U.S.)[4]
Before 2010	Goodstein, D.	Vice Provost, Cal Tech (U.S.) [5]
Around 2010	Campbell, C.J.	Oil geologist (ret., Ireland)[6]
After 2010	World Energy Council	World Non-Government Org.[7]
2012	Pang Xiongqi	Petroleum Executive (China)[8]
2010-2020	Laherrere, J.	Oil geologist (ret., France) [9]
2016	EIA nominal case	DOE analysis/ information (U.S.)[10]
After 2020	CERA	Energy consultants (U.S.) [11]
2025 or later	Shell	Major oil company (U.K.) [12]

[1] Bakhtiari, A.M.S. *World Oil Production Capacity Model Suggests Output Peak by 2006-07. Oil and Gas Journal*. April 26, 2004.
[2] Simmons, M.R. ASPO Workshop. May 26, 2003.
[3] Skrebowski, C. *Oil Field Mega Projects - 2004*. Petroleum Review. January 2004.
[4] Deffeyes, K.S. *Hubbert's Peak-The Impending World Oil Shortage*. Princeton University Press. 2003.
[5] Goodstein, D. *Out of Gas – The End of the Age of Oil*. W.W. Norton. 2004
[6] Campbell, C.J. *Industry Urged to Watch for Regular Oil Production Peaks, Depletion Signals. Oil and Gas Journal*.. July 14, 2003.
[7] *Drivers of the Energy Scene*. World Energy Council. 2003.
[8] Pang Xiongqi. *The Challenges Brought by Shortages of Oil and Gas in China and Their Countermeasures.* ASPO Lisbon Conference. May19-20, 2005.
[9] Laherrere, J. Seminar Center of Energy Conversion. Zurich. May 7, 2003
[10] DOE EIA. *Long Term World Oil Supply.* April 18, 2000. See Appendix I for discussion.
[11] Jackson, P. et al. *Triple Witching Hour for Oil Arrives Early in 2004 – But, As Yet, No Real Witches. CERA Alert*. April 7, 2004.
[12] Davis, G. *Meeting Future Energy Needs.* The Bridge. National Academies Press. Summer 2003.

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Energy Bulletin

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Peak oil primer and links

By EB staff

On this page:

1. Peak oil primer

What is peak oil?

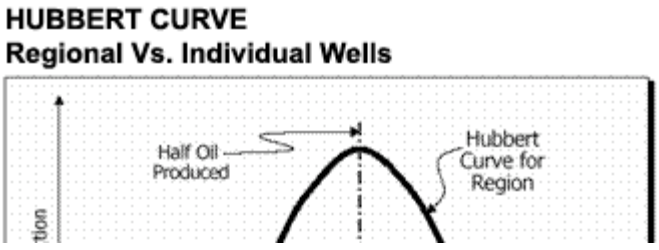
Peak oil is the simplest label for the problem of energy resource depletion, or more specifically, the peak in global oil production. Oil is a finite, non-renewable resource, one that has powered phenomenal economic and population growth over the last century and a half. The rate of oil 'production', meaning extraction and refining (currently about 84 million barrels/day), has grown almost every year of the last century. Once we have used up about half of the original reserves, oil production becomes ever more likely stop growing and begin a terminal decline, hence 'peak'. The peak in oil production does not signify 'running out of oil', but it does mean the end of cheap oil, as we switch from a buyers' to a sellers' market. For economies leveraged on ever increasing quantities of cheap oil, the consequences may be dire. Without significant successful cultural reform, severe economic and social consequences seem inevitable.

Why does oil peak? Why doesn't it suddenly run out?

Oil companies have, naturally enough, extracted the easier-to-reach, cheap oil first. The oil pumped first was on land, near the surface, under pressure, light and 'sweet' (meaning low sulfur content) and therefore easy to refine. The remaining oil is more likely to be off-shore, far from markets, in smaller fields and of lesser quality. It therefore takes ever more money *and energy* to extract, refine and transport. Under these conditions, the rate of production inevitably drops. Furthermore, all oil fields eventually reach a point where they become economically, and energetically, no longer viable. If it takes the energy of a barrel of oil to extract a barrel of oil, then further extraction is pointless, no matter what the price of oil.

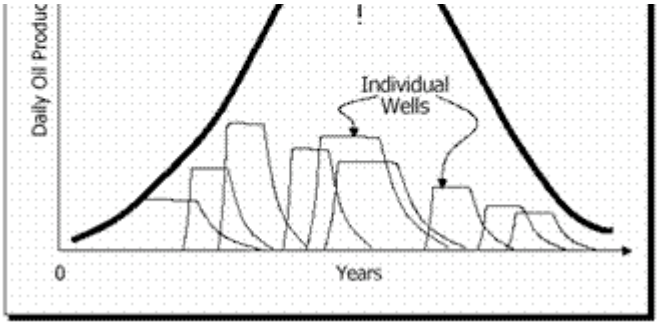
M. King Hubbert – the first to predict an oil peak

In the 1950s the well known U.S. geologist M. King Hubbert was working for Shell Oil. He noted that oil discoveries graphed over time tended to follow a bell shape curve. He supposed that the rate of oil production would follow a similar curve, now known as the Hubbert Curve (see figure). In 1956 Hubbert predicted that production from the US lower 48 states would peak between 1965 and 1970. Despite efforts from his employer to pressure him into not making



his projections public, the notoriously stubborn Hubbert did so anyway. In any case, most people inside and outside the industry quickly dismissed the predictions. As it happens, the US lower 48 oil production did peak in 1970/1. In that year, by definition, US oil producers had never produced as much oil, and Hubbert's predictions were a fading memory. The peak was only acknowledged with the benefit of several years of hindsight.

No oil producing region fits the bell shaped curve exactly because production is dependent on various geological, economic and political factors, but the Hubbert Curve remains a powerful predictive tool.



The Hubbert Curve is used to predict the rate of production from an oil producing region containing many individual wells. *Source: aspoitalia.net*

In retrospect, the U.S. oil peak might be seen as the most significant geopolitical event of the mid to late 20th Century, creating the conditions for the energy crises of the 1970s, leading to far greater U.S. strategic emphasis on controlling foreign sources of oil, and spelling the beginning of the end of the status of the U.S. as the world's major creditor nation. The U.S. of course, was able to import oil from elsewhere. Mounting debt has allowed life to continue in the U.S. with only minimal interruption. When global oil production peaks, the implications will be felt far more widely, and with much more force.

What does peak oil mean for our societies?

Our industrial societies and our financial systems were built on the assumption of continual growth – growth based on ever more readily available cheap fossil fuels. Oil in particular is the most convenient and multi-purposed of these fossil fuels. Oil currently accounts for about 43% of the world's total fuel consumption [PDF], and 95% of global energy used for transportation [PDF]. Oil and gas are feedstocks for plastics, paints, pharmaceuticals, fertilizers, electronic components, tyres and much more. Oil is so important that the peak will have vast implications across the realms of war and geopolitics, medicine, culture, transport and trade, economic stability and food production. Significantly, for every one joule of food consumed in the United States, around 10 joules of fossil fuel energy have been used to produce it.

The 'Hirsch Report'

A U.S. Dept. of Energy commissioned study "Peaking of World Oil Production: Impacts, Mitigation and Risk Management" [PDF] was released in early 2005. Prepared by Science Applications International Corporation (SAIC), it is known commonly as the Hirsch Report after its primary author Robert L. Hirsch. For many months the report, although available on the website of a Californian High School, remained unacknowledged by the DOE. The executive summary of the report warns that:

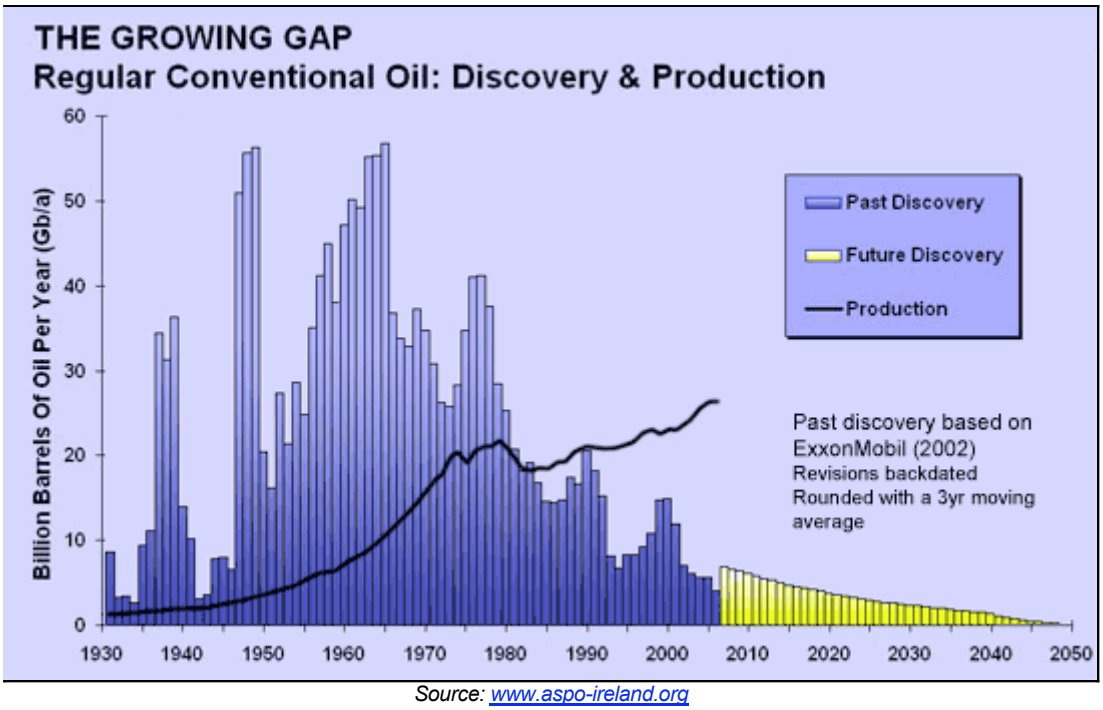
> as peaking is approached, liquid fuel prices and price volatility will increase dramatically, and, without timely mitigation, the economic, social, and political costs will be *unprecedented*. Viable mitigation options exist on both the supply and demand sides, but to have substantial impact, they must be initiated *more than a decade* in advance of peaking. [Emphasis added.]

A later paper by Hirsch recommends the world urgently begin spending $1 trillion per year in crash programs for at least a decade, preferably two, before peaking. Obviously, nothing like the kind of efforts envisaged have yet begun. Hirsch was not asked to speculate on on when the peak was likely to occur.

So when will oil peak globally?

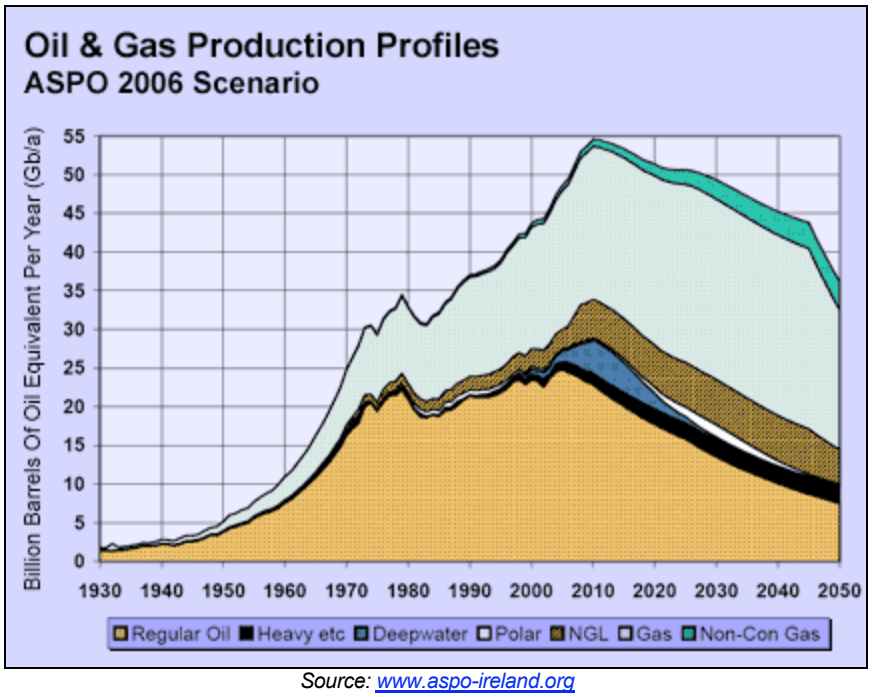
Later in life M. King Hubbert predicted a global oil peak between 1995 and 2000. He may have been close to the mark, except that the oil shocks of the 1970s slowed our use of oil.

As the following figure documents, global oil discovery peaked in the late 1960s. Since the mid-1980s, oil companies have been finding less oil than we have been consuming.



Source: www.aspo-ireland.org

Of the 65 largest oil producing countries in the world, up to 54 have passed their peak of production and are now in decline, including the USA in 1970/1, Indonesia in 1997, Australia in 2000, the North Sea in 2001, and Mexico in 2004. Hubbert's methods, as well as other methodologies, have been used to make various projections about the global oil peak, with results ranging from 'already peaked', to the very optimistic 2035. Many of the official sources of data used to model oil peak such as OPEC figures, oil company reports, and the USGS discovery projections, upon which the international energy agencies base their own reports, can be shown to be frighteningly unreliable. Several notable scientists have attempted independent studies, most famously, Colin Campbell with the Association for the Study of Peak Oil and Gas (ASPO).



Source: www.aspo-ireland.org

ASPO's latest model suggests that regular conventional oil reached an all time peak in 2005. If heavy oil, deepwater, polar and natural gas liquids are considered (the 'all-liquids' category), the oil peak is projected for around 2010. Combined oil and gas are expected to also peak globally around 2010.

Other notable researchers such as Princeton University Professor Emeritus Kenneth Deffeyes, senior advisor to the Iranian National Oil Company A. M. Samsam Bakhtiari, UK Petroleum Review editor Chris Skrebowski, energy banker and former advisor to the president Matthew Simmons and the researchers at The Oil Drum, have all projected similar peaks using quite varied methodology. A recent survey suggests that their perspective has become the consensus among informed observers and industry insiders[PDF].

Already peaked? As of writing, there is mounting evidence that we have passed not only the all time peak in regular conventional oil in May 2005, but also the peak of all-liquids in July 2006. A study by the German Government sponsored Energy Watch Group, oil billionaire T. Boone Pickens, and the former head of exploration and production at Saudi Aramco, Sadad al-Huseini have all recently supported this view.

Decline rates

Whether or not we've passed the peak, the most significant question may be: What will be the future rate of decline of oil production? Some form of co-ordinated adaptation might be possible if the annual drop in available oil was no more severe than 1-2% a year. Whereas 10% or more would soon implode the global economy. Most models project decline rates which reach 2-4%. Nations dependent on imports are likely to find that their access will fall at a sharper rate than the global decline rate, as consumption rises or remains steady within the exporting nations.

Natural gas peak

The effects of natural gas peak are relatively localized. This is due to the enormous economic and energetic expense of liquefying and transporting natural gas as a compressed liquid. Both European and North American natural gas production have already peaked, so these regions are facing the extra severity of a dual energy crisis.

But it's just oil and gas – there are other fossil fuels, other energy sources, right?

To evaluate other energy sources it helps to understand the concepts of Net Energy, or the Energy Returned On Energy Invested ratio (EROEI). One of the reasons our economies have grown so abundant so quickly over the last few generations is precisely because oil has had an unprecedentedly high EROEI ratio. In the early days of oil, for every barrel of oil used for exploration and drilling, up to 100 barrels of oil were found. More recently, as oil recovery becomes more difficult, the ratio has become significantly lower. Certain alternative energy 'sources' may actually have EROEI ratios of less than one, such as many methods of industrially producing biodiesel and ethanol, or extracting oil from shale. That is, when all factors are considered, you probably need to invest more energy into the process than you get back.

Hydrogen, touted by many as a seamless solution, is actually an energy carrier, but not an energy source. Hydrogen must be produced using an energy source such as natural gas or nuclear power. Because of energy losses in transformation, the hydrogen will always contain less energy than was invested in it.

Some alternatives such as wind and hydro-power may have much better EROEI, however their potential expansion may be limited by various physical factors. Even in combination it may not be possible to gather from renewable sources of energy anything like the rate and quality of energy that industrial society is accustomed to. Peak oil author Richard Heinberg uses the metaphor that whereas fossil fuels are akin to a massive inheritance, one spent rather drunkenly, renewables are much more like a hard won energy wage.

For certain tasks, such as air travel, no other energy source can readily be substituted for oil. As noted by the Hirsch reports, alternative energy infrastructures require long periods of investment, on the scale of decades, to be widely implemented. We may be already leaving the period of cheap energy before we have begun seriously embarking on this task.

It's worth noting briefly that any EROEI study is complex and different methods of accounting can come up with vastly different results, so any net energy study might be viewed with some suspicion. We may not know with total certainty the usefulness of any renewable energy technologies until the hidden fossil fuel energy subsidies are finally removed.

2. Further information

Deeper introductions:
Wolf at the Door: A Beginner's Guide to Oil Depletion – available in French, Polish and English.
Life After The Oil Crash – Matt Savinar's question and answer style peak oil blockbuster website.

Peak oil and climate change: If peak oil merely threatens industrial civilisation, climate change promises to destabilize the planetary biosphere. The two issues are integrally related, and solutions to peak oil can also address climate change. Consider how we might bridge peak oil and climate change activism. David Holmgren has begun integrating peak oil and climate change into a global scenario planning framework.

Peak coal: Recent studies suggest that we may reach 'peak coal' much sooner than previously thought. Chris Vernon rounds up five recent reports to that effect over at The Oil Drum: Europe.

Peak everything: Peak Everything is the name of a forthcoming book by peak oil author Richard Heinberg. Globally we have already passed peaks or are soon to be facing them in copper, phosphorous, fish catches, grain production, per capita fresh water and uranium to name but a few. This is no coincidence, we have been consuming the world's resources at an unprecedented rate. The human population, which has risen in lockstep with fossil fuel production, will likely peak more or less in sync with these fuels.

Oil and food production: Essays The Oil We Eat by Richard Manning, and Eating Fossil Fuels by Dale Allen Pfeiffer both look at modern agricultures' dependence on fossil fuels. Both are highly recommended.

Audio and video:
Global Public Media – essential interviews on peak oil and environmental issues
Peak Oil? – a 44 minute TV special from Four Corners (Australia), viewable online (July 2006)
The End of Suburbia and A Crude Awakening – two excellent peak oil documentaries purchasable on DVD.

Research and reference articles:

ASPO – original research from The Association for the Study of Peak Oil & Gas
ASPO Ireland – the Irish branch of ASPO through which Colin Campbell now publishes the ASPO monthly newsletter
ASPO-USA publishes about 3 good articles every week (many of which are republished here)
The Oil Depletion Analysis Centre (ODAC) has a good website that is frequently updated
The Oil Drum – the breaking edge of community peak oil research
DieOff.com – an alarming but scholarly archive of research. The original peak oil website.

News and commentary:
The Oil Drum the daily Drum Beat is a collation of news stories

Peak Energy Australian Big Gav's aggregation and commentary on energy related news

Gristmill – environmental news and articles, with an increasing emphasis on energy, sustainability and climate

Resource Insights – Kurt Cobb publishes intelligent peak oil informed commentary on a broad range of issues.

Casaubon's Book – several essays and how-to articles a week from author, mother and farmer Sharon Astyk

James Kunstler's blog – peak oil commentary with a special focus on cultural decline. See both www.kunstler.com and jameshowardkunstler.typepad.com

Crisis Energética – peak oil news in Spanish

Mailing lists:
RunningOnEmpty3 – a group for peak oil beginners
EnergyResources – the original peak oil focused email list
RunningOnEmpty2 – a more solutions, self-sufficiency focused list
groups.yahoo.com/group/EnergyRoundTable – a group emphasizing discussion and politics

There are numerous local mailing lists too, many on yahoo can be found at this link:
groups.yahoo.com/search?query=peak%20oil&ss=1

More links, including books to read: An excellent list of links is maintained here:
www.dynamiclist.com/?worldview/peakoil

3. What can be done?

Many people are working on preparations for peak oil at various different levels, but there is probably no cluster of solutions which do not involve some major changes in lifestyles, especially for the global affluent. Peak oil presents the potential for quite catastrophic upheavals, but ultimately also some more hopeful possibilities: a chance to address many underlying societal problems, and the opportunity return to simpler, healthier and more community oriented lifestyles.

The Post Carbon Institute Outposts. The Post Carbon Institute is a think tank devoted to exploring the implications of, and preparing for, peak oil, focusing on relocalization. They write, “the most important initiative of the Post Carbon Institute is working with groups of concerned citizens to prepare their community for the Post Carbon Age. These groups are *Outposts* in the sense that they are community-based extensions of the Post Carbon Institute; they operate autonomously yet receive guidance and electronic infrastructure from the Institute. Outposts work cooperatively in their local community to put theory about living with less hydrocarbons into practice while sharing knowledge and experiences with the global network of outposts.”
www.postcarbon.org
www.relocalize.net

The Community Solution to Peak Oil. Many excellent resources are available through the website of this Ohio based organization "dedicated to the development, growth and enhancement of small local

communities... that are sustainable, diverse and culturally sophisticated." The Community Solution have hosted several recent grassroots peak oil conferences, and have developed an important film, The Power of Community: How Cuba Survived Peak Oil, documenting how this country has relatively successfully adapted to a political oil peak after the collapse of the Soviet Union.
www.communitysolution.org

Permaculture: Permaculture is a 'design science' which can allow us to live in relative abundance with minimal resource use. Permaculture principles and practice can be applied to functionally redesigning social systems, built environments, ecological and agricultural practices the post-peak era. David Holmgren's 2001 book, *Permaculture: Principles and Pathways Beyond Sustainability,* deals explicitly with the global oil peak and proposes permaculture as the best set of strategies for dealing with what he terms 'energy descent'.
www.permaculturereactivist.net
www.permacultureinternational.org
www.holmgren.com.au

Transition Towns: Several communities around the world have begun their own preparations for peak oil, and are documenting the process. The Kinsale Energy Descent Action Plan out of rural Ireland is the world's first local action plan for peak oil, dealing with broad issues relating to peak, including health, education, tourism and youth issues. The plan and its initiator Rob Hopkins have inspired the Transition Towns movement of peak oil preparing towns, focused in Europe. In the US, local organizers within the town of Willits, Califonia have begun work on the Willits Economic LocaLization Project (WELL). Many other communities around the world are embarking along similar paths.
www.transitionculture.org - *Rob Hopkins' blog*
www.transitiontowns.org
www.willitseconomiclocalization.org

Oil Awareness Meet Ups is a grass roots awareness raising network helping people meet up and discuss peak oil. Join or start a meet-up in your neighborhood.
oilawareness.meetup.com

Local Currencies and Steady State Economics:
Local Currencies: Richard Douthwaite, a 'recovering economist', has proposed a number of alternative monetary systems to deal with energy decline and the associated monetary crises which might arise post-peak. Local currencies like LETS are in operation around the planet already (although LETS itself may be somewhat problematic). Experiment now with local currencies to help survive economic crises.
The Foundation for the Economics of Sustainability (FEASTA) has some of Richard Douthwaite's publications available for free online, including entire books as well as masses of other excellent research and articles by other writers, relating not just to economics and local currencies, but to various aspects of sustainability.
See also: www.communitycurrency.org/resources.html

Intentional Communities: Intentional Community (IC) is an inclusive term for ecovillages, cohousing, residential land trusts, communes, student co-ops, urban housing cooperatives and other related projects and dreams... ICs represent one of the sanest ways of dealing with energy peak.
www.ic.org
gen.ecovillage.org
www.cohousing.org

The Oil Depletion Protocol: is a global framework for distributing the world's remaining oil reserves more equitably than free market forces would allow, to avoid resource wars, profiteering and economic collapse. Help promote it:
Introduction to the Depletion Protocol by Colin Campbell (Word .doc format)
How to avoid oil wars, terrorism, and economic collapse by Richard Heinberg

Tradable Energy Quotas (TEQs) are a system for rationing fuel which includes everyone – individuals, industry and the Government – and which enables users to sell any rations they do not use.
www.teqs.net

Lobbying: Lobby governments to spend now on renewable energy and improving agricultural practices. Many facts are summarized in the following 'convince sheet' by Bruce Thomson:
greatchange.org/ov-thomson,convince_sheet.html

Your feedback is welcome.

Last updated 1 December 2007 by BA

Article found at :
http://www.energybulletin.net/newswire.php?id=36422

Original article :

Running on Empty

by Mark Hertsgaard
The Nation Magazine, April 24, 2008

It used to be that only environmentalists and paranoids warned about running out of oil. Not anymore. As climate change did over the past few years, peak oil seems poised to become the next big idea commanding the attention of governments, businesses and citizens the world over. The arrival of $119-a-barrel crude and $4-a-gallon gasoline this spring are but the most obvious signs that global oil production has or soon will peak. With global demand inexorably rising, a limited supply will bring higher, more volatile prices and eventually shortages that could provoke--to quote the title of the must-see peak oil documentary--the end of suburbia[1]. If the era of cheap, abundant oil is indeed coming to a close, the world's economy and, paradoxically, the fight against climate change could be in deep trouble.

Though largely unnoticed by the world media, a decisive moment in the peak oil debate came last September, when James Schlesinger declared that the "peakists" were right. You don't get closer to the American establishment and energy business than Schlesinger, who has served as chair of the Atomic Energy Commission, head of the CIA, Defense Secretary, Energy Secretary and adviser to countless oil companies. In a speech to a conference sponsored by the Association for the Study of Peak Oil, Schlesinger said, "It's no longer the case that we have a few voices crying in the wilderness. The battle is over. The peakists have won." Schlesinger added that many oil company CEOs privately agree that peak oil is imminent but don't say so publicly.

One who does is Jeroen van der Veer, CEO of Royal Dutch Shell. Without using the term "peak oil," van der Veer warned in January, "After 2015, easily accessible supplies of oil and gas probably will no longer keep up with demand."

Of course, peak oil could arrive sooner than 2015; columnist George Monbiot has claimed in the *Guardian* that a Citibank report calculates the date at 2012. But even 2015 leaves a very short time in which to prepare, because modern societies were built on cheap, abundant oil.

"The world has never faced a problem like this," warned a 2005 study funded by George W. Bush's Energy Department. "Previous energy transitions (wood to coal and coal to oil) were gradual and evolutionary; oil peaking will be abrupt and revolutionary."

The United States, with its two-hour commutes, three-car families, atrophied mass transit and petroleum-based food system, is most vulnerable to an oil shock. But similar vulnerabilities exist in most industrial societies, not to mention the roaring economies of China and India, where oil consumption is rising faster even than GDP as newly middle-class consumers buy the cars they have long dreamed of.

At first glance, one might think that peak oil would help the fight against climate change. After all, less available oil should translate into less oil consumption and lower greenhouse gas emissions. But modern civilization, to borrow George W. Bush's term, is addicted to oil. If peak oil arrives before the addiction is treated, the junkie will seek even more dangerous ways to get his fix.

Indeed, this is already happening. In Canada, energy companies are mining so-called tar sands--a mix of sand, water and heavy crude oil that can be refined into usable petroleum. But burning tar sands is about the worst thing to do if we want to avoid catastrophic climate change because the resulting petroleum has a much greater carbon footprint than conventional oil. Currently, a dozen such projects are under way; projects awaiting approval would quadruple the emissions those projects generate. One encouraging sign: in response to a lawsuit filed by Ecojustice, the top federal court in Canada has temporarily blocked a tar sands project proposed by an ExxonMobil subsidiary on climate change grounds. "This is something which will clearly apply to every single oil-sands project that comes before environmental assessment of any kind," said Sean Nixon, a lawyer for Ecojustice Canada.

More encouragement: some high-level government officials recognize the danger of peak oil and may be contemplating action. British Foreign Secretary David Miliband wants his country to consider creating "a post-oil economy." New York Governor David Paterson has spoken in detail about the imminence of peak oil and what government can do about it: invest in greater energy efficiency in the short term and new low-carbon energy sources in the medium to long term. Plug-in hybrid cars, for example, can get more than 100 miles per gallon--double that of today's generation of hybrids. And if the plug-in hybrids rely on electricity generated by solar, wind or other green energy sources, they fight climate change and peak oil at the same time.

Finally, activists in scores of towns and cities around the world are trying to prepare their communities for the transition to a post-oil economy. Rather than wait for national governments and multinational corporations to save them, these ordinary citizens are examining how their communities can produce their own energy, food, buildings and other essentials using local resources rather than materials that arrive from afar via oil-based transport. "Economic relocalization will be one of the inevitable impacts of the end of cheap transportation fuels," argues peak oil theorist Richard Heinberg. In Britain this movement has taken the form of "transition towns," which seek, in the words of organizer Rob Hopkins, "to design a conscious pathway down from the oil peak." Drawing on the experience of his hometown of Totnes, in Devon, Hopkins has just published *The Transition Handbook*, which explains how other towns can also begin preparing for the post-oil future.

Some of the transition movement's ideas--printing local currency, forming solar buying clubs, building "cob" houses made of mud--may seem quaint, inconvenient or naïve. But nothing is more naïve than assuming that the endless oil that modern societies grew addicted to over the past fifty years will last forever. The day of reckoning appears imminent, and as Hopkins says, "it is better to plan for it than be taken by surprise."

About Mark Hertsgaard

The Nation's environment correspondent, is a fellow of The Nation Institute and the author of five books that have been translated into sixteen languages, including *Earth Odyssey: Around the World in Search of Our Environmental Future*. His next book is *Living Through the Storm: Our Future Under Global Warming*.

[1] *The End of Suberbia* preview http://www.youtube.com/watch?v=qHr8OzaloLM

Two Energy Futures

close

* By Jeroen van der Veer

By 2100, the world's energy system will be radically different from today's. Renewable energy like solar, wind, hydroelectricity, and biofuels will make up a large share of the energy mix, and nuclear energy, too, will have a place. Humans will have found ways of dealing with air pollution and greenhouse gas emissions. New technologies will have reduced the amount of energy needed to power buildings and vehicles.

Indeed, the distant future looks bright, but much depends on how we get there. There are two possible routes. Let's call the first scenario Scramble. Like an off-road rally through a mountainous desert, it promises excitement and fierce competition. However, the unintended consequence of "more haste" will often be "less speed," and many will crash along the way.

The alternative scenario can be called Blueprints, which resembles a cautious ride, with some false starts, on a road that is still under construction. Whether we arrive safely at our destination depends on the discipline of the drivers and the ingenuity of all those involved in the construction effort. Technological innovation provides the excitement.

Regardless of which route we choose, the world's current predicament limits our room to maneuver. We are experiencing a step-change in the growth rate of energy demand due to rising population and economic development. After 2015, easily accessible supplies of oil and gas probably will no longer keep up with demand.

As a result, we will have no choice but to add other sources of energy – renewables, yes, but also more nuclear power and unconventional fossil fuels such as oil sands. Using more energy inevitably means emitting more CO2 at a time when climate change has become a critical global issue.

In the Scramble scenario, nations rush to secure energy resources for themselves, fearing that energy security is a zero-sum game, with clear winners and losers. The use of local coal and homegrown biofuels increases fast. Taking the path of least resistance, policymakers pay little attention to curbing energy consumption – until supplies run short. Likewise, despite much rhetoric, greenhouse gas emissions are not seriously addressed until major shocks trigger political reactions. Since these responses are overdue, they are severe and lead to energy price spikes and volatility.

The Blueprints scenario is less painful, even if the start is more disorderly. Numerous coalitions emerge to take on the challenges of economic development, energy security, and environmental pollution through cross-border cooperation. Much innovation occurs at the local level, as major cities develop links with industry to reduce local emissions. National governments introduce efficiency standards, taxes, and other policy instruments to improve the environmental performance of buildings, vehicles, and transport fuels.

Moreover, as calls for harmonization increase, policies converge across the globe. Cap-and-trade mechanisms that put a price on industrial CO2 emissions gain international acceptance. Rising CO2 prices in turn accelerate innovation, spawning breakthroughs. A growing number of cars are powered by electricity and hydrogen, while industrial facilities are fitted with technology to capture CO2 and store it underground.

Against the backdrop of these two equally plausible scenarios, we will know only in a few years whether December's Bali declaration on climate change was just rhetoric or the start of a global effort to counter it. Much will depend on how attitudes evolve in China, the European Union, India, and the United States.

Shell traditionally uses its scenarios to prepare for the future without expressing a preference for one over another. But, faced with the need to manage climate risk for our investors and our descendants, we believe the Blueprints outcomes provide the best balance between economy, energy, and environment. For a second opinion, we appealed to climate change calculations made at the Massachusetts Institute of Technology. These calculations indicate that a Blueprints world with CO2 capture and storage results in the least amount of climate change, provided emissions of other major manmade greenhouse gases are similarly reduced.

But the Blueprints scenario will be realized only if policymakers agree on a global approach to emissions trading and actively promote energy efficiency and new technology in four sectors: heat and power generation, industry, transport, and buildings.

This will require hard work, and time is short. For example, Blueprints assumes CO2 is captured at 90% of all coal- and gas-fired power plants in developed countries by 2050, plus at least 50% of those in non-OECD countries. Today, none capture CO2. Because CO2 capture and storage adds costs and yields no revenues, government support is needed to make it happen quickly on a scale large enough to affect global emissions. At the least, companies should earn carbon credits for the CO2 they capture and store.

Blueprints will not be easy. But it offers the world the best chance of reaching a sustainable energy future unscathed, so we should explore this route with the same ingenuity and persistence that put humans on the moon and created the digital age.

The world faces a long voyage before it reaches a low-carbon energy system. Companies can suggest possible routes to get there, but governments are in the driver's seat. And governments will determine whether we should prepare for bitter competition or a true team effort.

This article was distributed in cooperation with Project Syndicate (www.project-syndicate.org - opens in a new window)

** Jeroen van der Veer, Chief Executive of Royal Dutch Shell plc, is Energy Community leader of the World Economic Forum energy industry partnership in 2007-2008 and chaired this year's Energy Summit in Davos. He also chairs the Energy and Climate Change working group of the European Round Table of Industrialists.*

Global Peak Oil

Overview:
Peak oil is the term for energy resource depletion, specifically, the peak in global oil extraction. Oil is a finite resource, one that has powered phenomenal economic and population growth over the last century and a half. The **rate** of oil extraction (now about 87 million barrels/day), has grown almost every year of the last century. Once we have used up about half of the original reserves (estimated at 2.5 trillion barrels), the oil extraction rate stops growing and begins a terminal decline, hence 'peak'. The peak in oil extraction does not signify 'running out of oil', but it does mean the end of cheap oil .

Peak Oil is the convergence of three trends:
1) Proven reserves are pumping at capacity and can't ramp up any more.

2) New discoveries are smaller, harder to get, and can't replace the drawdown rate of proven reserves.

3) Demand is growing faster than extraction rate, especially in China and India.

Short answer:
Supply can longer meet demand, and rapid price escalation is evident.

Light Sweet Crude Oil - prices per barrel

April 1980 $38.00	$103.76 (adjusted for inflation) - Iran-Iraq war
February 2002	$ 20.00
January 2007	$ 50.00
1 November 2007	$ 96.00 (stock market plunged 200 points)
2 January 2008	$100.00 (stock market plunged 221 points)
20 February 2008	$101.32 (stock market plunged 458 points after being closed Monday)
4 March 2008	$103.95
5 March 2008	$104.52
6 March 2008	$105.10
10 March 2008	$107.93 (stock market plunged 161 points)
11 March 2008	$108.75
12 March 2008	$109.85 (Euro at record high of $1.55 against dollar)
13 March 2008	$110.33
9 April 2008	$112.21
15 April 2008	$113.93
16 April 2008	$115.07
22 April 2008	$119.90 (Euro at record high of $1.60 against dollar)
28 April 2008	$119.93
5 May 2008	$120.36
6 May 2008	$122.73
7 May 2008	$123.53 (stock market plunged 197 points)
9 May 2008	$126.20
12 May 2008	$126.40
13 May 2008	$126.98
20 May 2008	$129.60 (stock market plunged 197 points)
21 May 2008	$135.09 (stock market plunged 224 points)
6 June 2008	$139.12 (stock market plunged 393 points)
16 June 2008	$139.89
27 June 2008	$142.99 (stock market plunged 356 points)
3 July 2008	$145.85
11 July 2008	$147.27 (Israel-Iran saber rattling)

Introduction to Peak Oil

by Gail Tverberg – TheOilDrum.com
commentary posted on TheOilDrum.com under the name of “Gail the Actuary”
17 July 2007

Introduction

Most of us have read that oil shortages may be a problem in the not-too-distant future. Some news sources even mention the term "peak oil" as being part of the problem. Finding additional information can be difficult, however. Textbooks don't generally cover the subject, and material on the Internet is often fragmented or of uncertain accuracy. This booklet has been prepared to try to fill that gap. If you would like to reproduce your copy to share with others, feel free to do so.

TheOilDrum.com (TOD) is an Internet forum where researchers of all types plus interested lay people meet on a daily basis to discuss "Energy and Our Future". I am on the staff of TOD. Quite a few of TOD's members felt that it was important that someone prepare an introduction to peak oil for the general reader, so I undertook the task of bringing together some basic information.

Since I am not an expert on all areas, I prepared drafts of important material and put them up on TheOilDrum.com for review by members. After members had had a chance to comment, I made adjustments to try to reflect a reasonable version of current thinking on the subjects presented.

This booklet has been prepared with chapters and appendices so that readers can pick out those sections of interest. The basic information is in Chapters 1 thorough 4. People who are confused about the differences between what they are seeing in the press and what they are reading here will want to read Chapter 5 as well.

The Appendix provides some additional background information and discussion questions. It is expected to especially useful in a classroom setting. If your copy does not include the Appendices and you would like them, they can be found by searching for "Peak Oil Introduction Appendices".

I want to thank all TheOilDrum.com members who helped with this project. While I received input or assistance from many, the final decision as to what to include was mine alone.

Chapter 1: What Is Peak Oil?

In this chapter, we discuss some of the basic issues relating to peak oil and the expected worldwide decline in oil production.

1. What is peak oil?

"Peak oil" is the term used to describe the situation when the amount of oil that can be extracted from the earth in a given year begins to decline because geological limitations are reached. Extracting oil becomes more and more difficult, so that costs escalate and the amount of oil produced begins to decline. The term peak oil is generally used to describe a decline in *worldwide* production, but a similar phenomenon exists for individual countries and other smaller areas.

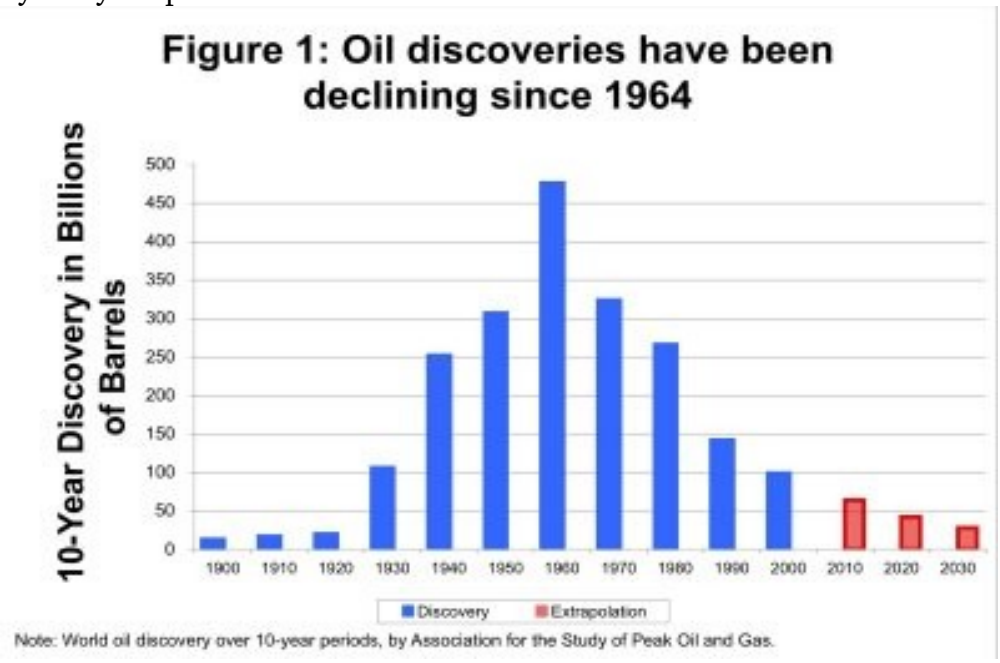
2. Why would oil production begin to decline? Can't we extract oil as fast as we want, until it finally runs out, many years from now?

What happens isn't quite as simple as "running out". Oil production in an oil field usually starts at a low level and increases as more oil wells are added. Eventually some of the older wells start producing more and more water mixed with the oil, and pressure declines. Oil companies do what they can to maintain production - drill new wells nearby, inject gas or water to maintain pressure, and apply other newer production techniques. Eventually, the proportion of oil in the oil/water mix becomes very low and the cost of extraction becomes very high. When it costs more to produce the oil than the oil is worth, production is abandoned.

On a worldwide basis, the phenomenon of peak oil can be thought of as a crisis in resources needed to produce oil. It's the size of the tap, not the size of the tank. As we deplete the large, easy-to-produce fields and move to ever-more-difficult fields, it takes more and more drilling rigs, more petroleum engineers, and more investment dollars. Eventually we reach a point where we are out of equipment, out of trained personnel, and the investment cost for expanding production becomes prohibitive. When production begins to drop because of all of these pressures, we reach "peak oil".

3. Aren't we continuing to discover more and more oil every year?

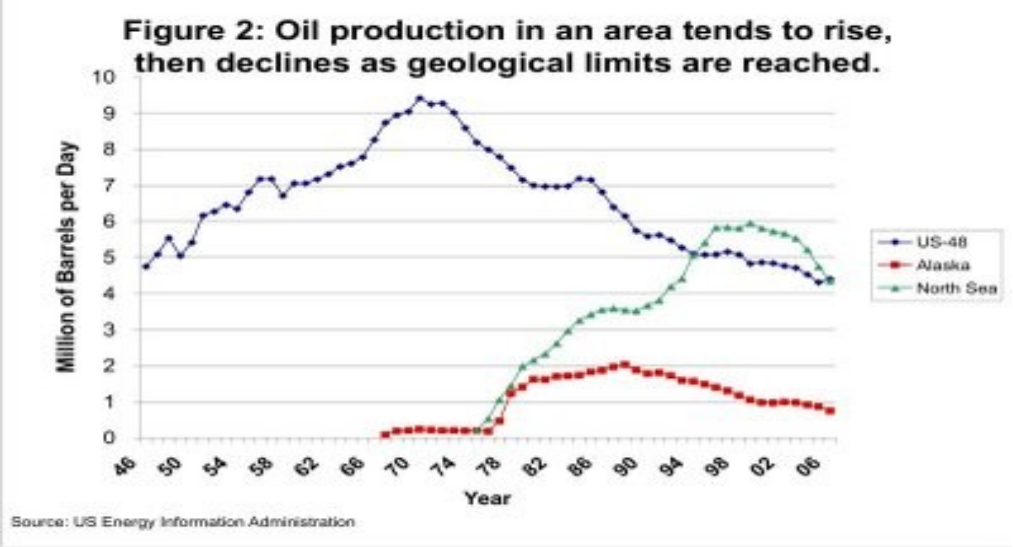
We are continuing to discover oil, but the quantity of oil discovered is lower now than it was 50 years ago, and much lower than the amount of oil we are now using. A graph of oil discoveries by ten year periods is as shown below



We often read in the news about finding new fields, but these fields tend to be smaller and harder to reach than those discovered in the past. We are now so concerned about finding oil that even small discoveries are reported as news.

4. Do we have any historical reason to expect that oil production will begin to decline at some point?

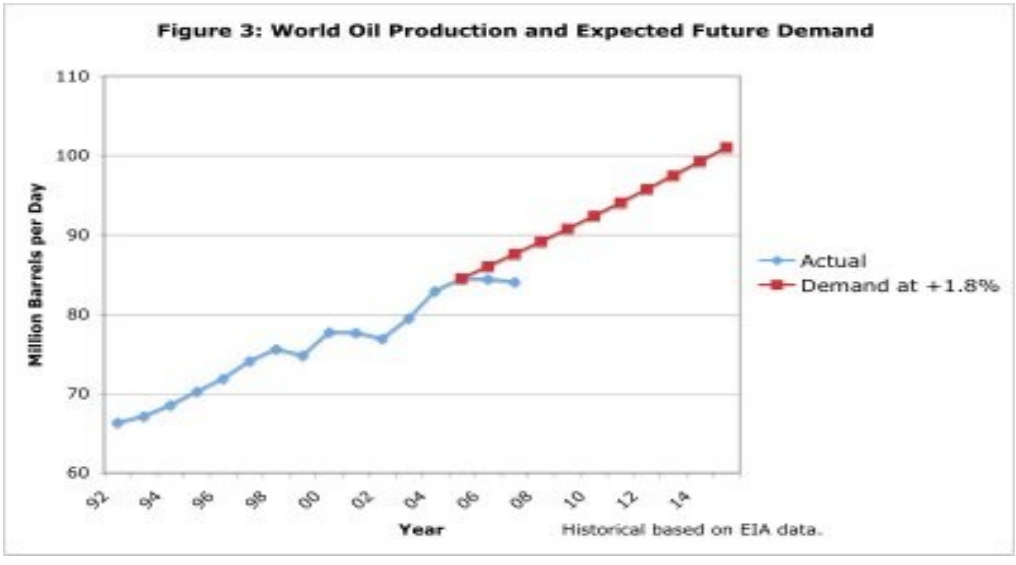
When we look at oil production in a given area, production tends to rise until approximately 50% of the oil that will eventually be extracted is gone, and then begins to decline. For example, Figure 1 shows oil production of the 48 states of the United States, of Alaska, and of the North Sea. Production in all these areas increases for a time, and then begins to decrease.



We have now reached the point where oil production is declining, apparently for geological reasons, in the majority of oil-producing countries. It is logical to expect that world oil production will eventually begin to decline.

5. What does world oil production look like?

Figure 3 shows recent world oil production, plus a rough estimate of future demand for oil. The future demand line assumes prices equivalent to those in early 2005 ($50 dollars a barrel for West Texas Intermediate) and an adequate supply of oil. This price level was chosen because it represents the price before the recent stall in production and the resulting escalation in petroleum costs. It also reflects the fact that there are many current reports of oil shortages around the world.



On this graph, a person can see that world oil production was rising fairly steadily, but recently has "stalled out". Based on data of the United States Energy Information Administration (EIA), oil production for the 2005 to 2007 period is level or drifting slightly downward.

Because of this "stalled out" condition, there is a growing gap between what the world would like for petroleum production and what is actually being produced. At this point, the countries that are suffering a shortfall because the current price is too expensive are mostly third world countries from Africa and Asia. The International Energy Agency (IEA) in June 2007 expressed concern that oil production is not high enough, and wanted Organization of Petroleum Exporting Countries (OPEC) to produce more.

6. Can OPEC raise its production of petroleum?
Many people suspect that the answer to this question may be no. Some publications report that Saudi Arabia is having production difficulties, as are several other OPEC countries (Kuwait, Iran, Nigeria and Venezuela). Saudi Arabia does not admit to any production problems. EIA data indicates declining oil production for Saudi Arabia, even before OPEC production cuts were announced in the fall of 2006.

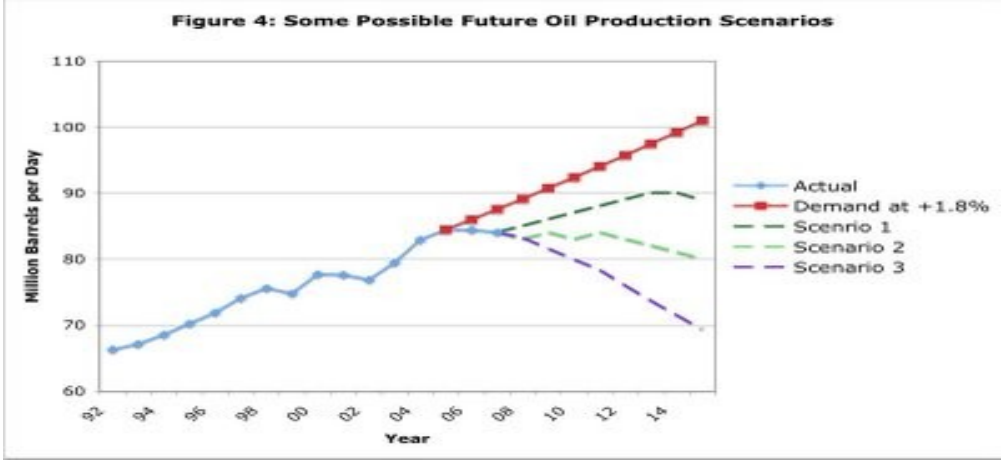
It is likely that we will learn the truth about OPEC's ability to raise production this winter. OPEC has its next planned meeting in September. Unless something very unusual happens, there will be a need for significantly higher oil production. OPEC's actions at that time will tell what the real situation is.

7. Doesn't OPEC report very large oil reserves? It seems like those high reserves would assure us that OPEC can increase its production at will.
No, the high reserves aren't all that helpful. First, there are serious doubts about the accuracy of OPEC's oil reserves. The reserves are not audited numbers. Analyses such as this one suggest that the reserves are likely overstated.

Second, even if OPEC reserves are accurate, the reserves tell us nothing about the flow rate. If the reserves include much very viscous oil, or if there are other production difficulties, it may take years to produce a relatively small flow of oil.

One important piece of detective work regarding Saudi oil reserves was done a couple of years ago. Matthew Simmons analyzed published scientific papers relating to Saudi oil wells and determined that Saudi wells were reaching a serious state of depletion. He documented his findings in the book Twilight in the Desert. This book is now available in paperback, and has been translated into German and Chinese.

8. What will the pattern of world oil production look like in the next few years?
It is uncertain, but Figure 4 shows three possible oil production scenarios as dotted lines.



If OPEC production is now falling, it is likely that we are at "peak oil" now, because production for the rest of the world is flat. If we are at peak oil, we might expect future oil production to follow a pattern similar to Scenario 3 (the lowest dotted line, with production falling immediately) or possibly Scenario 2 (the middle dotted line, with production falling after a plateau). Several respected energy industry insiders, including Matthew Simmons, energy investment banker and author of Twilight in the Desert, and Samsam Bakhtiari, retired Iranian oil executive, believe that we are at peak oil now.

Scenario 1 (the top dotted line) shows a scenario in which peak oil is still a few years away. Some scientists believe that this is a more likely scenario. The Newsletter of the Association for the Study of Peak Oil and Gas forecasts peak oil in 2011, four years from now. The PhD thesis of Fredrik Robelius showed that peak oil is expected to occur between 2008 and 2018. Chris Skrebowski, author of the Megaprojects analysis forecasts a worldwide peak in 2011/2012.

9. When was peak oil first predicted?
M. King Hubbert, in 1956, first predicted that US oil production for the 48 states would peak in 1970. This prediction turned out to be correct, to everyone's surprise. He also predicted a worldwide peak around 2000.

10. Will alternative energy sources be able to make up for the shortfall in petroleum production?
At this point, it seems unlikely that they will make up the shortfall.

On Figure 4, the gap that needs to be filled is the gap between future demand (the top line) and actual future production (something in the vicinity of the dotted lines). Clearly, the sooner oil production begins to drop and the steeper the decline, the bigger the gap that needs to be filled. Even if oil production stays level, there can be a gap because demand continues to increase.

At this point, there does not seem to be any "silver bullet" for replacing lost oil production. Oil is unique in its abundance, its high energy density, and its portability. There do appear to be a number of approaches that may solve small parts of the problem, however. These include:

- ethanol from corn,
- ethanol from sugar (generally imported),
- biodiesel,
- cellulosic ethanol from biomass, and
- coal-to-liquid.

None of these appears to be able to replace more than a small fraction of the oil we use, especially in a short timeframe. In addition, there are other drawbacks -- cost, environmental damage, and for coal-to-liquid, climate change issues. Indirect approaches to circumventing the shortage, like using battery operated cars, may be part of the picture as well. If these are used, they will probably need to be phased in slowly, as existing cars are retired. It is likely that conservation will need to be part of the mix.

Links by question:

Q5-1: Canaries in the Coal Mine
http://www.theoildrum.com/node/2749#comment-209910

Q5-2: Click on June 2007 IEA Highlights Report
http://omrpublic.iea.org/archiveresults.asp?formsection=highlights&f...

Q6: Oil Market Under Pressure, Supply Not Able to Counter Demand
http://www.resourceinvestor.com/pebble.asp?relid=33010

Q7-1: "Lies, damned lies and BP statistics" by Euan Mearns
http://europe.theoildrum.com/node/2666

Q7-2: Twilight in the Desert by Matthew Simmons
http://www.amazon.com/Twilight-Desert-Coming-Saudi-Economy/dp/0471790184...

Q8-1: Matt Simmons on Bloomberg: Peak Oil is Now (video)
http://www.theoildrum.com/node/2310

Q8-2: "World Oil Production Capacity Model Suggests Output Peak by 2006-07" by AMS Bakhtiari
http://www.energybulletin.net/147.html

Q8-3: Association for the Study of Peak Oil and Gas- Ireland Newsletter Shows Projections
http://www.aspo-ireland.org/contentFiles/newsletterPDFs/newsletter79_200...

Q8-4: PhD Thesis by Frederik Robelius - Giant Oil Fields and Their Importance to Future Production
http://publications.uu.se/theses/abstract.xsql?dbid=7625

Q8-5: "Magaprojects Planned Capacity Listing" by Chris Skrebowski
http://sydneypeakoil.com/downloads/PR_APR06_Megaprojects.pdf

Q8-6: "How close to peak oil are we?" by Chris Skrebowski
http://www.energybulletin.net/30930.html

Q9: Nuclear Energy and the Fossil Fuels by M. Hubbert King, 1956
http://www.hubbertpeak.com/hubbert/1956/1956.pdf

Q10-1: "Corn-Based Ethanol: Is This a Solution?" by Gail Tverberg
http://www.theoildrum.com/node/2615

Q10-2: "Lessons from Brazil" by Robert Rapier
http://www.theoildrum.com/story/2006/5/31/175512/149

Q10-3: "The Myths of Biofuels" Interview with David Fridley (45 minutes)
http://globalpublicmedia.com/the_reality_report_the_myths_of_biofuels

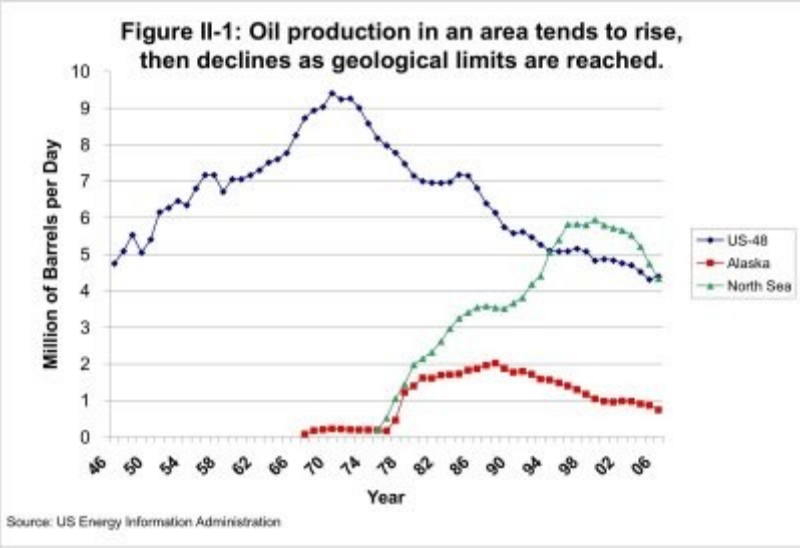
Q10-4: Whither Cellulosic Ethanol?
http://www.theoildrum.com/story/2006/8/15/13634/6716

Q10-5: Coal-to-Liquid Boondoggle
http://www.washingtonpost.com/wp-dyn/content/article/2007/06/17/AR200706...

Chapter 2: Is This a False Alarm?

As we look at the answers to these questions, we will see that the production decline discussed in Chapter 1: What Is Peak Oil? appears to be nearly immediate. Available methods for offsetting this decline appear to be too little, too late. This time the alarm is *real*.

1. It seems like people thought we were running out of oil in the 1970s, and then all of our problems went away. Why is the situation different now?
Let's look again at the graph of oil production for the US-48 states, Alaska, and the North Sea:



When US oil production began decreasing about 1970, there were still several sources of oil that could be ramped up:

- Saudi oil production could be increased, in a very short time frame.
- Alaskan production could be ramped up, once the pipeline was finished
- North Sea production could be started

Now we have reached the point where both Alaskan and North Sea production are declining. Saudi production also is declining, and there is suspicion that this is for geological reasons as well.

Discoveries in recent years have been mostly small fields or have been in places where oil is very difficult to obtain. In either of these situations, huge expense is required for very modest payback. We are running out of reasonable places to drill more wells.

2. What is the situation with current world oil production? Are major oil-producing regions having problems with production?
Six out of seven of the major oil producing areas are either reporting declining production, or have reported problems that are expected to lead to declining production in the near future. These six areas account for nearly half of world oil production. There are many other smaller areas with declining production as well. Thus, it appears that peak oil is very near at hand, and that large production increases from new sources will be needed in the next one to four years to prevent peak oil.

Based on data of the US Energy Information Administration, the largest oil producing countries / areas in 2006 were

- Russia - Increasing production, but future problems expected (9,247,000 barrels per day)
- Saudi Arabia - Declining production (9,152,000)
- United States - Long-term declining production (5,136,000)
- Iran - Declining production (4,028,000)
- China - Slight increase in production (3,686,000)
- Mexico - Largest oil field peaked in 2006 (3,256,000)
- North Sea (Norway, Great Britain) - Declining production (4,343,000)

Saudi Arabia used to be the world's largest oil producer, but its production has been declining since late 2005, so it is now second to Russia. Its production decline is supposedly voluntary, but analyses such as this one and this one suggest that there is a geological basis to its decline.

Russia is now the world's largest oil producer. The fact that its production has been increasing is one of the reasons we are not yet in deep decline. Russia's Alfa Bank is now warning that "production stagnation is unavoidable" reflecting "a higher proportion of water in the declining output", so it appears that this source of increase will be disappearing soon.

Mexico's production is now declining because of the decline in its largest field, Cantarell. The one country not included as having production problems is China. Even this classification is borderline. Oil production in China for the first three months of 2007 increased by only 0.3% over the corresponding period a year ago--hardly enough to matter.

With six of the seven major oil-producing areas having production issues of one type or another, a huge amount of oil from new sources is needed very quickly if worldwide production is to continue to increase. This oil is needed in a short time-frame -- the next one to four years. Production later will help mitigate the decline in production but is unlikely to prevent peak oil.

3. If we really want more oil, can't we just increase production in the areas where we have been drilling? I've heard that there is still quite a bit of oil left in the ground when we finish drilling.

Yes, there is still quite a of bit oil left in the ground - generally at least 50%, and sometimes as much as 90%, of the oil originally in place. But wanting to get more oil out doesn't seem to have a big impact. This is a graph from a report prepared for the US Department of Energy by Robert Hirsch, Roger Bezdek, and Robert Wendling in 2005. It shows that US energy oil production in the lower 48 states continued to decline between 1970 and 2004, regardless of external events.

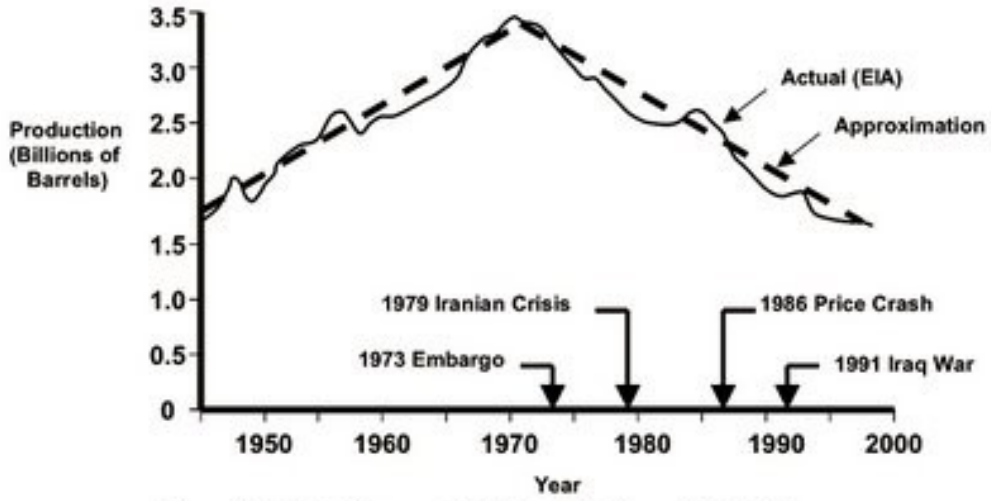


Figure II-2. U.S. Lower 48 Oil Production, 1945-2000

4. Won't higher prices result in greater production?

This is another graph from the report mentioned above by Hirsch, Bezdek, and Wendling.

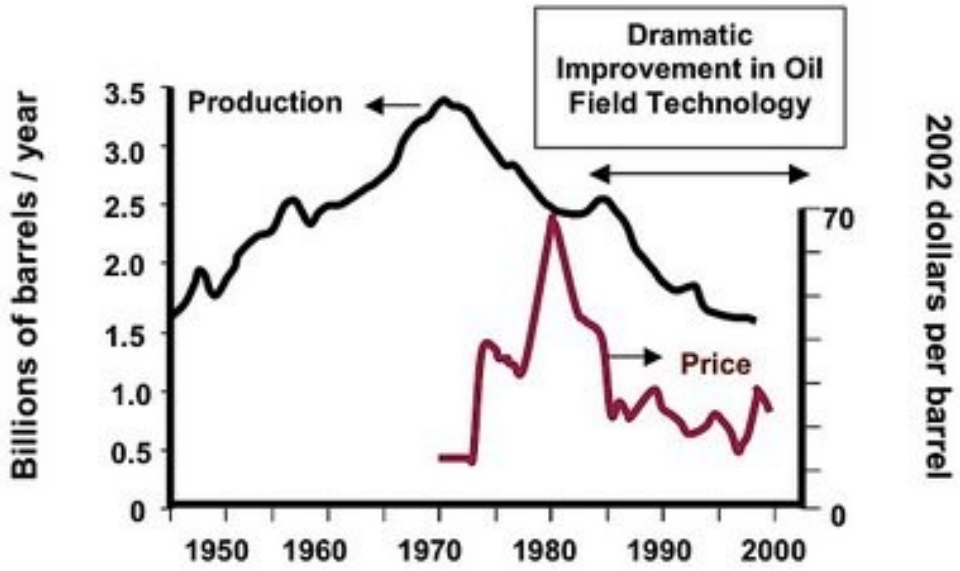


Figure II-3. Lower 48 Oil Production and Oil Prices

This graph seems to indicate that for US-48, price changes have had very little impact on oil production.

Also, if we look at world oil production in Chapter 1, Figure 3, we see that volumes have been approximately flat over the past two years, even though prices have been in the $60 to $75 per barrel range - very high by historical standards. With these high prices, OPEC has not offered to raise production and, in fact, reduced production targets effective November 2006.

5. Won't better technology solve our problems?

Given where we are today, it seems unlikely that technology will prevent peak oil. It may help mitigate the down-slope after peak. Some considerations in saying this:

• Technological changes seem to have had relatively little impact on US 48 states production, as shown in the graph in Q4 above.

• Liquid fuel substitutes for oil all have challenges of their own. All are expensive using today's technologies and are expected to be slow to scale up. Biofuels tend to be very land intensive; coal to liquid has serious climate change issues.

• Technological advances are having some benefit (for example, deepwater drilling), and this is reflected in the numbers we are seeing. We need much, much more, however.

• If a major technological advance is made, such as inventing a way to extract significantly more of the oil that has been left behind, it will almost certainly take several years to produce the new equipment to implement the solution widely. Because of the likely timing of peak oil, such a new solution is much more likely to affect the down-slope after peak, than to prevent it. If the technological advance is significant enough, it is possible that it will permit oil production to increase again at some point in the future.

6. How about the Canadian oil sands? I've heard that production may triple by 2020.

While we hear a lot about the oil sands, the amount of oil they produce is not all that large. In 1997, oil sands accounted for 0.8% of world production. By 2005, production had grown to just

under 1 million barrels per day, or 1.2% of world production. Even if production tripled, it would still be small compared to what is needed.

One factor impeding growth is the fact that current production methods require large amounts of natural gas, and this is in short supply. One idea under consideration is to build nuclear plants - eight would be required if production were to scale up to 4 million barrels a day. Given the time and expense of building nuclear plants, development is likely to take several years.

7. How about oil shale in the western United States? I have heard that there is a huge amount of this available.
Extraction of oil shale appears to be a very slow and expensive process. The methods under consideration require large amounts of energy plus a lot of water. In the West, the shortage of water is likely to be a major issue, even if the required energy can be obtained by building nuclear power plants, or by some other approach. At this point, no one is able to produce oil from oil shale in commercial quantities. It seems likely that it will take many years before even the level of production of the Canadian oil sands can be achieved.

8. How about the Jack 2 field? Newspaper articles in September 2006 seemed to say it would solve a lot of our problems.
The Jack 2 field is located in a very difficult-to-service location, five miles below the surface of the Gulf of Mexico and 175 miles from the Louisiana coast. It represents, at best, a small contribution to the oil needed to prevent a decline in world production. Newspaper production estimates of 3 billion to 15 billion barrels are for the whole region (rather than just Jack 2) and include natural gas as well as oil. If the estimated 3 to 15 billion barrels is actually oil, rather than mostly natural gas, it corresponds to 5 months to 2 years' oil usage by the US.

It is not yet clear that production will be economically feasible -- more appraisal wells are needed, and new equipment will need to be designed and built to handle oil in such a deep water location. If production is possible, it will almost certainly come too late to prevent peak oil. The cost of oil from such a location will also be extremely high, considering the cost of all the special equipment and the cost of insurance against hurricane damage in such a vulnerable location.

9. How about drilling in the Arctic National Wildlife Refuge (ANWR) in Alaska?
According to Wikipedia, the US Department of Interior under Gale Norton estimated that ANWR contained 10.4 billion barrels of oil, and that the maximum production from ANWR would be 1.4 million barrels a day. The US currently uses about 7.5 billion barrels of oil a year, so ANWR represents the equivalent of 17 months oil usage by the United States. The actual production would be spread out over a long period - at least ten years, but not starting until several years after work is begun. Maximum production of 1.4 million barrels would equate to about 7% of current US oil usage (or about 1.4% of world oil production).

Thus ANWR's contribution is likely to be small and come after peak has arrived.

10. How about drilling on the outer continental shelf around the United States? I understand that there is supposed to be quite a lot of oil there.
Based on this article from TheOilDrum.com, the Outer Continental Shelf (OCS) seems unlikely to contribute much oil for many years, because of the long lead times required in deep water locations. Special equipment will be needed, which will need to be designed and built. Thus, nearly all production is likely to occur after peak oil arrives.

The amount of oil available on the OCS is very uncertain. The current estimated amount of 115 billion barrels is the equivalent of about 15 years of US oil usage, or a little less than 4 years of

world oil usage. It is not clear how much of this can be economically produced - production is expected to be very expensive. In some areas, ice cover for part of the year is expected to be a problem.

11. Aren't there quite a number of countries whose production is declining, simply because they are not investing in sufficient infrastructure and don't have modern techniques - for example, Iraq, Iran, Venezuela, and Mexico. If the US could help these countries with our techniques, wouldn't our oil problems be solved?
This would be great, but it is questionable whether it would work:

• The basic issue of peak oil is the fact that large oil fields that need minimal infrastructure are mostly tapped out. The remaining fields are less desirable for a number of reasons -- they are very small, are located in deep water or near the arctic, or involve very viscous oil or oil mixed with poisonous chemicals.

• In order to tap these remaining fields, a *huge* amount of infrastructure is needed. This will be *very, very* expensive.

• One of the major types of infrastructure needed is drilling rigs. Based on a presentation of Matthew Simmons, the supply of these is limited. Also, many of these are very old, and appear to be near the end of their working lives.

• US oil companies are very small in size compared to the National Oil Companies that are having difficulty developing the fields in question. With the lack of rigs, and the huge investment likely to be required, it is doubtful that our oil companies could do much to help these countries with lagging production, if they wanted. Furthermore, the petroleum engineers that would be needed to oversee such operations are also in very short supply.

• It is doubtful whether these countries would welcome our expertise. As a major purchaser of oil, it would seem to be in our best interest to abide by their preferences.

Links by question:

Q2-1: "International Petroleum Monthly-Oil Production" from US Energy Information Agency
http://www.eia.doe.gov/ipm/supply.html

Q2-2: "Nosedive Toward the Desert" by Stuart Staniford
http://www.theoildrum.com/node/2331

Q2-3: "The Status of North Ghawar" by Stuart Staniford
http://www.theoildrum.com/node/2441

Q2-4: "Alfa Report Sees Trouble Looming in Oil Sector", Moscow Times, 7/10/2007
http://www.themoscowtimes.com/stories/2007/07/10/042-full.html

Q3: R. Hirsch, R. Bezdek, and R. Wendling, "Peaking of World Oil Production: Impacts, Mitigation, and Risk Management", for US Department of Energy, February 2005.
http://www.hilltoplancers.org/stories/hirsch0502.pdf

Q6: Nuclear Power for the Oilsands
http://canada.theoildrum.com/node/2572

Q7: Oil Shale and the Future
http://www.theoildrum.com/story/2006/7/6/0472/48972

Q8: Jack-2 and the Lower Tertiary of the Deepwater Gulf of Mexico
http://www.theoildrum.com/story/2006/9/8/11274/83638

Q9: Wikipedia - Arctic Refuge Drilling Controversy
http://en.wikipedia.org/wiki/Arctic_Refuge_drilling_controversy

Q10: Deep Ocean Energy Resources-A Critical Analysis by Dave Cohen
http://www.theoildrum.com/story/2006/7/12/101236/478#more

Q11-1: The Peaking of OffShore Oil and Gas by Matthew Simmons
http://www.simmonsco-intl.com/files/Offshore%20Technology%20Conference%2...

Q11-2: "Labour and Skills Crisis Could Stall Oil and Gas Boom" by Booz, Allen & Hamilton
http://www.boozallen.com/media/file/Labour_and_Skills_Crisis.pdf

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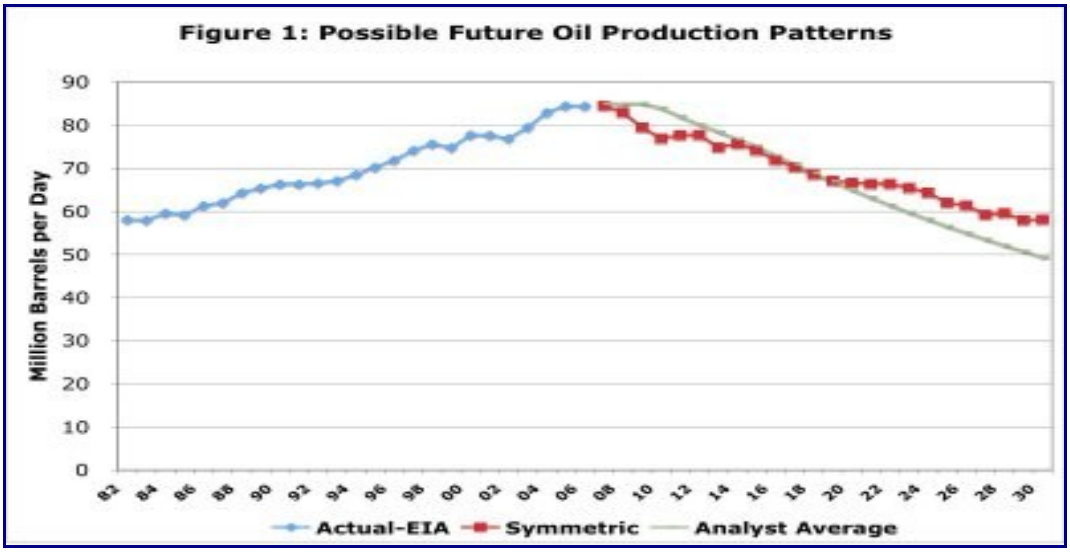
Chapter 3: What's Ahead?

A number of analysts are saying that peak oil is here now (see Chapter 1, Question 8). Suppose they are correct -- what kind of changes can we expect to see in the years ahead?

In this chapter, we will look at the implications of *peak oil now* -- how we can expect oil production to change between now and 2030, and how this decline in production is likely to affect the economy. While there are many who believe that peak oil is still a few years away (the newsletter of the Association for the Study of Peak Oil and Gas of Ireland predicts a peak in 2011, for example), this analysis will assume that the peak year is 2006, with the decline starting in 2007. If this assumption turns out to be a little early, the worst that will happen is that we will be a little ahead in our planning.

1. If peak is now, how much of a decline in world oil production can be expected in the next few years?
Figure 1 shows historical world oil production, together with two projections of what the future will bring:



The first of the projections we call the "symmetric" projection. It simply assumes that oil production will decrease in the future in a manner similar to the way that it increased in the past. This method assumes that 2006 is the peak year; 2007 production will be equal to 2005 production; 2008 production will be equal to 2004; and so on. Thus, the future is expected to be a mirror image of the past.

The second projection is what we call the "analyst average" method. Here, we average five projections assuming peak in the 2005 to 2007 period - two made by Ace, one made by Bakhtiari, and two made by Robelius. We have adjusted all of the projections to a "total liquids" basis for this comparison (that is, including ethanol and other liquid fuels that are similar to oil), so that they are comparable to each other and to the historical data.

Figure 1 shows that the projection methods produce fairly similar results. Both methods show production declining fairly rapidly:

- At 2010 - Symmetric: Minus 9%; Analysts Average: Minus 1%
- At 2020 - Symmetric: Minus 21%; Analysts Average: Minus 23%
- At 2030 - Symmetric: Minus 31%; Analysts Average; Minus 42%

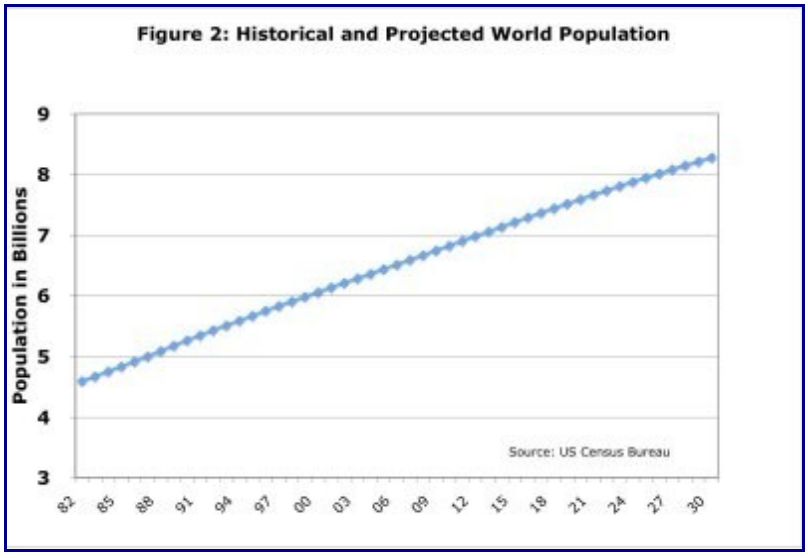
2. How likely is it that future production will follow a pattern similar to Figure 1?

The forecasts shown are only rough approximations. Actual production could be higher, especially if there is a major technology breakthrough. Such breakthroughs take a long time to widely implement --an average of 16 years, according to a recent report by the National Petroleum Council--so the benefit occurs fairly slowly. Another possibility for increased production is an increase in an alternative fuel, such as coal-to-liquid. Such an increase might make the decline somewhat less steep.

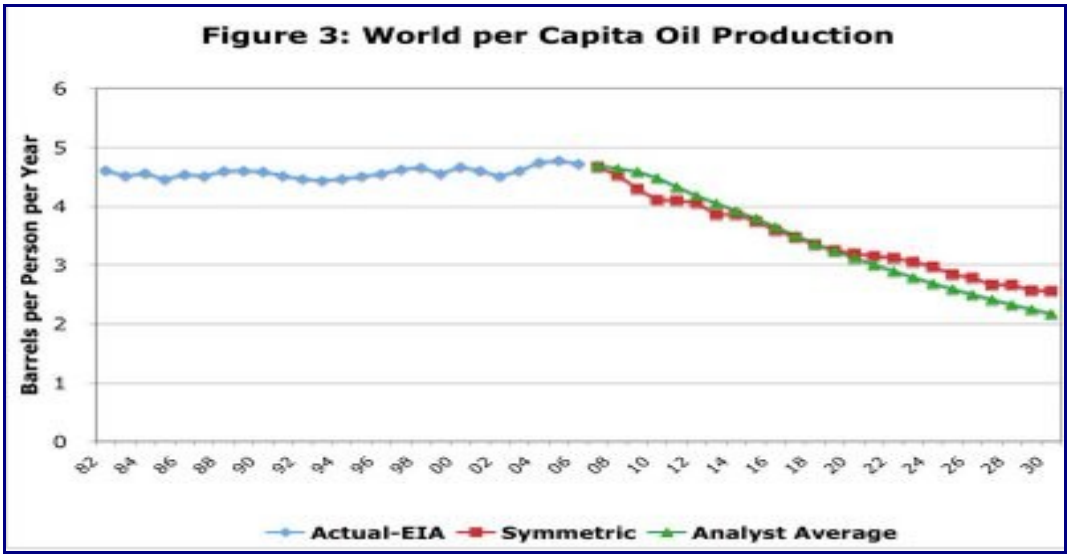
There is also a significant risk that future production will be lower than indicated. Social unrest can be a problem in countries with declining production, leading to pipeline attacks. Oil fields may not be developed because their owners lack the necessary funds for investment or the technology required to develop the fields. Some countries may choose to limit production, so as to save oil for later. Also, there is some evidence that newer technology may keep production in a field high until close to the end, then suddenly drop off. If this phenomenon is not adequately reflected in the projections, the estimates of future production may prove to be too high.

3. It seems like it is really the amount of oil per person that makes a difference. What kind of change in oil production is expected on a per capita basis?

The number of people in the world has been rising at between 1% and 2% per year. A graph of historical and expected future world population based on US Census Department estimates is shown in Figure 2.



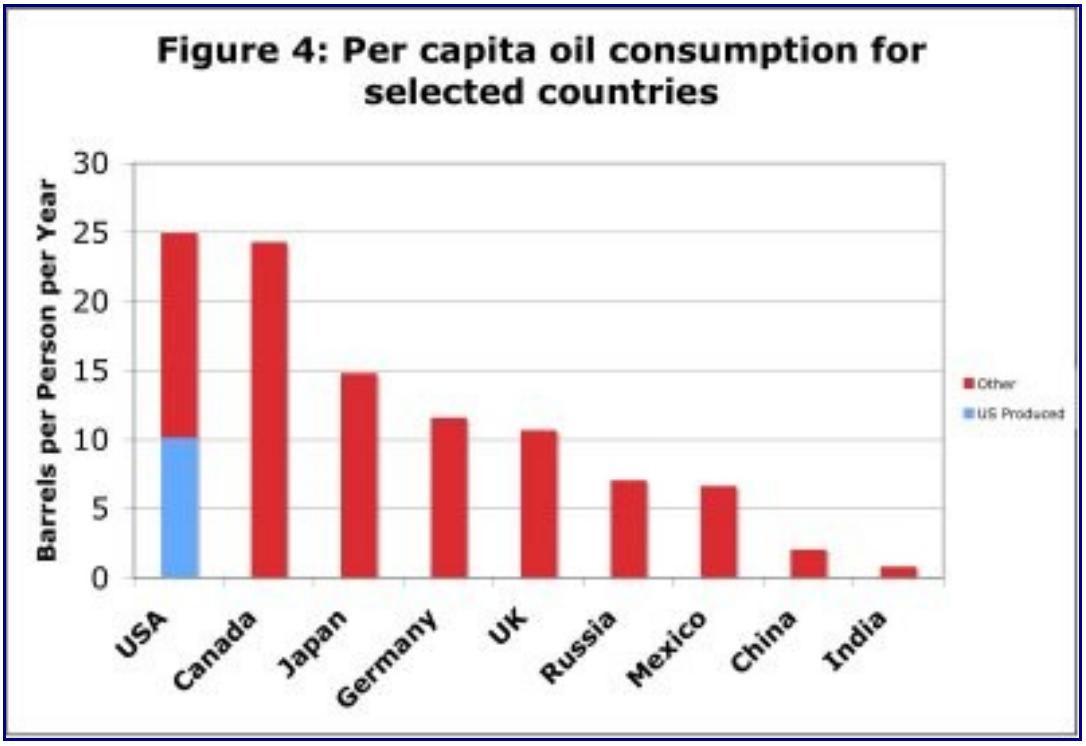
If we use the information in Figures 1 and 2 to calculate oil production per person, the result is as shown in Figure 3.



On a per capita basis, the amount of oil produced has been approximately level, at about 4.6 barrels per person, between 1982 and 2006. The forecasts show that the amount of oil per person is expected to decrease to approximately 2.0 to 2.5 barrels per person, by 2030.

4. Does a decrease in per capita oil production really make much difference? I have heard oil represents only a tiny fraction of world revenue.

There is a surprisingly close relationship between the amount of oil consumed and a country's standard of living. Figure 4 shows a comparison of current per capita oil consumption, for selected countries.



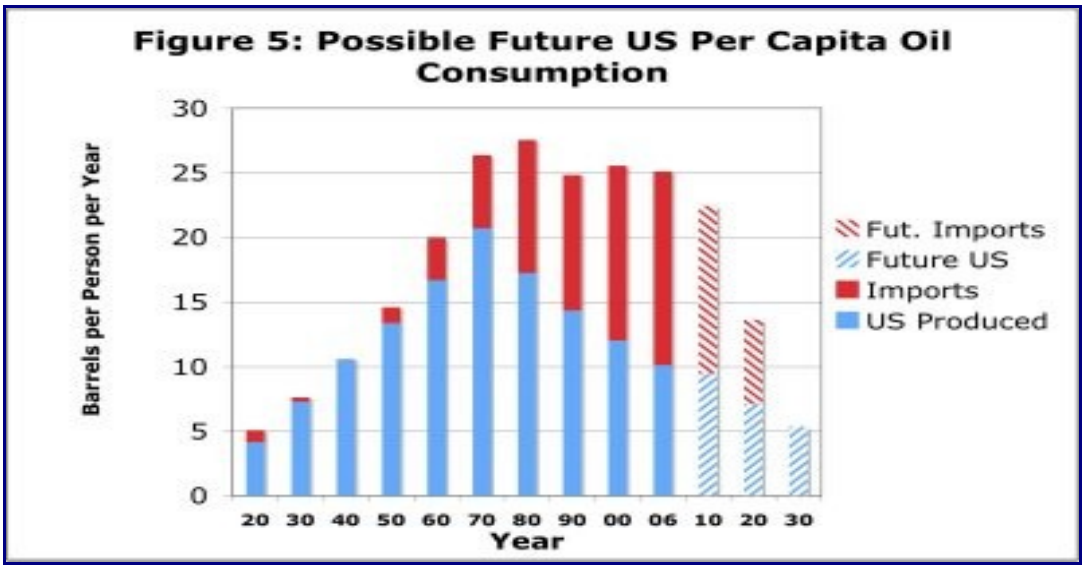
Of the countries shown, the United States has the highest consumption, at approximately 25 barrels per person per year. (A barrel is 42 gallons, so 25 barrels a year is 1,050 gallons, or 2.9 gallons per day). Canada is close behind, with about 24 barrels. Germany and the United

Kingdom are at a level roughly half of that of the United States, partly because they use more public transportation and partly because they drive smaller cars. Mexico and Russia both have per capita consumption of about 7. Note that this is still above the world-wide average per capita consumption of 4.6, from Figure 3. China and India have the lowest per capita consumption of the countries shown - about 2 barrels a year for China and 1 barrel a year for India.

Based on this comparison, there is a huge difference among countries in the amount of oil used. Figure 4 also shows a breakdown of US oil between US-produced and imported. If we consider only US-produced oil, oil production of the United States is about 10 barrels per person per year - close to the level currently used by Germany and the United Kingdom.

5. If world oil production decreases as shown in Figures 1 and 3, what impact will this have on the amount of oil the US consumes?

The US currently imports about 60% of its oil supply. The big question with respect to future US oil supply is how much oil we will continue to import in the future, when world supply begins to decline. Figure 5 shows one possible outcome, on a per capita basis.



On Figure 5, we show a a hypothetical situation in which US oil imports drop about 10% by 2010, then drop to about half of the current level by 2020 and disappear all together by 2030. These estimates are not much more than guesses. There are a lot of uncertainties about future imports:

• Will a free market in oil continue the way it does today, when demand is much greater than supply?

• Will oil-producing nations keep a disproportionate share of oil for themselves and their allies?

• Will the US insist on importing enough oil to fuel its SUVs, when some people are literally starving to death, because their country cannot afford oil for tractors and power plants?

We show a worst case scenario for 2030, with imports disappearing entirely. (If imports continue, oil availability in 2030 is likely to be higher). If imports disappear, a rough estimate is that US oil production will be about 5 barrels per person per year in 2030-- a little lower than the current level of 7 for Mexico and Russia. Efficiency advances and other mitigation efforts will presumably provide some benefit, so that the standard of living might be similar to, or somewhat higher than, the standard of living of Mexico and Russia today. The 5 barrels per person per year in 2030 is approximately equal to the US's oil consumption in 1920 -- a very different world than today.

6. Is the decline in availability of oil the only problem the world is likely to face in the years ahead?
No. With all of the years of growth in population and economies, we are reaching limits in many respects.

• Climate change As the result of man's activities, and in particular the growing use of fossil fuels, the world temperature is rising. Many are now saying that the use of fossil fuel should be limited - particularly coal. In North America, coal is often thought of as a possible substitute for oil, because it is in reasonably good supply and the technology for coal-to-liquids exists. Climate change issues make this substitution more questionable.

• Metal shortages Quite a number of metals are now in increasingly short supply - including copper, platinum, and uranium. Some have suggested that uranium shortages may limit nuclear expansion capabilities, but this is disputed by others.

• North American natural gas A shortage of natural gas in North America starting in a few years appears to be a significant possibility. Natural gas from conventional sources is in increasingly short supply. Gas from shale, which is a major "unconventional" source, is looking increasingly non-economic. Liquified natural gas (LNG) from overseas is sometimes thought to be a substitute, but a lack of investment in overseas facilities to process LNG is likely to limit its availability.

• World food supply and fresh water World food supply is under increasing pressure from competition from biofuels, shortages of fresh water for irrigation, crop failures due to climate change, increasing soil degradation and growing world population. Inadequate fresh water is a serious issue in its own right.

7. What are the immediate impacts of an oil shortage expected to be?
As one might expect, an oil shortage is likely to result in higher prices of goods that contain oil or use oil in their processing. Gasoline, diesel fuel, and residential heating fuel will of course be higher priced. Food will also be higher priced, because a considerable amount of oil is used in growing the food, processing it, and transporting it to market. Other types of energy are likely to rise in cost as well, as people shift to alternative fuels. The inflation rate is likely to rise.

While it is not as obvious, It is also likely that there will be actual "outages" of some oil-related products. Gasoline stations may be without gasoline in some areas, particularly when a nearby refinery is temporarily not available because of a storm or unplanned maintenance. Residential heating oil may be difficult to find in some locations. Asphalt may not be available for paving roads. We are already starting to see a few situations like these, because supplies are stretched tight.

If gasoline or another product is temporarily unavailable, there are likely to be indirect impacts as well. Schools may close because diesel is unavailable for buses, and factories may close for lack of a particular part. Liebig's Law of the Minimum says that a process is limited by its least available resource. If oil is not available, even temporarily, economic activity can be seriously impacted.

Some areas that are likely to first feel the impacts of oil shortages are
• Commercial airline flights - Cost of fuel and higher debt costs will be a problem
• Food imported by air - Demand will decline because of much-higher cost
• SUV manufacturers - Demand for large cars will decline precipitously
• Third world countries - These countries are already being priced out of the oil market

8. What is the impact of oil shortages on the financial markets likely to be?
Strange as it may seem, some of the biggest and most immediate impacts of oil shortages are likely to affect financial markets:
• End of the growth paradigm. Economic markets now expect continued growth and expansion. With declining supplies of oil and other necessary resources, this expectation will need to change to a steady state, or even to a planned decline.

• Declining credit availability. Debt is provided with the expectation that an individual's or organization's income will grow, or at least stay level in the years ahead. If this assumption no longer holds, a shift from the very loose credit standards seen in recent years to extremely tight credit seems likely. A recession or depression is likely to ensue.

• Declining stock prices. The value of stocks reflects the expected future earnings of the company. If these earnings are expected to stop growing, and perhaps shrink, the value of the stock can be expected to decline.

• Deflation and/or Inflation. A reduced supply of oil may lead to inflation, as existing monetary supplies "chase" fewer and fewer goods. Also, countries may adjust monetary policies to encourage inflation, if it becomes too difficult to pay off debt in a declining economy. There may also be huge deflationary pressures, as the value of stocks and other investments decline, debt becomes less available, and the economy shrinks.

• Reduced interest in insurance and other financial products. Volatility in monetary supply, declining values of stocks, and problems with the debt markets will all make insurance and other financial products less attractive.

• Declining globalization Declining living standards in third world countries, declining availability of commercial airline flights, increasing cost of global transportation, and increasing volatility of currencies are all likely to act to reduce globalization.

9. What types of jobs are likely to see growth in the years ahead?
• Small businesses, selling goods close to the customer.

• Recycling of all kinds, including clothing and parts from no-longer-wanted buildings.

• Home remodeling for energy efficiency and to accommodate more people in the same space.

• Food production will require more workers than the few farmers we have today. Some may be more like gardeners.

• Energy related jobs - As energy becomes more and more difficult to obtain, a larger and larger share of workers will need to work in this field.

• Scientist and engineers - Needed to develop more energy-efficient approaches. In agriculture, to develop approaches requiring less energy and less fertilizer, pesticides, and herbicides. In manufacturing, to design factories in this country, to replace factories making goods which can no longer be imported from oversees.

• Laborers - As energy becomes more costly, manual labor becomes a more attractive option.

10. What are some of the challenges in the years ahead expected to be?
• How do we adapt the transportation system to the new lower supply? Increased fuel efficiency standards for vehicles are unlikely to be enough by themselves. What else can be done without excessive cost-- car pooling? bicycles for short trips? expansion of public transportation programs? more use of distance learning and work-at-home programs? Does it make sense to plan for battery operated vehicles?

• How do we plan for a declining economy? Companies will not want to build a factory, if they know that it will need to be abandoned in ten years for lack of fuel. Oil companies will not want to build pipelines, if they know they can only be used for a short time.

• How do we deal with greatly reduced financial services? If mortgages become unavailable, how do we deal with home ownership? If loans are unavailable, how do businesses plan new factories?

• How do we find adequate resources (both capital and physical resources) to handle all of the investment that is needed in infrastructure? The only resources we have available are those we (1) mine, grow, or otherwise produce; (2) recycle; or (3) import. These resources are needed for other uses as well, including transportation and food.

• How do we find substitutes for the many chemical uses of oil - textiles, building materials, pharmaceuticals? Or do we give priority to oil for these uses?

• How do we protect the food supply? Should farmers be given special access to fuel, through some sort of rationing program? Should people be encouraged to start gardens, to supplement the food supply? How should we train people in low-energy agricultural techniques? Will it be necessary to break up large farms into units that are manageable with less energy?

• How can we avoid future shortages that are likely to have wide-ranging effects? For example, some people are concerned that we may not continue to have enough asphalt to maintain roads. Is this really a problem, and how can this be avoided? How can we circumvent shortages of metals needed to make cars and other consumer goods?

• Resources are unevenly divided. People will want to move to areas with greater resources. How do we deal with the conflict that may ensue? Do we forbid immigration all together? How do we keep countries from fighting over limited resources?

NOTE: Text reflects some edits suggested by the comments below. PDF can be found here.

Links by Question

Introduction -1: Chapter 1, Question 8
http://www.theoildrum.com/node/2743

Introduction -2: July 2007 Newsletter, Association for the Study of Peak Oil and Gas-Ireland
http://www.aspo-ireland.org/contentFiles/newsletterPDFs/newsletter79_200...

Q1-1: Updated World Forecasts, Including Saudi Arabia by Ace, July 19, 2007
http://www.theoildrum.com/node/2716

Q1-2: The World Oil Production Capacity Model by Samsam Bakhtiari, December 10, 2003
http://www.sfu.ca/%7Easamsamb/conference/WOCAP.htm

Q1-3: Giant Oil Fields - The Highway to Oil: Giant Oil Fields and their Importance for Future Oil Production by Frederik Robelius, Uppsala University, March 2007
http://publications.uu.se/abstract.xsql?dbid=7625

Q2: Facing Hard Truths about Energy by National Petroleum Council, July 18, 2007
http://www.npc.org/Facing_Hard_Truths-71807.pdf

Q5: Net Oil Exports and the Iron Triangle by Jeffrey J. Brown, July 13, 2007
http://www.theoildrum.com/node/2767

Q6-1: Intergovernmental Panel on Climate Change - Mitigation of Climate Change, 2007
http://www.mnp.nl/ipcc/pages_media/AR4-chapters.html

Q6-2: Measure of Metal Supply Finds Shortage by David Biello, Scientific American, January 17, 2006
http://www.sciam.com/article.cfm?articleID=000CEA15-3272-13C8-9BFE83414B...

Q6-3: Carmakers gear up for the next shortage - platinum, The Mining News, July 6, 2005
http://www.theminingnews.org/news.cfm?newsID=800

Q6-4: Lack of fuel may limit U.S. nuclear power expansion, Massachusetts institute of Technology News Office, March 21, 2007
http://web.mit.edu/newsoffice/2007/fuel-supply.html

Q6-5: Is Nuclear Power a Viable Option for Our Energy Needs? by Martin Sevior, March 1, 2007
http://www.theoildrum.com/node/2323

Q6-6: A Natural Gas Crisis Coming? by Dave Russum, July 21, 2007
http://languageinstinct.blogspot.com/2007/07/natural-gas-crisis-coming_2...

Q6-7: Facing Hard Truths about Energy by National Petroleum Council, July 18, 2007
http://www.npc.org/Facing_Hard_Truths-71807.pdf

Q6-8: Plank Road fever and the Barnett Shale by Arthur Berman, World Oil Magazine, April 2007
http://worldoil.com/magazine/MAGAZINE_DETAIL.asp?ART_ID=3171&MONTH_YEAR=...

Q6-9: Investing in LNG Projects, Dan Amoss, Whiskey and Gunpowder, July 11, 2007
http://www.whiskeyandgunpowder.com/Archives/2007/20070711.html

Q6-10: Limits to Growth: the 30 Year Update by Donella Meadows, Jorgen Randers, and Dennis Meadows, Chelsea Green (June 1, 2004)
http://www.amazon.com/Limits-Growth-Donella-H-Meadows/dp/193149858X/ref=...

Q6-11: Water Tables Falling and Rivers Running Dry by Lester Brown, July 24, 2007
http://www.earth-policy.org/Books/Seg/PB2ch03_ss2.htm

Q6-12: Australia's epic drought: The situation is grim by Kathy Marks in The Independent, April 20, 2007
http://news.independent.co.uk/world/australasia/article2465960.ece

Q6-13: Soil Degradation: A Threat to Developing-Country Food Security by 2020? by Sara J. Scherr, Food, Agriculture, and the Environment Discussion Paper 27, International Food Policy Research Institute, Washington D. C., February, 1999
http://www.ifpri.org/2020/dp/dp27.pdf

Q7: Liebig's law of the minimum from Wikipedia
http://en.wikipedia.org/wiki/Liebig's_law_of_the_minimum

Chapter 4: What Should We Do Now?

We know that peak oil will be here soon, and we feel like we should be doing something. But what? It is frustrating to know where to start. In this chapter, we will discuss a few ideas about what we as individuals can do.

1. What will the first few years after peak oil be like?
It is hard to know for certain, but a reasonable guess is that the impact will be like a major recession or depression. Many people will be laid off from work. Gasoline is likely to be very expensive ($10 a gallon or more) and may not be available, except in limited quantities after waiting in line for a long time. Fewer goods of all types will be available in stores. Imports from third-world countries are likely to be especially unavailable, because of the impact of the oil shortage on their economies.

Money may not have the same value as previously--opinion is divided as to whether deflation or rampant inflation will be a problem. Investments, even those previously considered safe, are likely to lose value. Things we take for granted--like bottled water, fast food restaurants, and dry cleaners--may disappear fairly quickly. Electricity may become less reliable, with more frequent outages. Airplane tickets are likely to be extremely expensive, or only available with a special permit based on need.

2. If a scenario like this is coming, what can a person do now?
Here are a few ideas:

• Visit family and friends now, especially those at a distance. This may be more difficult to do in the future.

• Learn to know your neighbors. It is likely that you will need each other's help more in the future.

• If you live by yourself, consider moving in with friends or relatives. In tough times, it is better to have others to rely on. It is also likely to be a lot cheaper.

• Buy a bicycle that you can use as alternate transportation, if the need arises.

• Start walking or jogging for exercise. Get yourself in good enough physical condition that you could walk a few miles if you needed to.

• Take care of your physical health. If you need dental work or new glasses, get them. Don't put off immunizations and other preventive medicine. These may be more difficult to get, or more expensive, later.

• Move to a walkable neighborhood. If it seems likely that you will be able to keep your job, move closer to your job.

• Trade in your car for one with better mileage. If you have a SUV, you can probably sell it at a better price now than in the future.

• If you have two cars powered by gasoline, consider trading one for a diesel-powered vehicle. That way, if gasoline (or diesel) is not available, you will still have one car you can drive.

• Make sure that you have at least a two-week supply of food and water, if there is some sort of supply disruption. It is always good to have some extra for an emergency--the likelihood of one arising is greater now.

• Keep reasonable supplies of things you may need in an emergency--good walking shoes, boots, coats, rain wear, blankets, flashlights and batteries (or wind-up flashlights).

• Take up hobbies that you will be able to continue in a low energy world, such as gardening, knitting, playing a musical instrument, bird watching, or playing cards with neighbors.

• Join a local sustainability group or "permaculture" group and start learning about sustainable gardening methods.

3. Do I need to do more than these things?
It really depends on how much worse things get, and how quickly. If major services like electricity and water remain in place for many years, and if gasoline and diesel remain reasonably available, then relatively simple steps will go a a long way.

Some steps that might be helpful to add once the crunch comes include:

• Join a carpool for work, or make arrangements to work at home. If public transportation is available, use it.

• Cut out unnecessary trips. Eat meals at home. Take your lunch to work. Walk or jog in your neighborhood rather than driving to the gym. Order from the internet or buy from stores you can walk to, rather than driving alone to stores.

• If you live a distance from shopping, consider forming a neighborhood carpool for grocery and other shopping. Do this for other trips as well, such as attending church. If closer alternatives are available, consider them instead.

• Plant a garden in your yard. Put in fruit or nut trees. Make a compost pile, and use it in your garden. Put to use what you learned in sustainability or permaculture groups.

• Meat, particularly beef, is likely to be very expensive. Learn to prepare meals using less meat. Make casseroles like your grandmother's, making a small amount of meat go a long way. Or make soup using a little meat plus vegetables or beans.

• Use hand-me-down clothing for younger children. Or have a neighborhood garage sale, and trade clothing with others near you.

4. Should families continue to have two, three, or four children, as they often do today?
With the uncertainties ahead, it would be much better if families were very small--one child, or none at all. The world's population has grown rapidly in the last 100 years. Part of the reason for growth is the fact that with oil and natural gas, it was possible to grow much more food than in the past. As we lose the use of these fossil fuels, it is likely that we will not be able to produce as much food as in the past, because of reduced ability to irrigate crops, and reduced availability of fertilizers, insecticides, and herbicides. In addition, manufactured goods of all types, including clothing and toys, are likely to be less available, with declining fossil fuel supply. Having smaller families will help fit the population to the available resources.

If couples have completed their families, it would probably be worthwhile for them to consider a permanent method of contraception, since birth control may be less available or more costly.

5. Are there any reasons why steps such as those outlined in Question 3 might be too little to handle the problem?
Besides the decline in oil production, there are a number of other areas of concern. Hopefully, most of these will never happen, or if they do happen, will not occur for several years. If they do happen, greater measures than those outlined in Question 3 are likely to be needed.

• Collapse of the financial system. Our financial system needs growth to sustain it, so that loans can be paid back with interest. Once peak oil hits, growth will be gone. Economic growth may even be replaced with economic decline. It is not clear our financial system can handle this.

• Collapse of foreign trade. Many factors may come into play: The cost of transportation will be higher. Airline transport may not be available at all. Fewer goods are likely to be produced by the poorer countries of the world, because of power outages related to high oil prices. Rapid inflation/deflation may make monetary transactions more difficult.

• Rapid climate change. Recently, scientists have discovered that climate change can take place over a very short period of time--as little as a decade or two. Temperature and precipitation changes may cause crop failures, and may make some areas no longer arable. Sea levels may also rise.

• Failure of the electrical grid. The grid tends to be vulnerable to many kinds of problems--including deterioration due to poor maintenance, damage during storms, and attacks in times of civil unrest. Maintenance is currently very poor (grade of D) according to the "Report Card on America's Infrastructure" by the American Society of Civil Engineers. If we cannot maintain the grid, and upgrade it for the new wind and solar capacity being added, we will all be in the dark.

• Water shortages. There are several issues--We are drawing down some aquifers at unsustainable rates, and these may be depleted. Climate change may reduce the amount of water available, by melting ice caps and changing storm patterns. City water and sewer systems require considerable energy inputs to continue functioning. If these are not provided, the systems will stop. Finally, systems must also be adequately maintained--something that is neglected currently.

• Road deterioration. If we don't have roads, it doesn't matter whether we have cars. In the future, asphalt (a petroleum product) is expected to become more and more expensive and less available. It is not clear whether recycling asphalt from lesser-used roads will overcome this difficulty.

• Decline in North American natural gas production. Natural gas is especially used for home heating, making plastics and making fertilizer. It is also used in electrical generation, particularly for extra load capacity when demand is high. Conventional natural gas is declining, and it is not clear that supply from other sources can make up the gap.

• Inadequate mineral supplies. A number of minerals are becoming less avaialble, including copper (used in electric wiring), platinum (used in catalytic converters), phosphorous (used in fertilizer).

• Fighting over available supplies. This could happen at any level. Individuals with inadequate food or gasoline may begin using violence. Or there may be fighting among groups within a nation, or between nations.

6. Are there any reasons for optimism?
Yes. We know that people throughout the ages have gotten along successfully with far fewer resources than we have now, and with much less foreign trade. Financial systems have gotten into trouble in the past, and eventually new systems have replaced them. If nothing else, barter works.

We know that among the countries of the world, the United States, Canada, and Russia have reasonably good resource endowments in relation to their populations. They have fairly large amounts of land for crops, moderate rainfall, reasonable amounts of fossil fuels remaining, and populations that are not excessively large.

We also know that Cuba successfully made a transition from high oil usage to much lower oil usage, through the development of local gardens, increased public transit, and bicycles. A movie has been made about the Cuban experience.

7. What should we do, if we want to do more than described in Question 3?
Some web sites (such as Life After the Oil Crash and wtdwtshtf.com) advocate moving to a farming area, buying land and hand tools, and learning to farm without fossil fuels. Typically, an individual purchases an existing farmhouse and adds solar panels or a windmill. The web sites generally recommend storing up large supplies of food, clothing, medicine, tools, guns, and ammunition, and learning a wide range of skills. These sites also suggest storing some things (liquor, razor blades, aspirin, etc.) for purposes of barter.

This approach may work for a few people, but it has its drawbacks. Making such a big move is likely to be expensive, and will most likely involve leaving one's job. The individual will be alone, so security may be a problem. The individual may be dependent on his or her own resources for most things, especially if the farm is in a remote location. If the weather is bad, crops may fail. Living on the edge of a small town may prevent some problems, but such a move would still be a major undertaking.

8. How about Ecovillages? What are they?
These are communities dedicated to the idea of sustainable living. These communities were set up in response to many issues facing the world, including global warming, resource depletion, and lifestyles that are not fulfilling. They were generally not formed with peak oil in mind.

Each ecovillage is different. Organizers often buy a large plot of land and lay out a plan for it. Individuals buy into the organization. Homes may be made from sustainable materials, such as bales of straw. Gardening is generally done using "permaculture"- a sustainable organic approach. Individuals may have assigned roles in the community.

The few ecovillages I investigated did not seem to truly be sustainable--they bought much of their food and clothing from outside, and made money by selling tours of their facilities. The ecovilliage approach could theoretically be expanded to provide self-sustaining post-peak oil communities, but would require some work. Some adventuresome readers may want to try this approach.

9. Is there a middle ground? What should be people be doing now, if they want to do more than outlined in Questions 2 and 3, but aren't ready to immerse themselves in a new lifestyle?
As a middle ground, people need to start thinking seriously about how to maintain their own food and water security, and start taking steps in that direction.

Food security. We certainly hope our current system of agriculture will continue without interruption, but there is no guarantee of this. Our current method is very productive, but uses huge amounts of energy. If we can keep our current system going, its productivity would likely be higher than that of a large number of individual gardens. The concern is that eventually the current system may break down due to reduced oil supply and need to be supplemented. Vulnerabilities include:

- Making hybrid seed, and transporting it to farmers
- Getting diesel fuel to the farmers who need it
- Transporting food to processing centers by truck
- Creating processed food in energy-intensive factories
- Making boxes and other containers for food
- Transporting processed food to market

If diesel fuel is allocated by high price alone, farmers may not be able to afford fuel, and may drop out. Or truck drivers may not be able to get what they need.

It is in our best interest to have a back-up plan. The one most often suggested is growing gardens in our yards--even front yards. Another choice is encouraging local farms, so that transportation is less of an issue. It takes several years to get everything working well (new skills learned, fruit trees to reach maturity), so we need to start early.

One type of crop that is particularly important is grain, since grain provides a lot of calories and stores well. In some parts of the country, potatoes might be a good substitute. It would be good if people started planting grain in gardens in their yards. There is a lot to learn in order to do this, including learning which grains grow well, how much moisture and nutrients the grains need, and how to process them. If the grain that grows well is unfamiliar, like amaranth, there is also a need to learn how to use it in cooking.

Individuals (or local farms) should also begin growing other foods that grow well in their areas, including fruits and nuts, greens of various types, and other more traditional garden crops, including beans. For all types of gardening, non-hybrids seeds (sometimes called heirloom seeds) are probably best for several reasons:

- It makes storing seeds after harvest possible, and reduces dependence on hybrid seeds.
- There is less uniformity, so the harvest is spread over a longer period.
- The reduced uniformity also helps prevent crop failure in years with drought or excessive rain. Some seeds will not grow, but others will. (Hybrids are all or nothing.)

Imported foods are likely to shrink in supply more quickly than other foods. If you live in a country that is dependent on imported foods, you may want to consider moving elsewhere.

Water Security. Here, the largest issue is whether there is likely to be sufficient supply in your area. Another issue is whether there will be sufficient water for your garden, at appropriate times. A third issue is whether there will be disruptions in general, because of poor maintenance or because the process of treating fresh water (and sewage) is energy-intensive.

With respect to sufficient water in your area, if it looks like there is a problem (desert Southwest, for example), relocating now rather than later is probably a good idea. Transporting water is energy intensive, and new efforts at developing energy (like shale oil or more ethanol) are likely to make the water supply situation even worse.

With respect to water for gardening, consider a rainwater catchment system for your roof. Runoff water is saved in barrels, and can be used for irrigation in dry periods.

General disruptions of water supply are more difficult. Keep some bottled water on hand. You may also want to consider a tank for greater storage supply. Rainwater catchment can be used for drinking water, with the correct type of roofing (not asphalt shingles!) and proper treatment, but this is not generally legal in the United States.

10. What kind of investments should I be making?
A person's first priority should be buying at least a little protection for a rainy day - some extra food and water, comfortable clothing, blankets and flashlights. I suggested two weeks worth in Question 2. If you have money and space, you may want to buy more.

Paying down debt is probably a good idea, if only for the peace of mind it brings. There are some possible scenarios where debt is not a problem (hyper-inflation but you keep your existing job and get a raise). In many other scenarios (deflation; job lay-offs; rising food and energy prices) debt is likely to be even harder to pay off than it is now.

Land for a garden is probably a good investment, as well as garden tools. You will want to invest in gardening equipment, some books on permaculture, and perhaps some heirloom seeds. You may also want to consider a rainwater catchment system, to collect water from your roof.

You may also want to invest in solar panels for your home. If you want round-the-clock solar energy, you will also need back-up batteries. Buying these is questionable--they tend to be very expensive, require lots of maintenance, and need to be replaced often.

There is a possibility that the financial system will run into difficulty in the not-too-distant future. Some ideas for investments that may protect against this are

- Treasury Inflation-Protected Securities (TIPS)
- Bank accounts protected by the FDIC
- Gold coins
- Silver coins

If you want to invest in the stock market, we know that there will be more and more drilling done for oil and gas done in the next few years, so companies making drilling equipment are likely to do well. Small independent oil and gas companies may also do well, doing "work-over" business. We know that there are likely to be shortages in some metals in the years ahead (copper, platinum, uranium), so shares in companies mining these types of metals may do well.

Investments in biofuels should be considered with caution. Most ethanol from corn appears to be heavily dependent on subsidies. If it should ever have to compete with other fuels on a level playing ground, it is likely to do poorly.

I would be cautious about buying insurance policies, except for short-term needs such as automobile coverage, homeowners coverage, and term life insurance. If we encounter a period of significant deflation, insurance companies are likely to fail, because bondholders cannot pay their debt. If we run into a period of rapid inflation, the life insurance or long term care coverage you buy may have very little real value when you come to use it.

11. Should I move to a different location?
There are many reasons you might want to consider moving to a different location:

- To find something less expensive. If times are going to be difficult, you do not want to be paying most of your income on a mortgage or rent.
- To be closer to friends or family, in the difficult times ahead.
- To share a house or apartment with friends or family.
- To be closer to work or public transportation.
- To be closer to a type of employment that you believe will have a better chance of continuing in the future.
- To have better fresh water supplies.
- To join a community with similar interests in sustainability.
- To leave a community that you feel may be prone to violence, in time of shortage.

12. We hear a lot about various things we can do to be "green", like buying fluorescent light bulbs. Do these save oil?
Most of the "green" ideas you read about save energy of some kind, but not necessarily oil. Even so, they are still a good idea. If there is a shortage of one type of energy, it tends to affect other types of energy as well. Doing “green” things is also helpful from a global warming perspective.

Here are some green ideas besides using fluorescent light bulbs:

• Move to a smaller house or apartment.

• Insulate your house, and have it professionally sealed to keep out drafts.

• If any rooms are unused, do not heat and cool them.

• Keep your house warmer in summer, and cooler in winter.

• If you no longer need a big refrigerator, buy a smaller one. Be sure it is an "Energy Star" refrigerator.

• If you have more than one refrigerator, get rid of the extra(s). Refrigerators are a big source of energy use. For parties, use ice in a tub.

• Separate freezers are also big energy users. Consider doing without.

• Eat less meat. Also avoid highly processed foods and bottled water. All of these require large amounts of energy for production.

• Get power strips and turn off appliances that drain energy when not in use.

• Turn off lights that are not needed.

• Rewire lights into smaller "banks", so you do not need to light up the whole basement when all you want is light in a small corner.

• Get a clothes line, so you do not need to use your clothes dryer.

• When cooking, use the microwave whenever possible.

• Reduce air travel to a minimum. Air travel results in a *huge* number of miles of travel with corresponding fuel use.

• Recycle whenever you can.

• Eliminate disposables as much as possible (coffee cups, napkins, plastic bags, etc.)

13. Should we be talking to our local government officials about these problems?
Yes! At the local level, there are many changes that would be helpful:

• Laws permitting people to put up clothes lines in their yards.

• Laws encouraging gardens to be grown, even in the front yards of homes.

• Laws permitting multiple occupancy of houses by unrelated individuals.

• New local public transportation plans, particularly ones that do not require large outlay of funds. For example, a plan that is more like a glorified car pool might work.

• Allocation of funds to study the best crops to be grown in the area, and the best cultivation methods, if energy supplies are much lower in the future.

It would also be helpful to make changes at higher levels of government, but these are beyond the scope of the discussion in this chapter.

14. What other resources might we look at to get ideas about what is ahead what we might do now?
The Community Solution is an organization that puts on an annual sustainability conference and issues reports on energy-related solutions.

Global Public Media has a number of talks on relocalization.

Closing the Collapse Gap is a humorous talk by Dmitry Orlov. The Soviet Union collapsed in 1990, and its oil production dropped about that time. Dmitry compares the US situation to that of the USSR.

Rolling Stone has a short summary of The Long Emergency, a book by James Howard Kunstler.

Links by Question:

Q2: Calculate a "walk score" for any neighborhood - Learn about walkable neighborhoods
http://www.walkscore.com/get-score.shtml?street=500+7th+street%2C+arcata...

Q4: Eating Fossil Fuels: Oil, Food, and the Coming Crisis in Agriculture by David Allen Pfeiffer, New Society Publishers, 2006
http://www.amazon.com/Eating-Fossil-Fuels-Coming-Agriculture/dp/08657156...

Q5-1: Rapid Climate Change, American Institute of Physics
http://www.aip.org/history/climate/rapid.htm

Q5-2: Report Card for America's Infrastructure by American Society of Civil Engineers
http://www.asce.org/reportcard/2005/page.cfm?id=92

Q5-3: Earth Policy Institute, Lester Brown President
http://www.earth-policy.org/

Q5-4: Report Card for America's Infrastructure by American Society of Civil Engineers
http://www.asce.org/reportcard/2005/page.cfm?id=92

Q5-5: National Petroleum Council - Hard Truths about America's Energy Supply, 2007
http://downloads.connectlive.com/events/npc071807/pdf-downloads/Facing_H...

Q5-6: Measure of Metal Supply Finds Future Shortage, David Biello, Scientific American, January 17, 2006.
http://www.sciam.com/article.cfm?articleID=000CEA15-3272-13C8-9BFE83414B...

Q5-7: Carmakers Gear Up for the Next Shortage-Platinum, The Mining News, July 6, 2005
http://www.theminingnews.org/news.cfm?newsID=800

Q5-8: Peak Phosphorus by Patrick Dery and Bart Anderson, August 13, 2007
http://www.energybulletin.net/33164.html

Q6: The Power Community: How Cuba Survived Peak Oil, Movie Directed by Faith Morgan, The Community Solution

Q7-1: Life After the Oil Crash
http://www.lifeaftertheoilcrash.net/

Q7-2: What to Do When the Shit Hits the Fan
http://wtdwtshtf.com/

Q8: Global Ecovillage Network
http://gen.ecovillage.org/

Q9-1: Local Harvest directory of local food sources
http://www.localharvest.org/about.jsp

Q9-2: Amaranth, Wikipedia
http://en.wikipedia.org/wiki/Amaranth

Q9-3: Heirloom Seeds
http://www.heirloomseeds.com/

Q9-4: American Rainwater Catchment Systems Association
http://www.arcsa-usa.org/

Q10-1: American Rainwater Catchment Systems Association
http://www.arcsa-usa.org/

Q10-2: Treasury Securities, Wikipedia
http://en.wikipedia.org/wiki/Treasury_security

Q12-1: Southface: Responsible Solutions for Environmental Living
http://www.southface.org/

Q12-2: Energy Star by US Environmental Protection Agency and US Department of Energy
http://www.energystar.gov/

Q14-1: The Community Solution Home Page
http://www.communitysolution.org/index.html

Q14-2: The Community Solution Conference, October 26-28, 2007 Yellow Springs, Ohio
http://www.communitysolution.org/conference.html

Q14-3: The Community Solution Reports
http://www.communitysolution.org/nsreports.html

Q14-4: Closing the Collapse Gap: The Soviet Union Was Better Prepared for Collapse than the US, by Dmitry Orlov, December 4, 2006
http://energybulletin.net/23259.html

Q14-5: Summary of The Long Emergency by James Howard Kunstler, March 24, 2005
http://www.rollingstone.com/news/story/7203633/the_long_emergency.html

Planning for Energy and Climate Uncertainty
Executive Summary

Post Carbon Cities: Planning for Energy and Climate Uncertainty provides guidance and support to local government officials and staff for meeting three critical goals:

- breaking community dependence on oil,

- stopping community contributions to global warming, and

- preparing the community to thrive in a time of energy and climate uncertainty.

The most direct strategy for achieving these goals is to reduce consumption and produce locally: reduce the community's overall consumption, and develop the capacity of local farmers and manufacturers to provide for the community's basic needs. The more your community can get its energy and basic goods from local sources, the less vulnerable it will be to rising and unstable oil prices, and the less it will contribute to climate change.

Energy and climate uncertainty

Most credible observers now recognize that our global climate faces radical change in the coming decades if we do not take immediate and far-reaching action. Peak oil (the coming high point and subsequent decline of world oil production) is not as widely understood, but presents a similarly complex set of challenges.

Time is short to prepare for peak oil and global warming. At current rates of fossil fuel consumption we will most likely pass peak oil by 2010*, and we seriously risk widespread, catastrophic climate change if we do not begin dramatically reducing global carbon emissions.†

The key problem posed by both peak oil and global warming is ultimately one of uncertainty: these phenomena are creating changes in economies and ecosystems at the global, regional and even local levels that we cannot easily predict. For local governments -responsible for managing local public services, planning for future land use and transportation, and protecting the community's economic and social health- this uncertainty creates a wide variety of risks and vulnerabilities. How will local economies be affected if the price of oil exceeds $100 a barrel? How will regional climate shifts affect the local water supply? Local government decision makers need to understand and respond to these challenges.

Incentives to act locally

As many southeastern U.S. municipalities discovered after Hurricane Katrina knocked out regional fuel pipelines in 2005, state/provincial and federal government agencies do not have the ability to meet every jurisdiction's resource needs in times of crisis. Local governments, however, have the flexibility, capacity and motivation to address risk management and emergency response needs in ways that higher-level government agencies cannot.

Local governments have strong financial incentives to address peak oil and climate change. Reducing local oil dependence and carbon emissions means pursuing energy-efficient buildings, locally-controlled energy sources, compact transit-oriented land uses, alternative transportation modes and other aims that are energy prudent, and thus ultimately fiscally conservative. When the challenges created by peak oil and climate change are not future risks but present problems, those communities that have prepared will have distinct advantages over those that haven't.

Local governments are well-positioned to address peak oil and climate change because they have influence over three key areas of urban spatial and economic development:

» **Building construction and energy efficiency.** Through zoning codes, building codes and the permitting process, municipalities can encourage building designs that save energy and resources.

» **Local land use and transportation patterns.** Municipal land use and transportation planning decisions directly influence whether people and businesses will have mobility choices that allow them to save energy and money.

» **Local economic activity.** Municipal economic development initiatives are opportunities to encourage development in low-energy, zero-carbon directions, by both incentive and example.

What local governments can do

The challenge for local governments is not to predict the future, but to plan for the future using appropriate tools and accurate information. Local governments should take a three-pronged approach to addressing energy and climate uncertainty:

» **Identify local vulnerabilities** based on a careful analysis of the potential impacts of peak oil and global warming on the community.

» **Mitigate local vulnerabilities**, and contribute to national and global efforts to limit the damage from peak oil and climate change.

» **Plan for long-term changes** that cannot be avoided, minimizing the disruptions they will cause and taking advantage of the opportunities they will offer.

Over the last fifteen years, hundreds of local governments in the U.S. and Canada have begun systematically reducing their greenhouse gas emissions in response to global warming. Since 2004, when oil prices climbed beyond 15-year highs, a number of local and regional government agencies in both countries have also begun responding to the threats posed by peak oil.

Drawing from the experiences and examples of these early actors -as well as from consultations with dozens of elected officials, managers, planners, architects, scientists and scholars- here are four initial steps that your own city can take in response to energy and climate uncertainty:

1. Sign the Mayors Climate Protection Agreement (U.S.) and/or endorse the World Mayors and Municipal Leaders Declaration on Climate Change. For U.S. mayors, signing the Agreement commits your city to "meet or beat" Kyoto Protocol targets for greenhouse gas reduction, in the absence of federal leadership. Both U.S. and Canadian cities can also contribute to international carbon mitigation efforts by signing the Declaration.
See www.coolmayors.com and www.iclei.org/montrealsummit.

2. Join ICLEI's Cities for Climate Protection Campaign to get your city started on reducing energy use and greenhouse gas emissions, and to connect to the resources and expertise of the leading global movement of local governments working on climate change.
See www.iclei.org.

3. Sign the Oil Depletion Protocol, which sets a target for reducing oil consumption across your community. Signing the Protocol sends a signal to citizens, business leaders and municipal staff that your city is serious about reducing its energy vulnerability. It also makes you part of an international effort to dampen the effects of peak oil.
See www.oildepletionprotocol.org.

4. Establish a Peak Oil Task Force to quickly identify the challenges and vulnerabilities your community faces as a result of peak oil. A task force is also a valuable way to introduce businesses, citizens and other community stakeholders to the challenges of energy uncertainty, and engage them in developing a broad-based community response
See Section 6.2, "Guide to establishing a peak oil task force."

Also drawing from these examples and consultations, here are five principles to integrate into your local government's ongoing decision-making and long-range planning processes:

1. Deal with transportation and land use (or you may as well stop now).
Fundamentally rethink your municipality's land use and transportation practices, from building and zoning codes to long-range planning. Make land use and transportation infrastructure decisions with 100-year timeframes. Organize with neighboring jurisdictions to address the land use and transportation challenges of energy and climate uncertainty at a regional level.

2. Tackle private energy consumption.
Use the tools you already have to encourage serious energy conservation and efficiency in the private sector. Engage the business community aggressively, challenging your local business leaders to reinvent the local economy for the post-carbon world.

3. Attack the problems piece-by-piece and from many angles.
Meet your energy and climate uncertainty response goals with multiple, proven solutions, pursuing many different kinds of solutions at different scales. Enlist the entire community, setting clear community goals and spurring action from all sides to meet them.

4. Plan for fundamental changes...and make fundamental changes happen.
Educate and involve your fellow elected officials, staff and community stakeholders about the challenges of energy and climate uncertainty, and challenge them to come up with serious solutions. Lead your city's transition by integrating peak oil and climate change considerations in your own decisions.

5. Build a sense of community. In short, do anything you can to get people talking with each other, forming relationships, and investing themselves in the larger community.

Next steps

The Post Carbon Cities network is a resource for everyone who works with or for local governments. Our website at www.postcarboncities.net provides news feeds and special features, resources for policymakers and planners, and a forum where elected officials, municipal staff and others can share and discuss their common problems, challenges, best practices and lessons learned.

We welcome your participation in this dialog; we can all learn much more, much faster, by sharing our successes and our failures, building an ever-richer knowledge base. Please visit us online and join the growing movement of municipal leaders who are preparing their communities for the challenges of energy and climate uncertainty.

ENDNOTES

** According to an increasing number of petroleum analysts, we seem to be facing an undulating plateau of world oil production from 2007 onward, with permanent decline likely underway by 2010. See page 12 of the Guidebook.*

† In 2006 James Hansen, director of NASA's Goddard Institute for Space Studies, publicly called for immediate, broad-based action to reduce carbon emissions, saying "we have a very brief window of opportunity to deal with climate change...no longer than a decade, at the most."

Transition Initiatives Primer

- becoming a Transition Town, City, District, Village, Community or even Island

by Ben Brangwyn and Rob Hopkins

Version: 26

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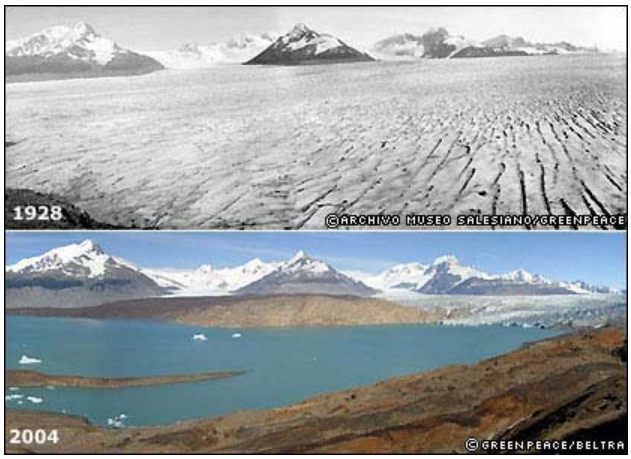
NOTE: this document is updated frequently. Your version may be out of date. Email benbrangwyn@transitionnetwork.org for the latest version.

Table of contents

Significant updates history

Version	Date	Updates
2-11	to 4-May-07	• Archived
12	11-May-07	• Added "Movies for raising awareness" section
15	24-May-07	• Added "Money as Debt" to movie section
16	19-Jun-07	• Expanded the criteria following discussion with funders and trustees
17	26-Jun-07	• Expanded the list of movies to include those that reconnect us to nature • Added Local Government section
18	27-Jun-07	• Removed post petroleum disorder section
19	30-Jun-07	• Added business section • Updated list of existing Transition Initiatives
20	4-Jul-07	• Added introduction to "Taking Action" section
21	14-Aug-07	• Added section on Transition Model (p 9) • Added inclusivity in the checklist (p 13) • Added "scale" to the checklist (p 13) • Added link to 12 Steps videos on YouTube (p 21) • Added section "Wider context of Transition" (p 21) • Added "Crude Awakening" and "The Great Warming" to movies (p 30) • Version 21a – added explanation to the criteria
22	20-Sep-07	• Added Andrew McNamara quote (p 6) • Updated criteria (p 13) • Added "Setting up your Transition Initiative"– different types (p 14) • Added " Questions of leadership and structure" (p 25) • 22a – amended criteria re doing training in Totnes/UK
23 23a 23b	5-Nov-07	• Added section on different types of organisations and constitutions (p 16) • Minor changes to Transition Model • Updated the section "Create your Energy Descent Action Plan" (p 26) • 23a – added "resilience indicators" and explanation (p 26) • 23b – updated licensing arrangements for Incovenient Truth (p 41)
24	29-Nov-07	• Added criteria for "regional hubs" in section on different type of initiatives, (p 14)
25	10-Jan-08	• Added points to section on organisations and constitutions (p16) • Added movies: "What A Way To Go" and "Message in the Waves" - the movie that inspired Modbury to go plastic bag free • Updated (simplified) the EDAP section, adding flow chart for explanation (p 28)
26	23-Apr-08	• Updated Escape from Suburbia in movies section (p 44) • Updated section on Local Transition Hubs (p 15) • Added UN Declaration of Human Rights to criteria and notes re constitutions (p 13)



Upsala Glacier, Argentina, once the biggest in South America – 1928 and 2004

Introduction

In response to the twin pressures of Peak Oil and Climate Change, some pioneering communities in the UK, Ireland and beyond are taking an integrated and inclusive approach to reduce their carbon footprint and increase their ability to withstand the fundamental shift that will accompany Peak Oil.

This document provides an overview of these initiatives for transitioning to a lower energy future and to greater levels of community resilience.

This document comes to you from the Transition Network, a charity recently formed to build upon the groundbreaking work done by Kinsale, Totnes and the other early adopters of the Transition model.

Our mission is to inspire, inform, support, network and train communities as they consider, adopt and implement a Transition Initiative. We're building a range of materials, training courses, events, tools & techniques, resources and a general support capability to help these communities.

It's early days, so we have a long way to go. But we understand how massive the task is, and we're giving it everything we've got. Recent funding from Tudor Trust has given us a firm foundation for our work.

Why Transition initiatives are necessary

The two toughest challenges facing humankind at the start of this 21st century are Climate Change and Peak Oil. The former is well documented and very visible in the media. Peak Oil, however, remains under the radar for most people. Yet Peak Oil, heralding the era of ever-declining fossil fuel availability, may well challenge the economic and social stability that is essential if we are to mitigate the threats posed by Climate Change.

The transition initiatives currently in progress in the UK

and beyond represent the most promising way of engaging people and communities to take the far-reaching actions that are required to mitigate the effects of Peak Oil and Climate Change.

Furthermore, these relocalisation efforts are designed to result in a life that is more fulfilling, more socially connected and more equitable.

More about Peak Oil

You may not have encountered the principles of Peak Oil in the media. Don't let that lull you into a false sense of security. There was a time when Climate Change suffered the same lack of exposure.

Peak Oil is not about "running out of oil" – we'll never run out of oil. There will always be oil left in the ground because either it's too hard to reach or it takes too much energy to extract. Ponder on a fact that the economists conveniently gloss over – regardless of how much money you can make selling oil, once it takes an oil barrel's worth of energy to extract a barrel of oil, the exploration, the drilling and the pumping will grind to a halt.

Peak Oil is about the end of cheap and plentiful oil, the recognition that the ever increasing volumes of oil being pumped into our economies will peak and then inexorably decline. It's about understanding how our industrial way of life is absolutely dependent on this ever-increasing supply of cheap oil.

From the start of the 1900s, plentiful oil allowed a coal-based industrialised society to massively accelerate its "development". From that time, each year there has been more oil (apart from the two oil shocks in the 1970s when Middle East crises caused worldwide recessions). And each year, society increased its complexity, its mechanisation, its globalised connectedness and its energy consumption levels.

The problems start when we've extracted around half of the recoverable oil. At this point, the oil gets more expensive (in cash and energy terms) to extract, is slower flowing and of a lower quality. At this point, for the first time in history, we aren't able to increase the amount of oil that's coming out of the ground, being refined and reaching the market.

At this point, oil supply plateaus and then declines, with massive ramifications for industrialised societies. Very few people are paying attention to this phenomenon, and it's easy to understand why.

The misleading petrol tank analogy

Most of us have experienced running out of petrol at some time while driving, and this can subtly misinform our expectations around oil depletion.

The pattern is simple. Your car runs smoothly as you use up the petrol, right until the last fraction of a litre – when it's about 97% empty. That's the only time you start to feel the impact of your "petrol depletion". The car starts juddering and spluttering, letting you know that you'd better act fast otherwise it'll come to a sudden standstill.

This pattern means we can ignore the petrol gauge until very late in the depletion cycle.

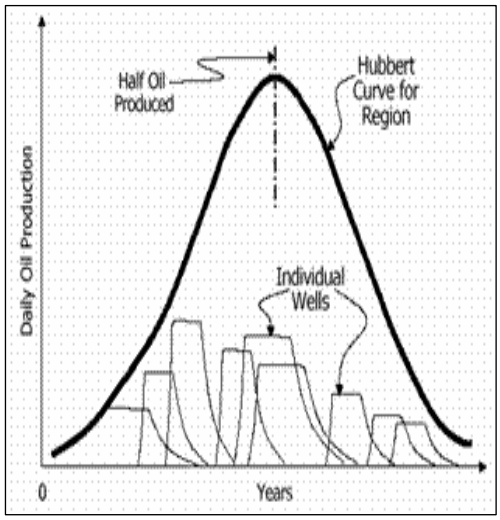
However, the way oil depletion affects industrial society couldn't be more different. The key point isn't when you're close to running out of oil. It's when the "tank" is half full (or half empty). Here's why…

Back to Peak Oil

Peak Oil recognises that we are not close to running out of oil. However, we are close to running out of easy-to-get, cheap oil. Very close. That means we're about to go into energy decline – that extended period when, year on year, we have decreasing amounts of oil to fuel our industrialised way of life.

The key concepts and implications of this are as follows:

- of all the fossil fuels, oil is uniquely energy dense and easy to transport.
- ever-increasing amounts of oil have fuelled the growth of industrial economies.
- all the key elements of industrial societies - transportation, manufacturing, food production, home heating, construction - are totally reliant on oil.
- understanding the depletion pattern of oil fields is crucial. There is a consistent pattern to the rate of extraction of oil - and this applies to individual fields, to an oil region, to a country and indeed to the entire planet - namely, the first half of the oil is easy to extract and high quality. However, once about half the recoverable oil has been pumped out, further extraction starts getting more expensive, slower, more energy intensive and the oil is of a lower quality.



- this pattern means that the flow of oil to the market, which has been steadily increasing over the past 150 years, will peak. After that, every successive year will see an ever-diminishing flow of oil, as well as an increasing risk of interruptions to supply.
- a growing body of independent oil experts and oil geologists have calculated that the peak will occur between 2006 and 2012 (a few years of hindsight is required in order to confirm the peaking point).
- technological advances in oil extraction and prospecting will have only a minor effect on depletion rates. As an example, when the US (lower 48) hit their oil production peak in 1972, the rate of depletion over the next decades was high, despite a significant wave of technological innovations.

It's difficult to overstate what this means to our lives in the developed countries.

To understand the degree to which this will affect the industrial world, here is the opening paragraph of executive summary of a report prepared for the US government in 2005 by an agency of experts in risk management and oil analysis:

> "The peaking of world oil production presents the U.S. and the world with an unprecedented risk management problem. As peaking is approached, liquid fuel prices and price volatility will increase dramatically, and, without timely mitigation, the economic, social, and political costs will be

> unprecedented. Viable mitigation options exist on both the supply and demand sides, but to have substantial impact, they must be initiated more than a decade in advance of peaking."
> *Peaking of World Oil Production: Impacts, Mitigation & Risk Management. Robert L. Hirsch, SAIC*

This report only came to light after being buried by the US administration for close to a year. A perusal of the far-reaching implications of the report give a clear indication why the government was so keen to keep it out of the public domain.

Despite the denial by governments, their agencies and oil companies that there is a problem, both Chevron and Total have both admitted that we're at the end of the era of cheap oil.

Jeremy Gilbert, former Chief Petroleum Engineer at BP, in May 2007 said the following:

> "I expect to see a peak sometime before 2015… and decline rates at 4-8% per year" (May-2007)

Several US senators, principally Republican Roscoe Bartlett, are raising the issue in the upper house.

In New Zealand, Jeanette Fitzsimmons, co-leader of the Green Party, is raising awareness about the threats of Peak Oil. In 2006, Helen Clark, the Prime Minister of New Zealand said this:

> "…oil price is very high because probably we're not too far short from peak production if we're not already there."

In Australia, the MP Andrew McNamara heading up the Queensland Oil Vulnerability Task force. He is now Queensland's newly appointed Minister for Sustainability, Climate Change Ahead of the impending public release of his government-commissioned report on "Queensland's Vulnerability to Oil Prices", he talks about the importance of relocalisation in the face of oil depletion:

> "There's no question whatsoever that community driven local solutions will be essential. That's where government will certainly have a role to play in assisting and encouraging local networks, who can assist with local supplies of food and fuel and water and jobs and the things we need from shops. It was one of my contentions in the first speech I made on this issue in February of 2005... that we will see a relocalisation of the way in which we live that will remind us of not last century, but the one before that. And that's not a bad thing. Undoubtedly one of the cheaper responses that will be very effective is promoting local consumption, local production, local distribution. And there are positive spin offs to that in terms of getting to know our communities better. There are human and community benefits from local networks that I look forward to seeing grow."
> *The Honourable Andrew McNamara, Queensland Minister for Sustainability, Climate Change and Innovation*

But apart from a few notable exceptions, national leaders are not stepping up to address these problems in any meaningful way. Yet.

So if the political leaders aren't going to fix the problem, what is?

Technology is often touted as the panacea for Peak Oil and Climate Change problems. However, a careful review of the reality of these technological solutions indicates their immaturity, their often disastrous environmental consequences and their lack of connection to the real world.

We could dither about, waiting for technology or governments to solve the problem for us. However, general consensus now appears to be that this is a rather high risk option.

It's up to us in our local communities to step up into a leadership position on this.

We have to get busy NOW to mitigate the effects of Peak Oil. The good news is that many of the solutions and mitigations for Climate Change will also address the threats from Peak Oil - and vice versa.

Taking action: the big picture - initiatives at global, national and local levels

Transition Initiatives exemplify the principle of thinking globally, acting locally. However, it's easy to wonder just how much difference you might make in your own community when the problems are so gigantic.

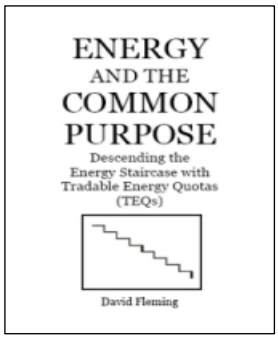
Well, first of all, even before you count the difference you're making in your community, remember that whenever you do this kind of work, you're inspiring other people. And then they take up the challenge and inspire others, And so it goes on. This way, your small contribution can multiply many many times over and be truly significant.

It's also good to know that there are schemes in place that are addressing the challenges of Peak Oil and Climate Change at the global and national levels. Transition Initiatives complement these schemes by making sure that the changes they demand in the way we live our day-to-day lives can actually be put into practice at ground level.

Here are the principle ones:

Global

- the Oil Depletion Protocol provides a way for nations to cooperatively manage their descent to lower oil use levels. This protocol provides a model for both oil producing and oil consuming countries to systematically reduce global oil consumption. For further information, go to www.oildepletionprotocol.org.
- Contraction & Convergence offers a mechanism for reducing global carbon emissions and establishing much greater levels of equity in peoples' and nations' right to emit carbon. An excellent resource for this scheme is http://www.climatejustice.org.uk/about/



National: energy rationing systems appear to hold the greatest promise for reducing our fossil fuel consumption at the national level. The government is already tentatively talking about this highly practical solution. See www.teqs.net for the full story.

Local: this is where local Transition Initiatives play a significant role. In essence, this is a process of relocalising all essential elements that a community needs to sustain itself and thrive. It builds local resilience in the face of the potentially damaging effects of Peak Oil

while dramatically reducing the community's carbon footprint. In this way, it addresses both Peak Oil and Climate Change.

Several cities in the US and well over 100 communities around the world are setting off on their own relocalisation journeys. For example, at the city level, Portland in Oregon (population 550,000) has just published their Peak Oil initial report for public consultation. Their opening paragraph explains their concerns:

> "In the past few years, powerful evidence has emerged that casts doubt on that assumption [that oil and natural gas will remain plentiful and affordable] and suggests that global production of both oil and natural gas is likely to reach its historic peak soon. This phenomenon is referred to as “Peak Oil.” Given both the continuous rise in global demand for these products and the fundamental role they play in all levels of social, economic and geopolitical activities, the consequences of such an event are enormous."

Portland has actually incorporated the Oil Depletion Protocol in its targets - it aims to reduce its oil and gas consumption by 2.6% per year, reaching a 25% reduction by 2020.

Here in the UK, a growing number of communities are looking towards the energy descent planning work that began in Kinsale in Ireland and is continuing in Totnes in Devon.

There are many excellent examples of energy reduction programmes in place in the UK under the "sustainability" banner. However, it's only when sustainability principles are combined with an understanding of Climate Change and Peak Oil that a fully integrated approach to the solutions can follow.

The Transition Model – what exactly is it?

The Transition Model is a loose set of realworld principles and practices that have been built up over time though experimentation and observation of communities as they drive forward to build local resilience and reduce carbon emissions.

There's more detail on each of these points elsewhere in the Primer, but for the moment, it might help to have the various elements outlined here.

Underlying awareness

Underpinning the Transition Model is a recognition of the following:

- Climate Change and Peak Oil require urgent action
- life with less energy is inevitable and it is better to plan for it than be taken by surprise
- industrial society has lost the resilience to be able to cope with energy shocks
- we have to act together and we have to act now
- regarding the world economy and the consumptive patterns within it, as long as the laws of physics apply, infinite growth within a finite system (such as planet earth) simply isn't possible.
- we demonstrated phenomenal levels of ingenuity and intelligence as we raced up the energy curve over the last 150 years, and there's no reason why we can't use those qualities, and more, as we negotiate our way down from the peak of the energy mountain

- if we plan and act early enough, and use our creativity and cooperation to unleash the genius within our local communities, then we can build a future that could be far more fulfilling and enriching, more connected and more gentle on the earth than the lifestyles we have today.

The 7 "Buts"

When faced with the prospect of difficult change and challenging actions, humans will construct their own emotional and psychological barriers that stop them taking those actions. The "7 Buts" name and dismantle what we've seen to be the most typical barriers to change.

The 12 Steps to Transition

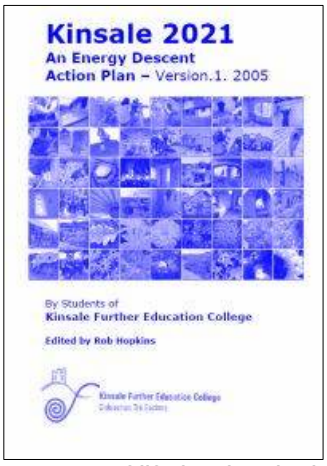
These are the areas that we've observed as being critical so far in Transition Initiatives. Communities are adopting these steps, adapting and reordering as they see fit.

It's not a prescriptive "must-do" list, it's what we've seen working through close scrutiny and being in Transition Initiatives ourselves. In time it will certainly change as we learn more about how communities can most effectively tackle the challenges of climate change and peak oil.

Transition Network

The Transition Network's role is to accelerate change through inspiring, encouraging, supporting, networking and training communities as they consider and then implement their version of the model.

Kinsale 2021 – an Energy Descent Action Plan



The first draft of the Kinsale Energy Descent Action Plan (EDAP) was completed in 2005. It sets out how Kinsale, an Irish town in West Cork of about 7,000 people, could make the transition from a high energy consumption town to a low energy one in response to the challenge of the impending peaking of world oil production.

This report, prepared by permaculture students from Kinsale Further Education College under the tutelage of Rob Hopkins, looks at how Kinsale could navigate this uncertain time by setting out a clear vision of a lower energy future, and then identifying a clear timetable for achieving it.

These efforts were one of the first attempts at this kind of project anywhere in the world. The report looks at most aspects of life in Kinsale, including food, energy, tourism, education and health. The report was also structured in such a way to enable other communities and towns to adopt a similar process and transition themselves towards a lower energy future.

The EDAP was awarded the Cork Environmental Forum's prestigious 2005 Roll of Honour Award and, even more importantly, was formally adopted in a unanimous vote by Kinsale's town council at the end of 2005.

It's worth remembering that this was a student project, working with a completely new approach. There's much work to be done to turn it into a lasting project with deep roots within the community, but it's a great start.

The lessons learned at Kinsale have resulted in the 12 steps, featuring later in this document.

The document can be downloaded here:
http://transitionculture.org/wp-content/uploads/members/KinsaleEnergyDescentActionPlan.pdf.

Transition Town Totnes

Transition Town Totnes was initiated by Rob Hopkins to address the twin challenge of Peak Oil and Climate Change. The initiative builds on Rob's seminal work in Ireland to develop an Energy Descent Action plan for the town of Kinsale.

Transition Town Totnes (TTT) is the UK's first "Transition Town" and draws on the collective genius of the local community to build resilience through a process of relocalising, where feasible, all aspects of life.

The thinking behind TTT is simply that a town using much less energy and resources than currently consumed could, if properly planned for and designed, be more resilient, more abundant and more pleasurable that the present.

Given the likely disruptions ahead resulting from Peak Oil and Climate Change, a resilient community - a community that is self-reliant for the greatest possible number of its needs - will be infinitely better prepared than existing communities with their total dependence on heavily globalised systems for food, energy, transportation, health and housing.

Through 2007, the project will continue to develop an Energy Descent Action Plan for Totnes, designing a positive timetabled way down from the oil peak. TTT strives to be inclusive, imaginative, practical and fun.

The TTT project started in late 2005 with an intensive programme of awareness raising on the issues of Peak Oil and Climate Change. When the population had been sufficiently primed, the project was kicked off with a "Official Unleashing of Transition Town Totnes" in September 2006, attended by 350 in the Town Hall. Since then, in an ever-expanding range of presentations, training courses, meetings, seminars, interviews, documents, blogs and downright hard work, the initiative has captured the imagination of the town and is progressing well.

Here's a rundown of the events, screenings, workshops etc so far (as at Jun-07):

- film screenings: 8 (with audiences up to 150)
- keynote presentations: 7 (with audiences up to 350) including such experts as:
    - Richard Heinberg (www.richardheinberg.com)
    - Aubrey Meyer (Contraction & Convergence - http://en.wikipedia.org/wiki/Contraction_and_Convergence)
    - David Fleming (www.teqs.net)

    - Mayer Hillman (Climate Change author and activist)
    - "Food and Farming in Transition", a sell-out evening at Dartington Hall, featuring Chris Skrebowski, Jeremy Leggett, Patrick Holden and Vandana Shiva

- events: 7 (with audiences up to 400), including:
    - the "Great Unleashing of Transition Town Totnes"
    - open space meetings for Food, Energy, Heart & Soul and Housing
    - "Seedy Sunday" seed sharing event
    - Local council "open space" meeting at Schumacher college
    - "Estates in Transition", a day long seminar for local landowners to evaluate their opportunities in a more localised scenario
- training courses: 10-week "Skilling Up for Powerdown" evening classes
- workshops: Oil Vulnerability Auditing (with 3 local businesses signed up to receive this service)
- resources: Local food directory
- Solar Hot Water challenge: getting 50 people to sign up for the programme
- pilot projects: Local currency (Totnes pounds, accepted by 20 local businesses)), now being launched as a larger scheme following the successful pilot, with a printing of 10,000 notes and with over 65 businesses taking part
- Oral history archives: gathering data from people who lived when everyone had a lower energy lifestyle
- Nut Tree Capital of Britain: first plantings have started
- Transition Stories: working with local schoolkids to get them thinking about a lower energy lifestyle
- Garden Swap: connecting people who are too old to work their gardens to people who don't have a garden but want to work in one

The programme of activities and events continues at a similar pace into Summer 2007.

In addition to the above activities, ten working groups are meeting regularly to investigate lower energy and more resilient solutions for these areas: Energy, Healthcare, Food, The Arts, Heart and Soul - the psychology of change, Local Government, Economics and Livelihoods. Further groups are in the process of starting up to round out this holistic approach to building the community resilience plan for Totnes.

The up-to-date situation can be viewed at either www.transitionculture.org (Rob Hopkins' personal blog) or www.transitiontowns.org/Totnes.

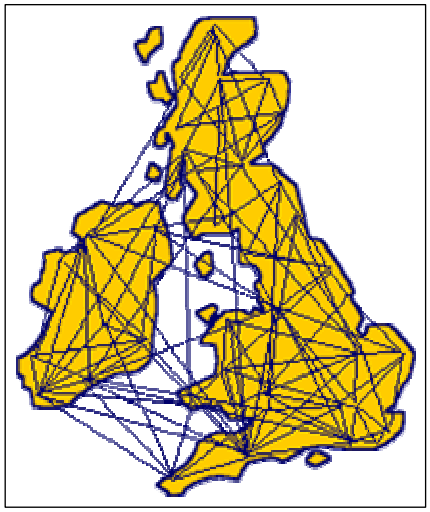
Other Transition initiatives

Here's a list of all the communities in the UK have officially adopted the Transition Model to increase their local resilience and reduce their carbon footprint (list current as at Nov-07).

This list is in the order of adoption.

- Totnes, UK - population: 8,500

- Kinsale, Ireland - population: 2,300
- Penwith, (West Cornwall district) - population: 64,000
- Ivybridge, UK - population 12,000
- Falmouth, UK - population: 20,000
- Moretonhampstead, UK - population: 1,500
- Lewes, UK - population: 16,000
- Stroud, UK - population: 12,000
- Ashburton, UK - population: 3,500
- Ottery St. Mary, UK - population: 7,500
- Bristol, UK - population: 400,000
- Brixton, UK - population: 65,000
- Forest Row, UK - population: 5,500
- Mayfield, UK - population: 2,500
- Glastonbury, UK - population: 9,000
- Lostwithiel, UK - population: 2,700
- Forest of Dean, UK - population: 80,000
- Nottingham, UK - population: 280,000
- Wrington, UK - population: 2,000
- Brighton&Hove, UK – population: 250,000
- Portobello, Edinburgh, UK – population: 10,000
- Market Harborough, UK – population: 20,000
- Sunshine Coast, Australia – population: 260,000
- West Kirby, UK – population: 13,000
- Llandeilo, Wales
- Bro Ddyfi, Wales
- Whitstable, England
- Marsden & Slaithwaite, England
- Frome, England
- Brampton, England
- Isle of Wight, England
- Waiheke Island, New Zealand
- Orewa, New Zealand
- Dunbar, Scotland
- Rhayader, Wales
- Seaton, England
- Bath, England
- Exeter, England
- Isle of Man
- Canterbury, England
- Kapiti District, New Zealand
- Carbon Neutral Biggar, a Transition Town, Scotland



- Presteigne, Wales
- Wolverton, England
- Leicester, England
- Holywood, Northern Ireland
- Westcliff-on-Sea, England
- Isles of Scilly, England
- Liverpool South, England
- Norwich, England

There are many other communities in contact with us regarding setting up their own Transition initiative. They appear on the following web page:

http://transitiontowns.org/TransitionNetwork/Mulling

We're expecting many of them, and more, to appear on this list of officially designated transition initiatives over the coming years.

As be build a critical mass of communities embarking on these energy descent planning processes, we'll be able to build a thriving cooperative network where people are sharing best practice, helping each other and creating a way of life that is far better than the atomised, disconnected unsustainable and inequitable society that we've grown into, largely on the back of super-abundant cheap oil.

Setting up your Transition Initiative – criteria

We've established a draft set of criteria that tells us how ready a community is to embark on this journey to a lower energy future. If you're thinking of adopting the Transition model for your community, take a look at this list and make an honest appraisal of where you are on these points. If there are any gaps, it should give you something to focus on while you build the initial energy and contacts around this initiative.

We've introduced this slightly more formal approach to registering Transition Towns/villages for several key reasons:

- Our trustees and funders want to make sure that while we actively nurture embryonic projects, we only promote to "official" status those communities we feel are ready to move into the awareness raising stage. This status confers additional levels of support such as speakers, trainings, wiki and forums that we're currently rolling out
- In order to establish coordinated programmes (such as combined funding bids to the National Lottery) we need a formally established category of Transition Initiatives that we're fully confident can support and deliver against such programmes.
- We've seen at least one community stall because they didn't have the right mindset or a suitable group of people, and didn't really understand what they were letting themselves in for.
- The distinct roles of "Local Transition Initiative", "Local Transition Hub" and "Temporary Initiating Hub" are very different and need to be discussed at the outset (see below).

Criteria

These criteria are developing all the time, and certainly aren't written in stone.

1. an understanding of Peak Oil and Climate Change as twin drivers (to be written into your group's constitution or governing documents)
2. a group of 4-5 people willing to step into leadership roles (not just the boundless enthusiasm of a single person)
3. at least two people from the core team willing to attend an initial two day training course. Initially these will be in Totnes and over time we'll roll them out to other areas as well, including internationally. Transition Training is just UK based right now, but that's going to have to change – we're working on it.
4. a potentially strong connection to the local council
5. an initial understanding of the 12 steps (see below)
6. a commitment to ask for help when needed
7. a commitment to regularly update your Transition Initiative web presence - either the wiki (collaborative workspace on the web that we'll make available to you), or your own website
8. a commitment to write up something on the Transition Towns blog once every couple of months (the world will be watching...)
9. a commitment, once you're into the Transition, for your group to give at least two presentations to other communities (in the vicinity) that are considering embarking on this journey – a sort of "here's what we did" or "here's how it was for us" talk
10. a commitment to network with other communities in Transition
11. minimal conflicts of interests in the core team
12. a commitment to work with the Transition Network re grant applications for funding from national grant giving bodies. Your own local trusts are yours to deal with as appropriate.
13. a commitment to strive for inclusivity across your entire initiative. We're aware that we need to strengthen this point in response to concerns about extreme political groups becoming involved in transition initiatives. One way of doing this is for your core group to explicitly state their support the UN Declaration of Human Rights (General Assembly resolution 217 A (III) of 10 December 1948). You could add this to your constitution (when finalised) so that extreme political groups that have discrimination as a key value cannot participate in the decision-making bodies within your transition initiative. There may be more elegant ways of handling this requirement, and there's a group within the network looking at how that might be done.
14. a recognition that although your entire county or district may need to go through transition, the first place for you to start is in your local community. It may be that eventually the number of transitioning communities in your area warrant some central group to help provide local support, but this will emerge over time, rather than be imposed. This point is in response to the several instances of people rushing off to transition their entire county/region rather than their local community.

    In exceptional situations where a coordinating hub or initiating hub needs to be set up (currently Bristol, Forest of Dean, Brighton&Hove) that hub is

responsible for making sure these criteria are applied to all the initiatives that start within their area. Further responsibilities for ongoing support and possibly training are emerging as we see this role develop.

Further criteria apply to initiating/coordinating hubs – these can be discussed person to person.

15. and finally, we recommend that at least one person on the core team should have attended a permaculture design course... it really does seem to make a difference

Once you can demonstrate to us at Transition Network that you're on board with these and ready to set off on your transition journey, you open the door to all sorts of wonderful support, guidance, materials, webspace, training, networking opportunities and coordinated funding initiatives that we'll be rolling out during 2007 and beyond.

The door is ready to open... contact details are at the end of this document.

Setting up your Transition Initiative – different types

There now appear to be four types of initiatives emerging within the Transition Model:

1. the "**Local Transition Initiative**" - embedded in its own locale where the steering group inspires and organises the local community. This is the real heart of "Transition".
2. the "**Local Transition Hub**" - based within a large congruent/contiguous area with its own identity (eg a city). Helps establish and support "**local transition initiatives**".
3. the "**Temporary Initiating Hub**" - made up of a collection of acquainted individuals work with eachother to help set up "**local transition initiatives**" in their home communities. As the initiatives arise, the hub gradually disbands.
4. the "**Regional Coordinating Hub**" – less of an organisation, more of a collection of existing transition initiatives that get together for mutual support and coordination around activities such as sharing resources and representing a united front to various government bodies.

More about the "Local Transition Initiative"

This is the most frequent and simple initiative, typically with communities of up to 15,000 people. Examples of this include Totnes, Lewes, Wrington, Portobello in Edinburgh.

This is where real change happens - at the local level, driven by the people living there. Without active local initiatives, there is no Transition Network.

More about the "Local Transition Hub"

Once it is fully established (and hopefully funded), this group's role will be to fire up transition initiatives in its designated “Locale” (ie surrounding area) and maintain a role of inspiring, encouraging, registering, supporting, networking and possibly training those

initiatives. The process of building that role will take time, and newly formed groups (and those operating without funding) can't be expected to perform all those tasks right from the start.

We envisage that the relationship between the Hub and the initiatives in the Locale will be mutually supportive and, at least initially, informal. We're hoping that within the Locale, the various initiatives will also network vigorously together and become mutually supportive, recognising that a community is only as resilient as its neighbours.

As we're in the very early days of this massive transition experiment, these roles and models are likely to evolve as experience shows us what works and what doesn't.

Current examples of **Local Transition Hubs** include Bristol and Forest of Dean.

The **Local Transition Hub** is also responsible for carrying out the "transition network" role in the Locale of making sure that each initiative works on the baseline Transition criteria right from the outset. As individual initiatives within the Locale mature, the Hub will encourage them to apply to the Transition Network for consideration as an official transition initiative. Over time, we expect the task of "registering" communities to official status will be taken up by the Local Transition Hub.

The Local Transition Hub will be a focus for communications with the local initiatives in that area.

If a group wants to take the role of a **Local Transition Hub**, then we at the Transition Network need to be really confident that you know what you're letting yourself in for and that you're going to be able to handle it. This'll probably involve a number of conversations, and probably a face to face discussion with the team.

We're planning to set up a "**Local Transition Hub**" community to discuss the complexities of this approach - and there are many.

We think this **Local Transition Hub** model is crucial for the cities, and larger scale rural initiatives, but the early adopters are going to have to carefully feel their way into this role. It's virgin territory and by no means a trivial undertaking... proceed with caution.

More about the "Temporary Initiating Hub"

This type of group is made up of a collection of individuals/groups from separate locales in the same region who are accustomed to working with each other in some kind of activist/environmental capacity.

The group helps each other to fire up Local Transition Initiatives in the region and then dissolves, with the original members moving into their own Local Transition Initiatives once they've achieved some critical mass to form a local steering group.

The role of the **Temporary Initiating Hub** is simply to handle the inspirational work with no ongoing responsibilities as a hub.

West Berkshire and a couple of others are taking this approach. In this scenario, the local initiatives, once they've started up, will look to the Transition Network for support training etc.

More about the role of the "Regional Transition Hub"

It's clear that we'll need to have some sort of structure that is able to engage with government at all levels – local, regional and national.

This recognition has partly driven the formation of several groups that intended to represent existing and future transition initiatives in their "catchment area".

Through observing this phenomenon and seeing what works well and what doesn't, and after discussing the situation with various transition initiatives, Transition Network is introducing a very brief set of criteria for this type of group.

> "Transition Network will only recognise organisations representing collections of transition initiatives if:
>
> - they have been requested by or emerged/arisen from a significant proportion of active Transition Initiatives (both official and embryonic) within that "catchment area", **and**
> - they are organised/run/coordinated by representatives appointed from within active Transition Initiatives (both official and embryonic) from within that "catchment area".
>
> Other criteria regarding purpose and scope of activities will emerge as these coordinating hubs form."

These criteria would, we feel, produce a demonstrably authentic, mandated, accountable, transparent, knowledgeable and suitably motivated supra-group.

Conclusion

As ever, we're dealing with a moving feast, and no doubt we'll need to keep a close eye on the field and respond in ways that helps the core groups – the local transition initiatives – achieve their key objectives.

Setting up your Transition Initiative – formal structures and constitutions

A key question arises early on in an initiative, namely, "what form should this group/organisation take?"

> (**Author note**: This is almost certainly the dullest section of this document. It was a complete pain to write up because of the impenetrable jargon I encountered within the even more impenetrable websites, replete with convoluted rules and exceptions.
>
> So, if you're just about to read this section – beware! Unless you're full of energy and enthusiasm, I guarantee that within 5 minutes that plate of biscuits will have fallen from your lap onto the floor and you'll be away in transition dreamland.)

There are many options for creating an organisation, each with differing requirements and attributes. To simplify matters, we're only going to discuss the not-for-profit or social enterprise options. Please note that this section relates to the UK, and certain elements will not apply to other countries (including Scotland).

The key options are:

- Unincorporated Association (not registered with Charity Commission or anywhere else)
- Charity (all the following are registered with Charity Commission)
    - Unincorporated Association
    - Trust
    - Company limited by guarantee (also registered at Companies House)
    - Charitable Incorporated Organisation (only available Spring 2008)
- Community Interest Company
- Workers co-operative
    - Unincorporated
    - Industrial & Provident Society (registered with the Registry of Friendly Societies)
    - Company Limited by Guarantee (registered with Companies House)

The following table describes each in more detail, listing the advantages and disadvantages. Another table follows this one discussing constitutions and "governing documents".

Type	Main attributes	How to set it up	Notes
Unincorporated Association (non-charity)	• governed by a constitution • managed by a management committee • not recognised in law as a legal entity • liability of members and the governing body is unlimited • cannot own property in its own right • it cannot enter into contracts (eg rental agreements)	• no approval or authorisation needed to set it up • draw up a constitution (sometimes called "rules") • if there is a membership fee, you are obliged to keep a membership list	Advantages • simple and flexible. No need to have the constitution agreed by any outside body (unless you are registering as a charity). • cheap to run. No need to submit accounts to anyone outside (unless you register as a charity, or funders demand it). • if you have charitable aims, you can register as a charity and gain advantages such as funding which is available only to charities. Disadvantages • some funders may prefer a more formal structure, especially if you are looking for big sums of money.
Charity – **Unincorporated Association**	• if the Unincorporated Association receives more than £1,000 per year and has charitable aims, it **must** be registered with the Charity Commission	• submit application form and constitution to Charity Commission • can "upgrade" to incorporated charity or CIO, but requires re-registration	• as above

Type	Main attributes	How to set it up	Notes
Charity – **Trust**	• usually set up to manage money or property for a charitable purpose • must register with Charity Commission	• draw up a trust deed • not really suitable for transition initiatives	• not really suitable for transition initiatives
Charity – **Incorporated Body**	• a limited company with charitable aims • must register with Charity Commission • can enter into contracts and own land • directors of the company are trustees of the charity and act as management committee • directors have limited liability (usually £5!) • can convert directly into a CIO (see below)	• draw up Memorandum and Articles of Association • register as a "Company Limited by Guarantee" at Companies House • apply for charitable status with the Charity Commission	Advantages • suitable for a larger organisation which has considerable assets (e.g. equipment, a building) and employs more than a few staff. • the company can take on legal obligations and buy property in its own name. The organisation and not its members is responsible for any debts. However directors do have a legal duty to act prudently and to ensure that the company manages its finances carefully. • many funders regard this structure as more stable, as they know the company will continue to exist even if there is a change of people involved. • some funders will give grants only to registered charities. Disadvantages • it is expensive to set up. It is time consuming to run and annual accountancy fees can be high. • a charitable company is regulated by both Companies House and the Charity Commission. You have to notify them of every change of directors/trustees and draw up a particular form of annual accounts and reports.
Charity – **Charitable Incorporated Organisation** (CIO)	• only available from Spring 2008 • must register with Charity Commission • doesn't have to register with Companies House • IDEAL vehicle for Transition Initiatives	• instructions currently being drawn up by Charity Commission	Advantages • less onerous requirements for preparing accounts • less onerous reporting requirements • one annual return • less onerous filing requirements • less onerous requirements relating to reporting of constitutional and governance changes • simpler constitutional form • codified duties for directors and members which reflect the charitable nature of the CIO Disadvantages • none, apparently

Type	Main attributes	How to set it up	Notes
Community Interest Company	• new legal form for Social Enterprises, available since July 05 • private company limited by shares or by guarantee • can convert directly into a CIO	• submit the following to Companies House: - Mem & Arts - community interest statement - an excluded company declaration - usual incorporation forms • the CIC Regulator will review before assigning CIC status	• limited company with special additional features created for the use of people who want to conduct a business or other activity for community benefit, and not purely for private advantage • must have a community interest test and an asset lock, to ensure that the CIC is established for community purposes and the assets and profits are dedicated to these purposes • a CIC can not be a registered charity and will not have the benefits of charitable status, even if the objects are entirely charitable in nature • www.cicregulator.gov.uk for more information
Workers Co-operative (has the following rules) • open membership • one member one vote • investment should not carry control • dividends distributed among members fairly • must include educational and social objectives • co-ops should co-operate with each other • concern for community	• unregistered	• apply rules to a group of people and call yourselves a co-op	Advantages • quick, cheap and easy • can raise money by issuing shares Disadvantages • no limited liability (members can have assets seized if co-op is bankrupt
	• registered as an Industrial & Provident Society	• register with the Registry of Friendly Societies	Advantages • limited liability • can raise money by issuing shares • cannot demutualise (always a co-op) Disadvantages • costs between £350 - £700 to register • high annual fees • tight limitations on range of activities
	• registered with Companies House as "company limited by guarantee"	• submit Mem & Arts to Companies House along with usual forms	Advantages • limited liability • high credibility with other traders and banks • can raise money be issuing shares Disadvantages • can be demutualised by later members

For further reading on Charities, go to the UK Charity Commission website here: www.charitycommission.gov.uk

For more information on Workers Co-operatives, go to these websites / documents:

- www.radicalroutes.org.uk/documents/wc.pdf
- www.cooperatives-uk.coop
- The Financial Services Authority regulates Industrial and Provident Societies - www.fsa.gov.uk. The Industrial and Provident section of FSA website is here.

For further reading on Community Interest Companies, go to CIC Registrars website here: www.cicregulator.gov.uk

The following publication has been recommended to us, "Keeping It Legal" by the Social Enterprise Coalition: www.socialenterprise.org.uk/Page.aspx?SP=1982

Governing documents – rules, constitutions and Mem & Arts

All organisations need some kind of governing document. This can be a constitution, Mem & Arts, or "rules". Some people would prefer to drive a nail into their skull than tackle this, but it's got to be done otherwise there's no real point of reference for the group or organisation. And in several cases it's a legal requirement. So bite the bullet and take a look at the following table. You'll see links and some key points.

Type	Managed by	Governing documents	Notes and links
Unincorporated Association (non-charity)	• management committee	• constitution (sometimes called "rules")	www.resourcecentre.org.uk Also Step-by-step guide Another is at the www.voda.org.uk site here:
Charity – **Unincorporated Association**	• management committee	• constitution (sometimes called "rules")	Model Constitution from the Charity Commission
Charity – **Trust**	• not suitable for Transition Initiatives	•	Model Trust Deed from the Charity Commission
Charity – **Incorporated Body**	• Board or council of management or directors	•	Model Memorandum and Articles of Association from the Charity Commission
Charity – **Charitable Incorporated Organisation** (CIO)	• Not available yet	• Not available yet	Not available yet
Community Interest Company	• board of directors	• Mem & Arts	Currently being updated at www.cicregulator.gov.uk website. Older versions can be found here: www.cicregulator.gov.uk/memArt.shtml
Workers Co-operative	• the workers or an elected "Committee of Management"	• Mem & Arts if a company limited by guarantee • Rules	Model Rules from Cooperatives UK: www.cooperatives-uk.coop/live/cme574.htm

You can also browse the various Transition Initiatives websites (www.transitiontowns.org) and take a look at the various forms that the constitutions have taken.

We're hoping that community groups that become formal bodies will incorporate their democratic and inclusive ethos within their foundation documents.

Further down the line, if it looks like there's a significant commonality among initiatives, then perhaps the Transition Network will produce a standard one. However, we do see some benefit gained in the process of putting together your own unique governing documents (even if it's a pain in the neck)!

One point of concern from initiatives around the world is potential involvement by extreme political groups. One way to reduce the likelihood of this happening is to explicitly state in your constitution that you support the UN Declaration of Human Rights. That will prevent members joining who belong to groups that have discrimination as one of their core values.

Setting up your Transition Initiative – 7 "buts"

So, having got this far in this Primer, you may well be thinking that a Transition Initiative would be appropriate for your community.

The section after this (12 Steps) will provide you with an outline roadmap for that journey, but first you'll have to navigate the initial barriers – real and imagined – that stand in your way. We call these 'The Seven Buts'.

But we've got no funding…

This really is not an issue. Funding is a very poor substitute for enthusiasm and community involvement, both of which will take you through the first phases of your transition. Funders can also demand a measure of control, and may steer the initiative in directions that run counter to community interests.

We'll show you how you can make sure your process generates an adequate amount of income. We're not talking fortunes, your Transition Town won't be floated on the Stock Market, but, as an eco-village designer Max Lindeggar told me years ago, "if a project doesn't make a profit it will make a loss."

Transition Town Totnes began in September 2005 with no money at all, and has been self-funding ever since. The talks and film screenings that we run bring in money to subsidise free events such as Open Space Days. You will reach a point where you have specific projects that will require funding, but until that point you'll manage. Retain the power over whether this happens… don't let lack of funding stop you.

But they won't let us…

There is a fear among some green folks that somehow any initiative that actually succeeds in effecting any change will get shut down, suppressed, attacked by faceless bureaucrats or corporations. If that fear is strong enough to prevent you taking any action, if the only action you're willing to take is to abdicate all your power to some notional "they", then you're probably reading the wrong document. On the other hand, Transition Towns operate 'below the radar', neither seeking victims nor making enemies. As such, they don't seem to be incurring the wrath of any existing institutions.

On the contrary, with corporate awareness of sustainability and Climate Change building daily, you will be surprised at how many people in positions of power will be enthused and inspired by what you are doing, and will support, rather than hinder, your efforts.

But there are already green groups in this town, I don't want to step on their toes…

We'll go into this in more detail in Step 3 below, but in essence, you'd be exceedingly unlucky to encounter any "turf wars". What your Transition Initiative will do is to form a common goal and sense of purpose for the existing groups, some of which you might find are a bit burnt out and will really appreciate the new vigour you will bring. Liaising with a network of existing groups towards an Energy Descent Action Plan will enhance and focus their work, rather than replicate or supersede it. Expect them to become some of your strong allies, crucial to the success of your Transition.

But no one in this town cares about the environment anyway…

One could easily be forgiven for thinking this, given the existence of what we might perceive a s an apathetic consumer culture surrounding us. Scratch a bit deeper though, and you'll find that the most surprising people are keen advocates of key elements of a Transition Initiative - local food, local crafts, local history and culture.

The key is to go to them, rather than expecting them to come to you. Seek out common ground, and you'll find your community to be a far more interesting place than you thought it was.

But surely it's too late to do anything…?

It *may* be too late, but the likelihood is that it isn't. That means your (and others') endeavours are absolutely crucial.

Don't let hopelessness sabotage your efforts - as Vandana Shiva says, "the uncertainty of our times is no reason to be certain about hopelessness".

But I don't have the right qualifications…

If you don't do it, who else will? It matters not that you don't have a PhD in sustainability, or years of experience in gardening or planning. What's important is that you care about where you live, that you see the need to act, and that you are open to new ways of engaging people.

If there was to be a job description for someone to start this process rolling it might list the qualities of that person as being;

- Positive
- Good with people
- A basic knowledge of the place and some of the key people in the town.

That, in truth, is about it… . You are, after all, about to design your own demise into the process from the start (see Step#1), so your role at this stage is like a gardener preparing the soil for the ensuing garden, which you may or may not be around to see.

But I don't have the energy for doing that!

As the quote often ascribed to Goethe goes, "whatever you can do or dream you can, begin it. Boldness has genius, power and magic in it!" The experience of beginning a Transition Initiative certainly shows this to be the case. While the idea of preparing your town (or city, hamlet, valley or island) for life beyond oil may seem staggering in its implications, there is something about the energy unleashed by the Transition Initiative process that is unstoppable.

You may feel overwhelmed by the prospect of all the work and complexity, but people will come forward to help. Indeed, many have commented on the serendipity of the whole process, how the right people appear at the right time. There is something about seizing that boldness, about making the leap from 'why is no-one doing anything' to 'let's do something', that generates the energy to keep it moving.

Very often, developing environmental initiatives is like pushing a broken down car up a hill; hard, unrewarding slog. Transition Towns is like coming down the other side – the car starts moving faster than you can keep up with it, accelerating all the time. Once you give it the push from the top of the hill it will develop its own momentum. That's not to say it isn't hard work sometimes, but it is almost always a pleasure.

The 12 steps of Transition

These 12 Steps have grown out of the observation of what seemed to work in the early Transition Initiatives, in particular Totnes.

They are not meant to be in any way prescriptive. Each project assembles these in different ways, adds new ones, disregards others. They do, however, offer what we think to be the key elements of your journey, and will hopefully help you over the first couple of years of your work.

#1. Set up a steering group and design its demise from the outset

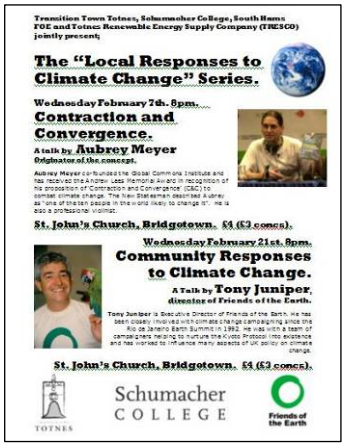
This stage puts a core team in place to drive the project forward during the initial phases.

We recommend that you form your Steering Group with the aim of getting through stages 2 – 5, and agree that once a minimum of four sub-groups (see #5) are formed, the Steering Group disbands and reforms with a person from each of those groups. This requires a degree of humility, but is very important in order to put the success of the project above the individuals involved. Ultimately your Steering Group should become made up of 1 representative from each sub-group.

#2. Awareness raising

This stage will identify your key allies, build crucial networks and prepare the community in general for the launch of your Transition initiative.

For an effective Energy Descent Action plan to evolve, its participants have to understand the potential effects of both Peak Oil and Climate Change – the former demanding a drive to increase community resilience, the later a reduction in carbon footprint.


Transition Town Totnes, Schumacher College, South Hams FOE and Totnes Renewable Energy Supply Company (TRESCO) jointly present;

The "Local Responses to Climate Change" Series.

Wednesday February 7th. 8pm.
Contraction and Convergence.
A talk by Aubrey Meyer
Originator of the concept.

Aubrey Meyer co-founded the Global Commons Institute and has received the Alternative Leo Nobel Memorial Award in recognition of his proposition of Contraction and Convergence (C&C) to combat climate change. The New Statesman described Aubrey as "one of the ten people in the world likely to change it". He is also a professional violinist.

St. John's Church, Bridgetown. £4 (£3 concs).

Wednesday February 21st. 8pm.
Community Responses to Climate Change.
A Talk by Tony Juniper, director of Friends of the Earth.

Tony Juniper is Executive Director of Friends of the Earth. He has been closely involved with climate change campaigning since the Rio de Janeiro Earth Summit in 1992. He was with a team of campaigners helping to nurture the Kyoto Protocol into existence and has worked to influence many aspects of UK policy on climate change.

St. John's Church, Bridgetown. £4 (£3 concs).

TOTNES
Schumacher COLLEGE
Friends of the Earth

Screenings of key movies (Inconvenient Truth, End of Suburbia, Crude Awakening, Power of Community) along with panels of "experts" to answer questions at the end of each, are very effective. (See next section for the lowdown on all the movies – where to get them, trailers, what the licensing regulations are, doomster rating vs solution rating)

Talks by experts in their field of Climate Change, Peak Oil and community solutions can be very inspiring.

Articles in local papers, interviews on local radio, presentations to existing groups, including schools, are also part of the toolkit to get people aware of the issues and ready to start thinking of solutions.

#3. Lay the foundations

This stage is about networking with existing groups and activists, making clear to them that the Transition Initiative is designed to incorporate their previous efforts and future inputs by looking at the future in a new way. Acknowledge and honour the work they do, and stress that they have a vital role to play.

Give them a concise and accessible overview of Peak Oil, what it means, how it relates to Climate Change, how it might affect the community in question, and the key challenges it presents. Set out your thinking about how a Transition Initiative might be able to act as a catalyst for getting the community to explore solutions and to begin thinking about grassroots mitigation strategies.

#4. Organise a Great Unleashing

This stage creates a memorable milestone to mark the project's "coming of age", moves it right into the community at large, builds a momentum to propel your initiative forward for the next period of its work and celebrates your community's desire to take action.

In terms of timing, we estimate that 6 months to a year after your first "awareness raising" movie screening is about right.

The **Official Unleashing of Transition Town Totnes** was held in September 2006, preceded by about 10 months of talks, film screenings and events.

Regarding contents, your Unleashing will need to bring people up to speed on Peak Oil and Climate Change, but in a spirit of "we can do something about this" rather than doom and gloom.

One item of content that we've seen work very well is a presentation on the practical and psychological barriers to personal change – after all, this is all about what we do as individuals.

It needn't be just talks, it could include music, food, opera, break dancing, whatever you feel best reflects your community's intention to embark on this collective adventure.

#5. Form working groups

Part of the process of developing an Energy Descent Action Plan is tapping into the collective genius of the community. Crucial for this is to set up a number of smaller groups to focus on specific aspects of the process. Each of these groups will develop their own ways of working and their own activities, but will all fall under the umbrella of the project as a whole.

Ideally, working groups are needed for all aspects of life that are required by your community to sustain itself and thrive. Examples of these are: food, waste, energy, education, youth, economics, transport, water, local government.

Each of these working groups is looking at their area and trying to determine the best ways of building community resilience and reducing the carbon footprint. Their solutions will form the backbone of the Energy Descent Action Plan.

#6. Use Open Space

We've found Open Space Technology to be a highly effective approach to running meetings for Transition Initiatives.

In theory it ought not to work. A large group of people comes together to explore a particular topic or issue, with no agenda, no timetable, no obvious coordinator and no minute takers.

However, we have run separate Open Spaces for Food, Energy, Housing, Economics and the Psychology of Change. By the end of each meeting, everyone has said what they needed to, extensive notes had been taken and typed up, lots of networking has had taken place, and a huge number of ideas had been identified and visions set out.

The essential reading on Open Space is *Harrison Owen's Open Space Technology: A User's Guide*, and you will also find *Peggy Holman and Tom Devane's The Change Handbook: Group Methods for Shaping the Future* an invaluable reference on the wider range of such tools.

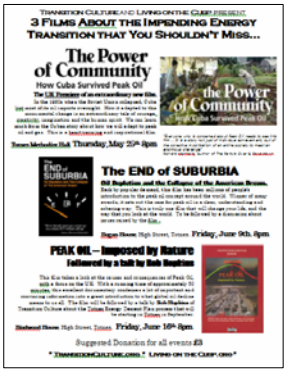
#7. Develop visible practical manifestations of the project

It is essential that you avoid any sense that your project is just a talking shop where people sit around and draw up wish lists. Your project needs, from an early stage, to begin to create practical, high visibility manifestations in your community. These will significantly enhance people's perceptions of the project and also their willingness to participate.

There's a difficult balance to achieve here during these early stages. You need to demonstrate visible progress, without embarking on projects that will ultimately have no place on the Energy Descent Action Plan.

In Transition Town Totnes, the Food group launched a project called 'Totnes - the Nut Tree Capital of Britain' which aims to get as much infrastructure of edible nut bearing trees into the town as possible. With the help of the Mayor, we recently planted some trees in the centre of town, and made it a high profile event (see left).

#8. Facilitate the Great Reskilling



If we are to respond to Peak Oil and Climate Change by moving to a lower energy future and relocalising our communities, then we'll need many of the skills that our grandparents took for granted. One of the most useful things a Transition Initiative can do is to reverse the "great deskilling" of the last 40 years by offering training in a range of some of these skills.

Research among the older members of our communities is instructive – after all, they lived before the throwaway society took hold and they understand what a lower energy society might look like. Some examples of courses are:

repairing, cooking, cycle maintenance, natural building, loft insulation, dyeing, herbal walks, gardening, basic home energy efficiency, making sour doughs, practical food growing (the list is endless).

Your Great Reskilling programme will give people a powerful realisation of their own ability to solve problems, to achieve practical results and to work cooperatively alongside other people. They'll also appreciate that learning can truly be fun.

#9. Build a Bridge to Local Government

Whatever the degree of groundswell your Transition Initiative manages to generate, however many practical projects you've initiated and however wonderful your Energy Descent Plan is, you will not progress too far unless you have cultivated a positive and productive relationship with your local authority. Whether it is planning issues, funding or providing connections, you need them on board. Contrary to your expectations, you may well find that you are pushing against an open door.

We are exploring how we might draft up an Energy Descent Action Plan for Totnes in a format similar to the current Community Development Plan. Perhaps, one day, council planners will be sitting at a table with two documents in front of them – a conventional Community Plan and a beautifully presented Energy Descent Action Plan. It's sometime in 2008 on the day when oil prices first break the $100 a barrel ceiling. The planners look from one document to the other and conclude that only the Energy Descent Action Plan actually addresses the challenges facing them. And as that document moves centre stage, the community plan slides gently into the bin (we can dream!).

#10. Honour the elders

For those of us born in the 1960s when the cheap oil party was in full swing, it is very hard to picture a life with less oil. Every year of my life (the oil crises of the 70s excepted) has been underpinned by more energy than the previous years.

In order to rebuild that picture of a lower energy society, we have to engage with those who directly remember the transition to the age of Cheap Oil, especially the period between 1930 and 1960.

While you clearly want to avoid any sense that what you are advocating is 'going back' or 'returning' to some dim distant past, there is much to be learnt from how things were done, what the invisible connections between the different elements of society were and how daily life was supported. Finding out all of this can be deeply illuminating, and can lead to our feeling much more connected to the place we are developing our Transition Initiatives.

#11. Let it go where it wants to go…

Although you may start out developing your Transition Initiative with a clear idea of where it will go, it will inevitably go elsewhere. If you try and hold onto a rigid vision, it will begin to sap your energy and appear to stall. Your role is not to come up with all the answers, but to act as a catalyst for the community to design their own transition.

If you keep your focus on the key design criteria – building community resilience and reducing the carbon footprint – you'll watch as the collective genius of the community enables a feasible, practicable and highly inventive solution to emerge.

#12. Create an Energy Descent Plan

Each working group will have been focusing on practical actions to increase community resilience and reduce the carbon footprint.

Combined, these actions form the Energy Descent Action Plan. That's where the collective genius of the community has designed its own future to take account of the potential threats from Peak Oil and Climate Change.

The process of building the EDAP is not a trivial task. It's evolving as we figure out what works and what doesn't.

Transition Network Support – Local Resource Picture template

Building a picture of the local resource – current and potential availability, current and potential requirements – will be key to creating a realistic EDAP. We're developing templates to help this process.

Transition Network Support – Transition Timeline

We're working with climate change scientists, ecologists, energy analysts and green economists to draw up an over-arching timeline that provides a timebased landscape on which to draw your EDAP.

Transition Network Support - Resilience indicators

This sections introduces the concept of "resilience indicators", and this needs some explanation. Resilience is the ability of a system or community to withstand impacts from outside. An indicator is a way of measuring that.

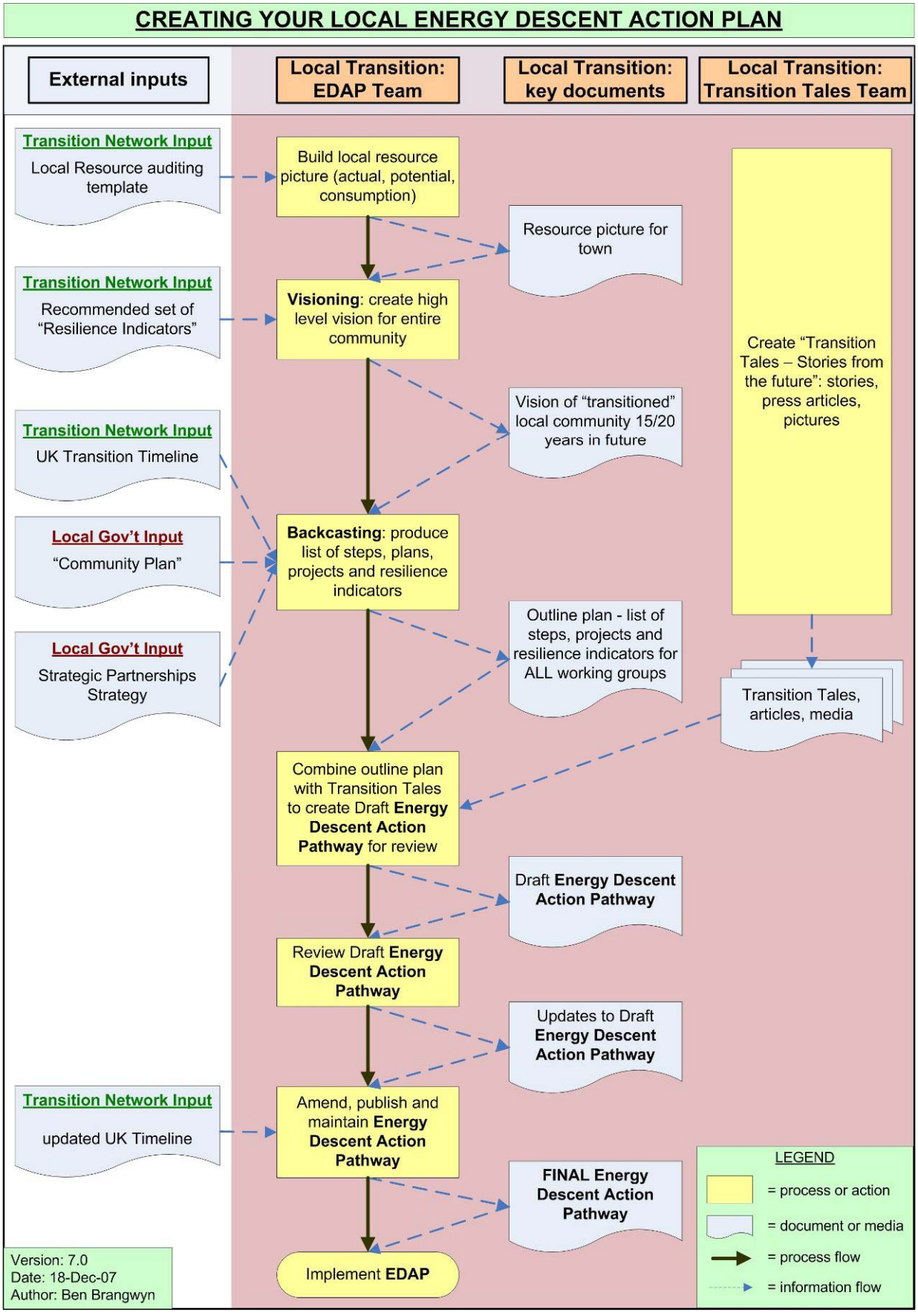
Conventionally, the principle way of measuring a reducing carbon footprint is CO2 emissions. However, we firmly believe that cutting carbon while failing to build resilience is an insufficient response when you're trying to address both peak oil and climate change.

So how might you be able to tell that the resilience of the settlement in quesiton is increasing?

Resilience indicators might look at the following:

- percentage of food grown locally
- amount of local currency in circulation as a percentage of total money in circulation
- number of businesses locally owned
- average commuting distances for workers in the town
- average commuting distance for people living in the town but working outside it
- percentage of energy produced locally
- quantity of renewable building materials
- proportion of essential goods being manufactured within the community of within a given distance
- proportion of compostable "waste" that is actually composted

While some indicators will be universal, many will be place-specific and will emerge from the energy descent plan process. We're thinking hard about a full set of universal resilience indicators and we'll publish them to the network when they're ready.


CREATING YOUR LOCAL ENERGY DESCENT ACTION PLAN
External inputs
Local Transition: EDAP Team
Local Transition: key documents
Local Transition: Transition Tales Team
Transition Network Input
Local Resource auditing template
Build local resource picture (actual, potential, consumption)
Resource picture for town
Transition Network Input
Recommended set of "Resilience Indicators"
Visioning: create high level vision for entire community
Vision of "transitioned" local community 15/20 years in future
Transition Network Input
UK Transition Timeline
Local Gov't Input
"Community Plan"
Backcasting: produce list of steps, plans, projects and resilience indicators
Outline plan - list of steps, projects and resilience indicators for ALL working groups
Local Gov't Input
Strategic Partnerships Strategy
Create "Transition Tales – Stories from the future": stories, press articles, pictures
Transition Tales, articles, media
Combine outline plan with Transition Tales to create Draft Energy Descent Action Pathway for review
Draft Energy Descent Action Pathway
Review Draft Energy Descent Action Pathway
Updates to Draft Energy Descent Action Pathway
Transition Network Input
updated UK Timeline
Amend, publish and maintain Energy Descent Action Pathway
FINAL Energy Descent Action Pathway
Implement EDAP
LEGEND
= process or action
= document or media
= process flow
= information flow
Version: 7.0
Date: 18-Dec-07
Author: Ben Brangwyn

The Energy Descent Action Plan

Incidentally, some people in the transitioning communities are calling this a "pathway" or a "vision" as opposed to a "plan". Whatever works for you if fine with us.

In essence, the EDAP will paint a picture of the community that is so colourful, so appealing and so irresistible, that anyone not involved in bringing it to fruition will feel bereft of meaning in their life.

And here's how to do it (at least, this is as far as we've got in figuring it out):

1. **Build a local resource picture:** gather data for your community relating to each of the working groups: arable land, transport options, health provision, renewable energy sources, textile manufacturing capability, building materials. This may well have been done in the early stages of the working groups' activities.
    - Transition Network will provide templates for this
2. **Create a vision for the community in 15-20 years hence:** what would your community look like in 15 or 20 years if we were emitting drastically less CO2, using drastically less non-renewable energy, and was well on the way to rebuilding resilience in all critical aspects of life.
    - Transition Network will provide resilience indicators to help focus your visioning exercise
3. **Backcast from the vision to "today":** list out a timeline of the milestones, prerequisites, activities and processes that need to be in place for the visions to be achieved. The resilience indicators will help shape this phase.
    - Transition Network will be providing an over-arching UK Transition Timeline to assist this process
4. **Get the Local Community Plan and Partnership Strategy** as produced by the local government. Their plans are likely to have timescales and elements that you need to take into account.
5. **Transition Tales:** meanwhile the Transition Tales group is producing articles, stories, pictures and representations of the envisioned community, how we'd get there and what might happen on the way.
6. **Create the first draft of the EDAP:** merge the overall plan and the transition stories into one cohesive whole, and pass out for review and consultation.
7. **Finalise the EDAP:** integrate the feedback into the EDAP. Realistically, this document (if that's what it ends up being) won't ever be "final" - it will be continually updated and augmented as conditions change and ideas emerge.

This is a living process and we won't know how close it is to reality until a few groups have gone through it.

Transition Network is building plans to support this process by providing elements such as a set of standard resilience indicators, and an overarching master timeline covering energy, climate, food etc.

Videos of the 12 Steps to Transition

YouTube has videos of Rob presenting the 12 Steps at the Transition Network conference in May 2007. Type the following into to the address window of your browser:

http://www.youtube.com/results?search_query=rob+hopkins+twelve+steps

If you run the same query without the "twelve steps", you'll see an impressive array of videos of Rob being interviewed by Adrienne Campbell of TT Lewes.

The wider context of Transition

In the UK and Wales alone, there are 11,000 parishes (towns/villages), 60 cities and any number of rural communities that are going to have to navigate the downslope of energy descent, either proactively or reactively.

But along with these community-based transition, each individual needs to evolve away from addiction to oil and a whole raft of ecologically devastating practices, away from the complex web that locks them into the endless growth paradigm.

This will be easier for some than others, but we all have to do it.

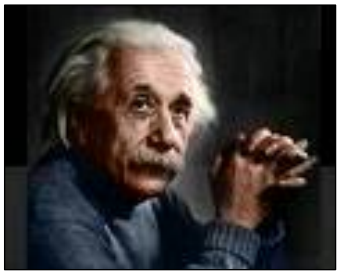
And each of us needs to travel closer to a heartfelt understanding that if we want to stay living on Earth, we'll have to weave ourselves back into the fabric of the planet, and comprehend that the "humans are separate from the earth" duality underpinning our industrialised societies is false, misleading and a one-way ticket to a hell on earth far hotter than we can handle.

This journey involves fully feeling the unbearable weight of accountability for what's happening, the complicity we all have in supporting this unsustainable paradigm. For some, it involves feeling the pain of the planet, and that can be overwhelming. This journey into realisation is best undertaken with fellow travellers to share the burden and provide support. Taken alone, it's a lonely path that many, lacking sufficient emotional support, turn back from.

So gather some stalwarts around you and take the plunge. And when you've come out the other side, wiser, more resilient and more determined, act as a guide to those who come after you, for their need will be all the greater.

Some quotes that tell the story of the wider Transition

“We have to find a way to live in this planet-time without closing our eyes to what we’re doing.” – *Joanna Macy*



"The significant problems we have cannot be solved at the same level of thinking with which we created them." – *Albert Einstein*

"Our task must be to widen our circle of compassion to embrace all living creatures and the whole of nature in its beauty." – *Albert Einstein*

"We used to be hunter-gatherers, now we're shopper-borrowers." – *Robin Williams*, 1990

"If the world is to be healed through human efforts, I am convinced it will be by ordinary people, people whose love for this life is even greater than their fear. People who can open to the web of life that called us into being." – *Joanna Macy*

"Whenever I see an adult on a bicycle, I no longer despair for the future of the human race." – *H.G. Wells*

“If the Great Turning should fail, it will not be for lack of technology or relevant data so much as for lack of political will. When we are distracted and fearful, and the odds are running against us, it is easy to let the mind and heart go numb.

The dangers now facing us are so pervasive and yet often so hard to see – and painful to see, when we manage to look at them – that this numbing touches us all. No one is unaffected by it. No one is immune to doubt, denial, or disbelief about the severity of our situation – and about our power to change it. Yet of all the dangers we face, from climatic change to nuclear wars, none is so great as the deadening of our response.

That numbing of mind and heart is already upon us – in the diversions we create for ourselves as individuals and nations, in the fights we pick, and aims we pursue, the stuff we buy. So let us look at it. Let’s see what this deadening is and how it happens. For this work [as described in her book "Coming Back to Life"] helps us wake us from that sleep and come back to life.

Then, reconnected with our deepest desire, we will be able to take part in the Great Turning. We will choose life.” – *Joanna Macy*

Connecting with Earth - the lyrical journey of the carbon atom

Carbon is the building block of life, and here is a phase in its never-ending journey, adapted from an essay by Primo Levi.

If ever you thought you were unconnected to the planet, this essay should put you right, for you have around 700,000,000,000,000,000,000,000,000 carbon atoms in your body (representing 10% of your mass), each of which has already performed countless dances not unlike the one you're about to read...

"Our atom of carbon lies for hundreds of millions of years, bound to three atoms of oxygen and one of calcium, in the form of limestone not too far from the earth's surface.

At any moment a blow of a pick axe detaches it and sends it on its way to the lime kiln, plunging it into the world of things that change. It is roasted and, still clinging to its oxygen companions, is issued from the chimney and takes the path of the air. Its story, which once was immobile, has now turned tumultuous.

It was caught by the wind, flung down on the earth and lifted ten kilometres high. It was breathed in by a falcon, descended into its precipitous lungs, but did not penetrate its rich blood and was expelled.

It dissolved three times in the water of the sea, once in the water of a cascading torrent, and again was expelled. It travelled with the wind for eight years: now high, now low, on the sea and among the clouds, over forests, deserts, and limitless expanses of ice; then it stumbled into capture and the organic adventure.

The atom we are speaking of was borne by the wind along a row of vines. It had the good fortune to brush against a leaf, penetrate it, and be nailed there by a ray of the sun.

Now our atom has formed part of a molecule of glucose. It travels from the leaf to the trunk, and from here descends to the almost ripe bunch of grapes. What then follows is the province of the winemakers.

It is the destiny of wine to be drunk. Its drinker kept the molecule in his liver for more than a week, well curled up and tranquil, as reserve energy for a sudden effort; an effort that he was forced to make the following Sunday, pursuing a bolting horse...

The atom was dragged by the bloodstream all the way to a minute muscle fibre in the thigh... and later, as carbon dioxide, was breathed back into the air.

Once again the wind, which this time travels far, sails over the Apennines and the Adriatic, Greece, the Aegean, and Cyprus: we are over Lebanon. And the dance is repeated.

The atom now penetrates and is trapped by the venerable trunk of a cedar, one of the last. It could stay in the cedar for up to 500 years but let us say that after twenty years a wood worm has taken interest in it and swallowed it.

The woodworm then formed a pupa, and in the spring it came out in the shape of a moth which is now drying in the sun, confused and dazzled by the splendour of the day. Our atom is in one of the insect's thousand eyes.

When the insect dies, it falls to the ground and is buried amongst the undergrowth of the woods. Here are at work the omnipresent, untiring and invisible micro organisms of the humus. The moth has slowly disintegrated and the atom has once again taken wing.

> It takes to the air... and eventually comes to rest on the surface of the ocean, then sinks slowly. A passing coccolithophore appropriates the atom to build its impossibly delicate shell of calcium carbonate. Soon it too dies and glides to the bottom of the ocean, where it is compacted with its trillion companions and their own carbon atoms.

> In geological time, tectonic plate movements bring this sediment, now as chalky cliffs, to the surface of the earth, exposing our atom once more to the possibility of flight in the complex dance of life."

Now look at your hand – a scar perhaps, or a fingernail. Think of it as less of a hand, more of a temporary resting place for countless carbon atoms. A place where they're taking a mini-break before they continue on a vast never-ending journey that encompasses the depths of the oceans, the highest skies, the dinosaurs before you and creatures we can't even dream of that will come after us.

Feeling connected yet?

Questions of leadership and structure

Leaders, focalisers, initiators, convenors...

The idea of leadership is vast and interesting and we're having a lot of discussions about it right now with people who have rich social and organisational experience from both practical and theoretical domains.

Here's Chomsky's take on it:

> "If leadership is delegated, monitored, interchangeable, and recallable it can be a useful, maybe even necessary device. But always [needs to be] viewed with a critical eye." (correspondence, 11-Sep-07)

However, the term "leader" has such loaded connotations that conversations about the subject are massively prone to misunderstandings and conflict.

So it's important to form a crystal clear definition of the term before discussing it here.

First of all, in a well-functioning group, anyone can exercise leadership for a while.

Leadership is about inspiring others, taking initiative and helping a group find a direction that they want to follow. That might entail some or all of the following roles: critical thinker, ideas person, group harmony maintainer, driver, organiser, integrator/chair, external networker.

Leadership doesn't have to be about power over a group, it is about making a group feel empowered. It is not about hierarchy, it is not about "who's boss", it's not about management and it's not about "followers". In particular, it's not about a permanent label that's applied to an individual.

Every single one of us has leadership qualities and it's important that we develop them – we all need to be able to inspire others, and we all need to be able to start something new.

But we also need to recognise that depending on the task in hand, we're likely to flow between all the roles required – inspirer, doer, timekeeper, liaison, supporter, recorder, creator, tidier, contributor etc. If we want to be personally resilient (ie adaptable) and maximise our contribution to the community transition, then we need to develop all the attributes for these roles as well.

However, it could be that the term "leader" is so tainted that it won't work for your transition group. Other words can be used to describe some of the nuanced roles that are needed in this area: focaliser, catalyser, convenor, coordinator, chair, hub, planner, initiator. In the end, it doesn't take long for the word to lose its connotations and become "your" word, defined by the emergent qualities demonstrated in your groups within and around the role.

Regarding consensus, it's great if time isn't a really scarce resource. I'm a believer in pragmatic solutions, so in the run up to a decision, as long as everyone feels they have been truly heard, had a chance to influence the group and have heard their ideas critically but constructively evaluated then most people will be prepared to either:

- change their mind (without losing face)
- see their ideas blended with others to form something different
- accept that the rest of the group differs but want their minority views recorded

Well handled conflict and difference usually improves the quality of decisions and degree of commitment to them.

Emergent structures for core groups

Most of us recognise that we need to be looking beyond the traditional hierarchical models for the Transition Initiatives, but we haven't got the time to spend all our efforts figuring out what that'll look like.

Within the small group running the Transition Network organisation, we've adopted a temporary hierarchical structure, with a parallel process to find a more suitable model that we'll adopt in time and that may be adoptable/adaptable by the individual communities that head off down the transition trail. Chaordic, Natural Step, Viable System, Mondragon, Cooperative, Parecon and others are all in the mixer for this.

We're also recognising that there needs to be a level of fluidity - some situations call for totally flat structure, others demand accountability (eg to each other and to stakeholders within the community or network) and others need people to take a lead role for a time.

We don't have the answers for this beyond knowing that the most successful structures will address the need for resilience, accountability, adaptability and cooperability. Eclecticism may be crucial here.

Time

> "We are time's subjects, and time bids be gone."
> *William Shakespeare*

Running through all of this decision-making and action-taking is the imperative of time. Climate Chaos isn't going to wait for us to get 100% consensus on every point, nor will fossil fuel depletion.

Time may not be a challenge for your group. If it isn't, you're very fortunate.

For the rest of us, we're encountering plenty of barriers to action outside of our groups. The last thing we need is to augment those barriers with our own personal psychological attachments to the dogma or paradigms of a certain way of working.

The role of local government

The role for local government that is emerging, favoured by government officials and transition initiatives alike, is "**supporting, not driving**".

We always knew that local government would play a crucial role in Transition Initiatives in the UK and Ireland. And over the recent months, we're seeing that role emerge from both the existing transitioning communities and from new communities in the earliest stages of contact with us.

Our first surprise was just how willing the local councils are to engage meaningfully with existing transition initiatives.

Our second is the number of communities where the first person to contact us is from the local council. This is a recent phenomenon, and one that we welcome wholeheartedly.

Some examples of both of these are noted below.

Examples of councils working with Transition Initiatives

Totnes

At Schumacher college In Totnes, local officials congregated to explore how an understanding of peak oil and climate change might inform their work and their decisions. 23 councillors, from local parish councils, Town Councils and the District Council, as well as the local MP attended.

A number of elected officials are active in transition groups within the overall initiative.

The Town Council has officially endorsed the Transition Initiative.

Lewes

We have engaged with key officers of Lewes District Council from our first meetings in January. Since May, when the new Council was formed, we have invited members of the cabinet to our events, and have had informal talks with them. One of our members stood and was elected to the Council, and two new Town Councillors are active supporters of TTL.

Our aim is to give support to the Council's Climate Change Strategy, and to look to them for support to deal with the issue of Peak Oil. Next step is to offer to give a presentation to senior management on TTL.

Stroud

The full Cabinet of Stroud District Council convened a meeting with Richard Heinberg in May 2007. Richard is the author of 3 key books on Peak Oil, one of the world's leading educators in Peak Oil and mitigation strategies.

Penwith

Penwith District Council (PDC) has been a strategic partner of Transition Penwith (TP) since the group was founded in November 2006.

PDC provides TP with resources such as venue, equipment, use of council office committee rooms for meetings, marketing and development support, partnership working and funding advice. The PDC Sustainable Communities Officer sits on the committee of TP as the Treasurer.

PDC Officers are providing support in different ways, for example the PDC Sustainable Tourism Officer is working with TP to put in a bid for developing a Transition Tourism model for the peninsulas of Europe. The PDC Rural Economy Officer is working with TP to provide funding and support to re-establish the farmer's market back in Penzance Town Centre, and to develop a Community Farm Project.

TP actively engages with Parish Councillors, Town councillors (Hayle, St. Just, St. Ives and Penzance) and District Councillors, and also with Cornwall County Councillors. TP has strong support from the local MP, Andrew George, who has spoken at TP events, and taken questions to Parliament on our behalf. The Mayors of Penzance. St. Ives and St. Just have attended TP events and expressed their support.

Examples of first contact by Councillors and Mayors

The following excerpts are from emails, voicemails or direct reports from members of the steering groups for existing Transitions.

- **City Councillor:** "I'm a city councillor in xxxx and have been following the transition towns network with great interest... I'm trying to get hold of any documents etc that provide a brief summary of what transition towns are all about that I can circulate to members and officers. Please can you point me in the direction of resources."
- **Mayor:** "My name is xxxx, Town Mayor of xxxx in Warwickshire. I am very interested in using my Mayoral year to begin some local green initiatives. I intend to organise an event for the Autumn to kick things off. I would be very interested in hearing from you and to have someone from your network as one of my keynote speakers at the event."

- **City Councillor:** "I am involved in a group setting up a Transition project in xxxx, Manchester, which we hope to become a pilot for the rest of the city."

- **Chairman of Town Council:** "I am Chairman of xxxx town Council having been a Councillor for 6 years... I have proposed that the Community Planning Group take the 'Transition' issue forward... The Primer is extremely helpful and I look forward in due course to visiting Totnes."

- **Chairman of Town Council**: (voicemail) "We've recently taken over the town council in the local elections, we put Transition Towns in our manifesto and now we need to come along to your conference to learn more about how we support the community in setting up a Transition Initiative."

- **District Field Officer i/c Parish Plans:** "Parish Plans are increasingly focusing on sustainable development and 'green' issues so the Energy Descent Action Plans seems a logical next step."

Recommendations for local government involvement

The following recommendations come from local government officials active in existing transition initiatives or in discussions about potentially helping their community adopt and adapt the Transition Model. In summary, the best mode of engagement appears to be "**supporting, not driving**".

- **Chairman of Town Council**: Whilst I would see the Council being supportive to a Transition Town movement, one of the things that I found most attractive about Transition Towns was the grass roots community involvement. In my experience the very best model is the Council supporting and encouraging the various communities, but much if not most of the initiative coming from the various community groups.

  We as councillors need to be aware that Transition Towns are not something that we bestow on the community, it is not going to be just a badge or symbol for the council, it is something that will happen anyway. Though Council support will help and assist the birth. The Council may also help the ideas to move into parts of the community that might otherwise not be reached.

- **Parish Councillor (Founder of Transition Penwith**): "I strongly believe that Transition Initiatives need to engage and involve Local Government in all their activities, and that their field of influence needs to reach into Central Government. While it is critical that Transition Initiatives remain non-political, and do not become Council-led, they need to be Council-supported and Council-informed. It is important to remember that Local Governance is there to support the community, and furthermore, it consists of people who live and work in our communities. It's time we moved beyond the boundaries of 'them and us' and realised that we all need to work together if we are going to effectively address the challenges ahead of us."

- **Local councillor**: Let the ideas arise from the community and remain under community control. The job of the council is to facilitate, to listen, possibly to provide advice, contacts or funds and, most important, to ensure that bureaucracy does not get in the way of grassroots initiatives.

No doubt the model of engagement will develop over time, For the moment, this approach of **supporting, but not driving** appears to be working well.

Getting businesses involved

There's a strong business case for adopting more sustainable practices, and its gradually finding its way into mainstream business thinking. The emphasis on CSR and triple bottom line accounting may be steps in the right direction, and carbon trading could yield substantial cuts in global CO2 emissions. However, none of these address the way that Peak Oil will make itself felt on businesses that have long supply chains, or serve markets in distant locales.

Businesses that have a long term perspective and are aware of the constraints fossil fuel depletion will have on the globalised economy need to be looking in general at oil dependency throughout their organisation and at four specific areas: supply chain, waste, energy usage and markets.

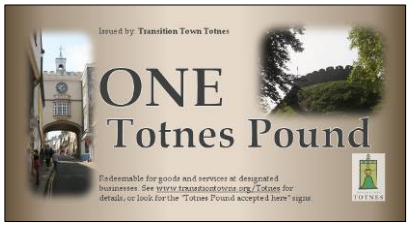
Examples from Totnes

There's much work underway in Transition Town Totnes to look at these areas. Three examples are oil vulnerability auditing, business exchange and local complementary currency:

Oil vulnerability auditing takes a detailed look at how rising oil prices might impact a business, examining costs and availability of raw materials, energy costs of key processes and transportation costs involved in selling and marketing. Once a costed model is built up, scenarios can be run with varying oil prices. With the inevitable and dramatic price rises ahead for oil and all types of energy, certain areas of a business may not be viable. In that case, mitigation plans can be put in place, perhaps looking at alternative raw materials sourced more locally, and opening up markets that will be less affected by high transportation costs.

The **business exchange** is a project that takes a different look at waste. It aims to match up companies where one business's waste is a raw material for another. For example, the building trade discards huge amounts of wood that could be used by companies making wood chips for the new type of household boilers.

A particularly high profile way of building local resilience in the business sector is launching a **local complementary currency**. Totnes continues its experiment in complementary currency by printing up 10,000 of the second generation Totnes Pounds and releasing the first 2,000 over the initial weeks. Local currencies strengthen local economies by avoiding the leaky bucket syndrome where wealth that is generated within a community "leaks" out to the wider economy at large. So far, fifty local businesses have signed up to accept the pound in payment for goods and services.



A Transition Town envisages a more localised future, where, production and consumption occurs closer to home. Where fragile supply chains that are vulnerable to surges in oil prices have become prohibitively expensive and have been replaced by local networks.

Where the total amount of energy consumed in business is significantly less than current unsustainable levels.

We're only scratching the surface of how we can work with businesses. As the various transition initiatives develop, we'll see all sorts of unexpected connections and ways of working emerge. And this is essential, because a Transition Initiative that fails to work creatively and proactively with the business community will enjoy only limited success.

Movies for raising awareness

In the right hands, these can be extremely useful tools. In the wrong ones, they can burden the viewers with feelings of doom and despondency, reducing their willingness to take action.

There are three types of movies that are worth showing. Those that:

- explain the problem (such as "End of Suburbia")
- create inspiration for solutions (such as "Power of Community") – these are a little thin on the ground, though we do have a "Transition – The Movie!" being made during 2007
- reawaken our deepest connections to the earth and to the other forms of life with whom we share this planet

Movies – reconnecting us to nature

This latter category is perhaps best viewed at home with some select friends. The licenses are usually more restrictive than the other categories as well.

These movies work by gently drawing together the tenuous threads that connect all life to the planet and all life forms to each other. They also help overcome the dominant anthropocentric view of this planet. Somehow, watching a spider weave a web underwater, fill it full of air, then pull its prey into the bubble and consume it makes some of man's technological achievements appear distinctly lacklustre. (MicroCosmos, distributed by Pathe in the UK)

The following list of movies in this category come highly recommended:

- Microcosmos (better with the sound turned down)
- Baraka
- Koyaanisqatsi
- Winged Migration (a Rob Hopkins recommendation)
- Princess Mononoke (particular favourite of Stephan Harding of Schumacher College)

Movies – Peak Oil, Climate Change, economics, possible solutions

With all of these movies, it's important to create a bit of an event, rather than just a screening. This isn't too hard – here's the recipe:

1. Introduce the film personally by putting it into the context of your overall hopes for your community
2. Have everyone turn to someone they don't know and, in turns, introduce themselves and explain what brought them to the event that night.
3. Show it
4. Have everyone pair up (preferably with someone they don't know) and do an active talking/listening exercise about their impressions of the movie (ie one talks for 3 minutes while the other listens, then they switch over). You can give direction with something like "Say what gives you cause for concern and then what gives you cause for hope about the movie"
5. Run a Q&A on Peak Oil and/or Climate Change – whichever is relevant to the movie. Make sure you have someone there who knows what he/she is talking about – though it's no shame to say "I don't know, but I can find out and get back to you".
6. Watch out for the "I'm alone in the depths of my fear" type questions – they're typically a cry out for counselling or connection and can paralyse a room. What can work in that situation is to acknowledge the person's fear and then to ask in the room "if there's anyone here who has a part of themselves that is full of fear around this, please put up your hand". Put yours up first... and hope! Unless you're sitting in a room full of denial, you'll see a lot of hands shoot up. You can then explain that the Transition Model has a place where people can move through their fears and into a place of action (usually handled by the "Heart and Soul" group, once it's formed).

The recommended movies are listed below.

Title and details	Review – by Rob Hopkins unless noted otherwise	Doom rating --------- Solution rating	Where to get it ---------- Licensing ---------- Trailer	Production values ---------- US / Euro bias
End of Suburbia: Oil Depletion & The Collapse of the American Dream ---------- 2004 ---------- 78 mins ---------- Canada	http://transitionculture.org/?p=146 o What I love about EOS is that it leaves no convenient back door to sidle out of, really it boils down to no oil, no transportation infrastructure; no transportation infrastructure, no globalised economy; no globalised economy, no nothing, apart from localisation. It is obvious isn't it? Or is it just me? I think the film puts it so clearly. o I have often seen how screenings of EOS in towns act, in hindsight, as a catalyst for all sorts of things that follow.	hi --------- lo	www.powerswitch.org.uk/order.htm ---------- From the film website: You are free to show the documentary to as many people, as many times as you wish, as long as it is not for profit and the DVD or VHS is an original. You are welcome to charge a modest admission to cover costs or fundraise for a non-profit group. ---------- www.endofsuburbia.com/previews.htm	hi ---------- US
Peak Oil: Imposed by Nature ---------- 2005 ---------- 30 mins ---------- Norway	From the web: o Generally speaking, this DVD is hard to watch - not because it's boring, but because the viewer comes to the realisation that lifestyles are going to change. Along with global warming, our consumerist ways will be the stuff of legend in another 50 years. o It makes many concrete arguments that are difficult to rebut. Simply put, if Peak Oil is in fact true, then our current way of life - from driving our cars to buying fruit from the supermarket - will never again be the way are. Unless you are filthy rich, you will have to make massive sacrifices. o This DVD interviews highly respected scientists from around the world, but mainly from Europe.	hi --------- lo	www.powerswitch.org.uk/order.htm ---------- According to PowerSwitch: You are free to show the documentary to as many people, as many times as you wish, as long as it is not for profit and the DVD or VHS is an original. You are welcome to charge a modest admission to cover costs or fundraise for a non-profit group. ---------- www.powerswitch.org.uk/order.htm	med ---------- Euro

Title and details	Review – by Rob Hopkins unless noted otherwise	Doom rating --- Solution rating	Where to get it --- Licensing --- Trailer	Production values --- US / Euro bias
Power of Community – how Cuba survived Peak Oil --- 2006 --- 53 mins --- USA	http://transitionculture.org/2006/04/28/transition-culture-presents-the-uk-premiere-of-the-power-of-community/#more-315 o It is a wonderful and inspirational film and is one not to be missed. o film has been premiered in the US and in Ireland to rapturous reviews	lo --- hi	www.powerswitch.org.uk/order.htm --- From the film website: "All public screenings must be non-commercial, though you may collect a small fee to cover expenses or to raise money for a non-profit organization." --- www.powerofcommunity.org/	med --- even
Crude Impact --- 2006 --- 97 mins --- USA	http://transitionculture.org/2006/12/12/review-new-peak-oil-film-crude-impact/#more-550 o clearly and passionately presents the argument that we are at or near the peak, which will be a transition of historic importance. o possibly suffers from being too long. It runs for over 90 minutes, and despite my being avidly keen to watch it, I did catch my eyelids drooping occasionally. o Little is discussed in terms of what our lives might look like without it, but that is not the film's purpose. Crude Impact focuses our minds not only on our dependence on oil, but also on all that has been done in order to sustain our habit. As such it is a very powerful tool in our attempts to break our collective addiction.	med --- lo	www.powerswitch.org.uk/order.htm --- For non-profits and other organizations who wish to screen the film to a small group of 50 people or less, where there is no admission fee, we ask for a screening fee of $115 plus the cost of the DVD, which you can purchase online. Otherwise contact screenings@vistaclarafilms.com --- www.crudeimpact.com/page.asp?content_id=9587	hi --- US
A Crude Awakening: the oil crash --- 2006 --- 85 mins --- Switzerland	http://transitionculture.org/2007/02/07/film-review-a-crude-awakening-the-oil-crash/#more-586 o very impressed, the best exposition of the Peak Oil argument yet committed to film o Crude Awakening keeps its gaze purely on Peak Oil, and presents a well argued, well-paced, and well-edited summary of what Peak Oil is and what it will mean for us all o It is a film which avoids over sensationalising the material, allowing the facts to speak for themselves. It isn't overly explicit about what the impacts of Peak Oil might be, allowing the viewer to follow those trains of thought in his or her own head.	med --- lo	not for sale yet. Check here for updates: www.oilcrashmovie.com/dvd.html --- UPDATE 23-July-07: The UK, distributor is Dogwoof Pictures. Cinematic release is Friday 9-Nov. We're exploring together how to involve all the Transitioners in the premiers. Watch this space. --- www.youtube.com/watch?v=Or-TyPACK-g	hi --- even

Title and details	Review – by Rob Hopkins unless noted otherwise	Doom rating --------- Solution rating	Where to get it ---------- Licensing ---------- Trailer	Production values ---------- US / Euro bias
An Inconvenient Truth ---------- 2006 ---------- 100 mins ---------- US	http://transitionculture.org/2006/11/17/a-review-of-an-inconvenient-truth/#more-530 o what is so powerful about this film is that it makes the whole subject comprehensible to the lay person. Such a thing could be dry and dull, yet it is completely engrossing. It is well edited and paced, I have to say I was on the edge of my seat. As a film designed to shock the world into action, it is very powerful and, hopefully, effective. o He ignores Peak Oil (something he has since spoken widely on), which would profoundly affect many of his proposed solutions. He doesn't really take on the role that global capitalism has played in creating the mess that is Climate Change. His solutions imply that low energy bulbs alone will save the planet, and that biodiesel can run all our cars, in other words that business-as-usual is still viable with light green trimmings. o Gore sets out the case clearly, tugging at the heart strings, and concludes by telling people that there is still time to avert the worst scenarios. All of these he does brilliantly.	hi --------- lo	Everywhere! ---------- Update Nov-07. You have to join Filmbank first, with a deposit of £150. Then the rental, even for non-commercial screening, is £75, with another £15 for post and package. Filmbank an be contacted on: 020 7984 5957/5958 www.filmbank.co.uk Howver, Paramount may allow Transition Initiatives to show this movie free of charge – we're discussing it with them. (Note: in May-07, a community "no charge" showing in Wolvercote village hall to 75 people was permitted for free by Paramount) ---------- www.climatecrisis.net/trailer/	hi ---------- even
Escape from Suburbia: beyond the American dream ---------- 2007 ---------- ?? mins ---------- US	From the movie website o The END of SUBURBIA explored the American Way of Life and its prospects as the planet enters the age of Peak Oil. o Rob Hopkins' less than enthusiastic review is here: http://transitionculture.org/2007/08/17/a-review-of-escape-from-suburbia/ o Several reviewers from the UK found the personal stories to be less than engaging and its emphasis on "escape from" rather than "transform where you are" to be unrealistic – there simply aren't enough places to "escape to"!	medium --------- lo	www.escapefromsuburbia.com ---------- Screening permission is granted to non profit environmental and peak oil organizations to show it freely at their meetings, to members. ---------- www.youtube.com/watch?v=J2y9BbNjLAY	high ---------- US

Title and details	Review – by Rob Hopkins unless noted otherwise	Doom rating --------- Solution rating	Where to get it ---------- Licensing ---------- Trailer	Production values ---------- US / Euro bias
Energy Crossroads: a burning need to change course ---------- 2007 ---------- 54 mins ---------- US	From TT Forest Row's Mike Grenville: o Although the film focuses on the US situation, it still has relevance elsewhere and takes a positive view on where we are and what can be done. From the film website: o As our global population and its appetite for energy rise drastically, resource depletion and global warming have become the most pressing issues facing humanity today. o Most experts agree that global Peak Oil production, when demand exceeds supply, will occur within the next 15 years and will drastically change the very fabric of our industrialized world. o It is clear that in order for us to survive our modern self-destructive societies, we will have to change course drastically and as fast as possible. o Scientists and experts agree that the use of renewable energy such as solar and wind power, coupled with higher efficiency and conservation, will be key factors in preserving our quality of life and paving the way to a sustainable world for our children.	hi --------- hi	www.energyxroads.com/buydvd.html ---------- Public performance policy: Buying this public performance rights version of the DVD ($59.95) gives you and your organization the right to show the film publicly in a non-theatrical setting as many times as you want, as long as no admission is charged. This educational DVD has an extra hour of bonus materials, which includes a 25 minutes documentary produced in 1974 soon after the 1973 oil embargo, extended interviews and more. ---------- www.energyxroads.com/trailer.html	hi ---------- US
Money As Debt ---------- 2006 ---------- 47 mins ---------- Canada	From www.themoneymasters.com o This excellent, entertaining and animated feature by graphic artist and videographer, Paul Grignon, explains – in careful detail - today's magically perverse debt money system. From Ben Brangwyn of Transition Network o Essential viewing for everyone. Explains, simply and clearly, the rise and rise of banking from its earliest origins into the dominant form it is today. Basically, without money reform and a removal of the debt/interest basis of our economy, all attempts at sustainability are doomed to failure. o Will make you want to set up a local currency in your community! o Perhaps best used as an awareness tool for identifying the people who will form the Economics group in your Transition Initiative	hi --------- hi	http://www.moneyasdebt.net/ ---------- From the publisher: "purchase a box of 10 wholesale, screening rights included . Hold a FREE (or by donation) public showing and sell them retail" Ben comment: box of 10 wholesale with FULL SCREENING RIGHTS is $135 CAD (that's about £55). If you sell 6 at the retail price of c.£10, you've recouped the costs of the batch of 10. My guess is that at a screening at least one in twelve viewers would buy it. ---------- http://www.moneyasdebt.net/ click Trailer	ok – it uses simple animations with excellent voice over ---------- relevant to entire world

Title and details	Review – by Rob Hopkins unless noted otherwise	Doom rating --------- Solution rating	Where to get it ---------- Licensing ---------- Trailer	Production values ---------- US / Euro bias
11th Hour (produced by Leonardo DiCapricio) ---------- 2007 ---------- Full length ---------- USA	From a colleague in the UK: Here's a few good things: o it's not all about Leonardo, he doesn't do very much in it, he let's the experts do the talking o it's not just about global warming and climate change, it picks up on much wider sustainability issues o it's surprisingly bold in its criticism of corporates and the US government and questions the idea of unending economic growth quite well o it managed to get quite philosophical and deep about the role of humans on the earth etc, whilst still being easy to follow o it finished positively (much more so that AIT). The first two thirds of the film were deeply depressing, then the final third turned it around and it ended up quite invigorating. some weaknesses are: o very american centric (I don't think this is necessarily a problem though) o the 'what you can do personally' was maybe a little weak.	hi --------- hi	only on theatre release at the moment ---------- awaiting details ---------- http://wip.warnerbros.com/11thhour/	very high ---------- relevant to entire world

Title and details	Review – by Rob Hopkins unless noted otherwise	Doom rating --------- Solution rating	Where to get it ---------- Licensing ---------- Trailer	Production values ---------- US / Euro bias
The Great Warming ---------- 2006 ---------- Full length ---------- Canada	From Ben Brangwyn in the UK: Supported by the US National Wildlife Federation Pros: o refers to feedback mechanisms such as water vapour - this area is often underemphasised o lots of inspiring people rather than a high profile politician driving/flying/presenting o wide-ranging on impacts, looking around the world at agriculture, sea levels, droughts, even the Thames Barrier – a rather terrifying section if you happen to work on the ground floor of the Houses of Parliament o Not very North American centric Cons: o too much emphasis on technological solutions such as "hydrogen economy" and manmade "trees" that harvest carbon from the atmosphere o not enough emphasis on changing our underlying relationship with the planet	hi --------- med	https://www.thegreatwarming.com/orderform.php ---------- details requested from website re licensing ---------- http://www.thegreatwarming.com/	very high ---------- relevant to entire world
What A Way To Go: life at the end of the empire ---------- 2007 ---------- 123 minutes ---------- Canada	From Ben Brangwyn in the UK: Pros: o hardcore, hard-hitting personal journey into the ecological nightmare of civilisation. If you've never read Derrick Jensen or Ran Prieur or seen "End of Suburbia" this might be a tough watch. On the other hand, if you have, this one is essential viewing. o covers plenty of ground – discusses the confluence of Peak Oil, Climate Change, natural resource depletion and population Cons: o short on solutions o almost devoid of hope, presupposing that civilisation must collapse before we reach a more sustainable way of living – not much "transition" thought	hi --------- low	www.whatawaytogomovie.com ---------- small scale public single showing license is $50 10 pack DVD is $210 institutional lending license is $197 ---------- www.whatawaytogomovie.com/trailers/	very high ---------- relevant to entire world

Title and details	Review – by Rob Hopkins unless noted otherwise	Doom rating --------- Solution rating	Where to get it ---------- Licensing ---------- Trailer	Production values ---------- US / Euro bias
Message in the Waves ---------- 2007 ---------- 123 minutes ---------- BBC NaturalWorld 2007	From Ben Brangwyn in the UK: Pros: o a beautifully filmed, inspiring yet heart-rending look at what plastic and rubbish is doing to our ocean and marine life, looking particularly at Hawai'i o inspired Modbury to go plastic bag free, soon to be followed by many others, including China (perhaps). Cons: o plenty of surfing and beach shots (some would say that was a bonus!) o you'll never want to use a plastic bag again (another bonus?)	hi --------- low	http://www.megaupload.com/?d=7HNOTYWA ---------- The BBC were giving away the DVD and then ran out. They put it on an obscure and very unreliable download server for free download. I managed to retrieve it and put it on our fast download server ---------- http://www.messageinthewaves.com/	very high ---------- relevant to entire world
Manufactured Landscapes ---------- 2007 ---------- 90 minutes ---------- Canada	From James Samuel in Transition Waiheke Island, New Zealand: "This film made me gasp, in shock at the sheer magnitude and scale shown by the images. It's like nothing I have ever seen. It begins with a glimpse into ... industrialised China. The film shows another reality, one which exists simultaneaously with our own, and one we are not separate from, but are part of and contribute to. The narration by Edward Burtynsky is brief and intermittent - just enough to connect some of the dots. And it talks about Peak Oil."	hi --------- low	http://www.mongrelmedia.com/films/ManufacturedLandscapes.html ---------- No group showing license available yet ---------- http://www.youtube.com/watch?v=67j7JlEZzpQ	very high ---------- relevant to entire world

Transition Network

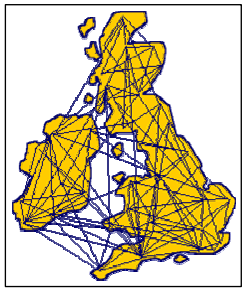
In parallel with these efforts at Totnes, we've set up a national charity, "Transition Network" to support the Transition Initiatives that are springing up around the UK and Ireland.

The mission of the charity, with initial funding from the Tudor Trust and Esmee Fairbairn Foundation, is focused on:

> "inspiring, encouraging, supporting, networking and training communities as they consider, adopt, adapt and implement the transition model in order to establish a Transition Initiative in their locale. The model emboldens communities to look peak oil and climate change squarely in the eye, unleash the collective genius of their own people and significantly rebuld resilience (in response to peak oil) and drastically reduce carbon emissions (in response to climate change)."

We're building a range of materials, training courses, events, tools & techniques, resources and a general support capability to help these communities. It's early days and we have a lot of work to do – but we're getting on with it!

The charity is located in Totnes to stay close to where some of the main innovations are happening right now. The vision for Transition Initiatives is a UK that is resilient in the face of the challenges posed by Peak Oil and that has dramatically reduced its carbon emissions.



To get an idea of the scale of the task in hand, there are 11,000 villages and towns in England and Wales alone, along with 60 cities and a huge number of rural communities. Each of these will need to transition to a significantly lower energy way of living.

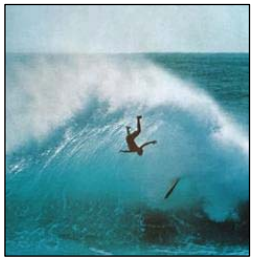
We collectively demonstrated huge levels of ingenuity and spirit as we climbed up the energy curve. There's no reason that we can't use those same qualities to design our way down the other side. And in fact, if we start early and work with sufficient creativity and inclusivity, we may find that a lower energy life is a qualitative improvement over the current disconnected existence that many of us lead.

Conclusion

The three levels of action – global (eg Kyoto, oil depletion protocol and C&C), national (eg tradable energy quotas) and local (eg transition initiatives) – hold much promise to see humankind through the great energy transition of the 21st century. With cooperation, coordination and a following wind, we have the potential to create a more fulfilling, more equitable and more sustainable world.

The challenge is to find a way to proactively navigate the down-slope of Peak Oil while taking actions to address Climate Change.

As a species, we'll be transitioning to a lower energy future whether we want to or not. Far better to ride that wave rather than getting engulfed by it.



Further Reading

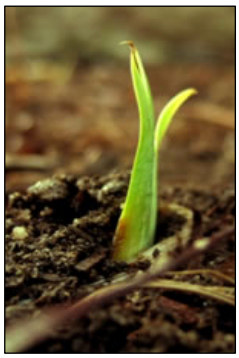
Website links are current as 20-June-07.

On Community Transitioning

- Rob Hopkins "Energy Descent Pathways: Evaluating potential responses to Peak Oil", self published MSc thesis, available from: www.transitionculture.org/?page_id=508

On Peak Oil

- Energy Bulletin
  - excellent Peak Oil primer: www.energybulletin.net/primer.php
  - multiple news feeds on energy issues: www.energybulletin.net
- ASPO – Association for the Study of Peak Oil. The source of much data and inspiration and where Peak Oil awareness started.
  - www.peakoil.net/
- The Hirsch Report – produced for the US government in 2005. Was almost lost until it gained prominence in 2006. Remarkable for the unequivocal call to urgent action in order to mitigate the effects of Peak Oil.
  - www.netl.doe.gov/publications/others/pdf/Oil_Peaking_NETL.pdf
- David Strahan (2007) The Last Oil Shock; a survival guide to the imminent extinction of petroleum man. Published by John Murray. Probably the best book on Peak Oil and its implications for the UK. Also up-to-date news at: www.davidstrahan.com/
- Richard Heinberg – any of his books.
  - The Party's Over: Oil, War and the Fate of Industrial Societies
  - Powerdown: Options and Actions for a Post-Carbon World
  - The Oil Depletion Protocol : A Plan to Avert Oil Wars, Terrorism and Economic Collapse
  - Additionally, his essays on Peak Oil often appear on the Energy Bulletin website above.



- Hardcore Peak Oil site for people who want graphs, data and complex analysis. Astounding research levels. Sometimes a bit too geeky: www.theoildrum.com

Climate Change

- The Intergovernmental Panel on Climate Change – the world's most authoritative body assessing Climate Change
  - www.ipcc.ch
- A commentary by working climate scientists on breaking climate news stories
  - www.realclimate.org
- Hadley Centre – the Met Office's bureau for researching the potential effects of Climate Change.
  - www.metoffice.gov.uk/research/hadleycentre/

Contact Details

Ben Brangwyn
Co-founder, Transition Network
email: benbrangwyn@transitionnetwork.org
phone: +44 5601 531882
skype: benbrangwyn

Descending the Oil Peak:
Navigating the Transition from Oil and Natural Gas

Report of the City of Portland
Peak Oil Task Force

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City of Portland Peak Oil Task Force members

Affiliations are provided for identification purposes and are not intended to represent the formal participation of any agency or organization.

Richard Benner, Metro

Christine Caruso, MCM Architects and Portland Planning Commission

David Cohan, Portland Peak Oil and Northwest Energy Efficiency Alliance

Angela Crowley-Koch, Oregon Chapter of Physicians for Social Responsibility

Lesa Dixon-Gray, Oregon Department of Human Services

Allen Lee, Quantec

Jeanne Longley, Zero Waste Alliance

Bill Scott, Flexcar

Sallie Schullinger-Krause, Oregon Environmental Council

Marcus Simantel, retired farmer

Randy White, Clear Channel Radio

Rowan Wolf, Portland Community College

Staff

Michael Armstrong, Office of Sustainable Development
Kyle Diesner, Office of Sustainable Development
Steve Dotterrer, Bureau of Planning
Matt Emlen, Office of Sustainable Development
Lavinia Gordon, Office of Transportation
Peter Hurley, Office of Transportation
Andria Jacob, Office of Sustainable Development
John Kaufmann, Oregon Department of Energy
Patty Rueter, Office of Emergency Management
Charlie Stephens

Contents

Executive Summary

Introduction: Preparing for Peak Oil

Every day, businesses, government agencies and households around the world plan and make decisions based on the assumption that oil and natural gas will remain plentiful and affordable. In the past few years, powerful evidence has emerged that casts doubt on that assumption and suggests that global production of both oil and natural gas is likely to reach its historic peak soon. This phenomenon is referred to as "peak oil." Given both the continuous rise in global demand for these products and the fundamental role they play in all levels of social, economic and geopolitical activities, the consequences of such an event are enormous. This report assesses Portland's vulnerabilities in the face of wide-ranging changes in global energy markets and provides an initial set of recommendations for addressing that challenge thoughtfully and prudently.

Task Force Created by City Council

In May 2006 Portland City Council adopted Resolution 36407 establishing the Peak Oil Task Force consisting of 12 citizens from a wide variety of backgrounds. The resolution charged the Task Force with examining the potential economic and social consequences of peak oil in Portland and developing recommendations to mitigate the impacts of rising energy costs and declining supplies. Over the past six months, the Task Force held more than 40 meetings and involved more than 80 stakeholders and interested citizens in gathering information.

Impacts and Vulnerabilities: High Fuel Prices Will Change Portland

Fifty years from now, the peak of global oil production will be a distant memory. Predictions for the year oil production will peak range from present day until 2040, with the most common estimates between 2010 and 2020. Despite the apparent breadth of current projections, even the most optimistic forecasts offer little time to adapt given the very long lead times required to change such things as transportation and building infrastructure.

Of all the impacts from rising oil prices, the clearest are those on transportation, which will experience profound pressure to shift toward more efficient modes of travel. For personal travel, this means transit, carpooling, walking, bicycling and highly efficient vehicles. Transportation of freight will become more costly and either decline or shift modes from air and truck to rail and boat. Population may shift to city centers, and density and mixed-use buildings will increase.

Food is a critical resource, and the American food system has become highly dependent on fossil fuels. Food production and distribution accounts for 17 percent of U.S. energy consumption. Because of this, higher oil and natural gas prices are expected to lead to a decline in the amount and variety of food produced and available locally, even with Portland's proximity to the agricultural production of the Willamette Valley. Food prices will rise, further straining the ability of low-income households to put food on the table.

Like agriculture, the economy as a whole is expected to experience significant disruption and volatility. Impacts will vary widely by industry and firm, and Portland has strengths in high technology and a relatively diversified transportation system. Portland also enjoys a strong and growing clean energy sector, which is likely to see increased demand. Nevertheless, many of Portland's industries are dependent on national and global markets, and business start-ups and failures are likely to increase.

Unemployment could be a major economic and social issue. This is of particular concern, since social services are already stretched to their limits. Vulnerable and marginalized populations are likely to grow and will be the first and hardest hit by rising oil prices. Increasing costs and decreasing incomes will reduce health coverage and further stress the health care system, which is already in crisis. Heating, maintenance, and monthly housing costs will consume a larger share of household budgets and push people toward lower-quality housing choices at the same time that auto transportation costs increase dramatically. First responders, especially police, are likely to be further taxed as social service agencies struggle to meet demand.

Recommendations: Act Big, Act Now

The Task Force findings illustrate the profound economic and social vulnerabilities that could result as fuel supplies cease to be abundant and inexpensive. The magnitude of this issue led the Task Force to explore bold and far-reaching solutions. The Task Force is unified in urging strong and immediate action.

The Task Force recommends preparedness on two different levels. Most of the recommendations seek to reduce Portland's exposure to rising fuel prices, anticipating the economic and lifestyle adjustments that will be needed in the future. Other recommendations prepare Portland to maintain community stability as volatile energy markets trigger conditions ranging from emergency shortages to longer-term economic and social disruption.

Reduce Portland's exposure*:* The Task Force proposes cutting oil and natural gas consumption in half, transforming how energy is used in transportation, food supply, buildings and manufacturing. It proposes strategies to maintain business viability and employment in an energy-constrained marketplace.

Strengthen community cohesion**:** However well Portland succeeds in its energy transition, it will not be able to isolate itself from global energy crises or the resulting economic implications. The Task Force sees the potential for profound economic hardship and high levels of unemployment, and it recommends having plans in place to adapt social and economic support systems accordingly. Similarly, contingency plans are needed for fuel shortages that may last for months or years, well beyond the time considered in existing emergency plans.

The Task Force recommends a comprehensive package of actions, proposing strategies to initiate institutional change and to motivate action by households and businesses. The recommendations propose major changes for Portland, but the Task Force believes their implementation can have a positive social and economic impact as local residents and businesses spend less on imported fuels and redirect dollars into the local economy. This presents a significant economic development opportunity for Portland.

While all the recommendations are important, ***achieving a significant reduction in oil and natural gas use*** is a necessity for easing the transition to an energy-constrained future.

1. Reduce total oil and natural gas consumption by 50 percent over the next 25 years.

Leadership builds the public will, community spirit and institutional capacity needed to implement the ambitious changes. Leadership is needed to build partnerships to address these issues at a regional and statewide level.

2. Inform citizens about peak oil and foster community and community-based solutions.
3. Engage business, government and community leaders to initiate planning and policy change.

Urban design addresses the challenge at a community scale.

4. Support land use patterns that reduce transportation needs, promote walkability and provide easy access to services and transportation options.
5. Design infrastructure to promote transportation options and facilitate efficient movement of freight, and prevent infrastructure investments that would not be prudent given fuel shortages and higher prices.

Expanded efficiency and conservation programs shape the many energy choices made by individual households and businesses.

6. Encourage energy-efficient and renewable transportation choices.
7. Expand building energy-efficiency programs and incentives for all new and existing structures.

Sustainable economic development fosters the growth of businesses that can supply energy-efficient solutions and provide employment and wealth creation in a new economic context.

8. Preserve farmland and expand local food production and processing.
9. Identify and promote sustainable business opportunities.

Social and economic support systems will be needed to help Portlanders dislocated by the effects of fuel price increases.

10. Redesign the safety net and protect vulnerable and marginalized populations.

Emergency plans should be in place to respond to sudden price increases or supply interruptions.

11. Prepare emergency plans for sudden and severe shortages.

Each of these 11 major recommendations is accompanied by a series of action items detailing how it can be implemented.

Next steps

A number of the recommendations imply the need for a central program to coordinate goal setting, tracking and communications. Other recommendations are policies, programs or projects to be implemented by specific bureaus or groups of bureaus. The Task Force proposes that a team of city staff be appointed to translate these recommendations into a funded, operational course of action.

Acting on this report, however, does not need to await further study or analysis. City bureaus can immediately look for ways to incorporate these energy concerns and impacts into ongoing planning activities and educational programs around sustainable development. City Council can challenge bureaus to align their investments and activities with the recommendations outlined in this report.

Finally, the Task Force members would like to express their willingness to continue assisting the City of Portland as it engages City staff and the public about peak oil and Portland's energy future.

Introduction: Preparing for Peak Oil

Every day, businesses, government agencies and households around the world plan and make decisions based on the assumption that oil and natural gas will remain plentiful and affordable. In the past few years, powerful evidence has emerged that casts doubt on that assumption and suggests that both oil and natural gas production are likely to begin to decline significantly. This phenomenon is known as "peak oil."[1] Given the fundamental role of oil and natural gas in all levels of social, economic, and geopolitical activities, the consequences of such a change are enormous. Portland City Council created the Peak Oil Task Force by resolution to investigate the implications for Portland of a future in which oil and natural gas production is declining, prices are rising, and supply is subject to periodic volatility. The resolution charged the Task Force with addressing these issues and presenting findings and recommendations to the City Council.

The starting point for the Task Force is well summarized in the introduction to the February 2005 United States Department of Energy (U.S. D.O.E.) report, *Peaking of World Oil Production: Impacts, Mitigation, & Risk Management*:

> The Earth's endowment of oil is finite and demand for oil continues to increase with time. Accordingly, geologists know that at some future date, conventional oil supply will no longer be capable of satisfying world demand. At that point world conventional oil production will have peaked and begin to decline.[2]

While there is a wide range of opinions on when the peak will occur, many experts predict global oil production will peak within five years, and few anticipate a peak later than 2020. For purposes of the Task Force these debates about when the peak will occur are largely irrelevant. Fossil fuel consumption patterns cannot be substantially altered without changing the transportation and building infrastructure. Since these change slowly, action is required now even if peak production is 10 or more years away. Again, the U.S. D.O.E. report is instructive:

> Mitigation will require an intense effort over decades. This inescapable conclusion is based on the time required to replace vast numbers of liquid fuel consuming vehicles and the time required to build a substantial number of substitute fuel production facilities. . . . There will be no quick fixes. Even crash programs will require more than a decade to yield substantial relief.

Development of alternative liquid fuels will help, but no credible authority believes that a significant portion of petroleum transportation fuels can be replaced by alternatives in the short term or that they can make up the whole gap, even in the long term.

To avoid unnecessary confusion and debate in the reading of this report, a crucial point of understanding is that peak oil does not imply that the world is physically running out of oil or natural gas in the immediate future. Generally, the peak of production is expected to occur at the point at which about half the resource has been used, meaning that half still remains. The crucial concern is that, while production is approaching its peak, demand for oil is rising rapidly. The

[1] In keeping with standard usage, the term "peak oil" is used throughout this report to refer to both oil and natural gas.
[2] Commonly referred to as the "Hirsch Report."

inevitable collision between escalating demand and a plateau and decline in production will bring sweeping economic consequences.

The oil and natural gas we have already used were relatively cheap to obtain. Many of the existing oil fields are known to be in decline, and the remaining supplies are deeper, under water, in more extreme climatic locations and/or in politically unstable regions. All these conditions place upward pressure on production costs. Following from this, even current production levels cannot be maintained without massive, risky investments in new production that will directly increase costs. Even in a static situation, therefore, either production will fall or costs—and then prices—will rise. Unfortunately, the situation is not static. Greatly exacerbating the increasing cost of production is rapidly increasing global demand resulting from accelerating industrialization, particularly in China and India, both of which have extremely large populations. Current production capacity exceeds demand by only a few percent, and that margin is steadily shrinking. As in any market where production costs are rising, demand is rising, and supply and demand are closely matched, basic economic theory holds that:

1) Long-term prices will rise;
2) Short-term prices will be more volatile, with spikes and drops occurring at an increasing rate; and
3) Supplies will become less reliable because even small disturbances at any point in the production or delivery chains will lead to immediate shortages for consumers.

The scenario that the Task Force addressed assumed all of these outcomes would occur. The Task Force focused its efforts, however, on the impacts of gradually increasing long-term prices because the longer timeframe allows for the development and implementation of meaningful long-term policy recommendations. While the Task Force fully believes oil and natural gas supplies will likely be punctuated by sudden disruptions and price hikes that will trigger periodic emergencies, it also recognizes that it has less to add in this arena, as the consequences will be similar to other types of emergencies which are already addressed by agencies such as the Portland Office of Emergency Management.

The Task Force acknowledges the possibility of a scenario in which the impacts are so severe that society will deteriorate severely, leading to rampant unemployment, hunger, crime and violence. While such a collapse is not out of the realm of possibility, the Task Force felt it would not be constructive to focus on it because, by its very definition, such a situation implies that government is able to respond in an extremely limited way. The transition the Task Force chose to focus on is meant to mitigate the likelihood of such a collapse and to provide some ability to respond to a collapse, should one occur.

During six months of careful study, consultation and dialogue, the Task Force investigated the types of impacts that Portland may experience as a result of changes in the global supply and demand for oil and natural gas. This document briefly reviews the process the Task Force followed in developing this report, explores in detail the impacts peak oil is anticipated to lead to, and makes recommendations to City Council for responding to those impacts. This report is intended to assess Portland's vulnerabilities in the face of wide-ranging changes in global energy markets and to provide an initial set of recommendations for addressing that challenge thoughtfully and prudently.

Task Force Process

In May 2006 Portland City Council adopted Resolution 36407 establishing the Peak Oil Task Force. In the resolution, City Council charged the Task Force with four key tasks:

1) Review information on the issues of peak oil and natural gas production and the related economic and social consequences;
2) Seek community and business input on the impacts and proposed solutions;
3) Develop recommendations to City Council on strategies the City of Portland can take to mitigate the impacts of declining energy supplies in areas including, but not limited to: transportation, business and home energy use, water, food security, health care, communications, land use planning, and wastewater treatment; and
4) Propose methods of educating the public about peak oil in order to create positive behavior change among businesses and residents that reduces dependence on fossil fuels.

The resolution also instructed the Offices of Sustainable Development, Transportation, and Emergency Management and the Bureau of Planning to provide staff support to the Task Force. In addition, the Oregon Department of Energy agreed to provide technical assistance on energy and policy issues.

Commissioner Dan Saltzman appointed 12 members to the Peak Oil Task Force in July 2006. At its first meeting, the Task Force established four subcommittees to examine peak oil from several perspectives, which, while overlapping, were also intended to produce distinct insights. The four subcommittees were:

1) Land Use and Transportation
2) Food and Agriculture
3) Public and Social Services (including education, health, social services, utilities and public safety)
4) Economic Change

Each Task Force member participated in at least one subcommittee, and about 10 members of the public also participated regularly in subcommittee meetings. Each subcommittee identified a set of relevant issue areas and stakeholders, experts and other resources to consult. After the initial organizational meetings, subcommittee meetings typically involved a discussion with one or more stakeholders or experts, including local and state agencies, major regional employers, health care providers, developers, food retailers, human service agencies and economists, among many others. From July through December 2006, the full Task Force met every two weeks, with each subcommittee convening at least once between meetings of the Task Force. Collectively, the Task Force held more than 40 subcommittee meetings and involved 80 stakeholders. An additional 40 citizens participated in at least one Task Force or subcommittee meeting, with most taking part in multiple meetings.

Task Force subcommittees generally directed their efforts first toward gathering relevant background information and context; second, toward exploring likely impacts of peak oil on their focus areas; and third, toward developing recommendations to address the anticipated impacts. Subcommittees reported their preliminary findings and proposals to the full Task Force, where they were reviewed and discussed. After the four subcommittees produced their preliminary impacts and

recommendations, a fifth subcommittee was formed to develop recommendations for how best to inform and engage the public and encourage behavior change. In addition, Task Force members identified several umbrella issues and recommendations that were added to those developed by subcommittees.

A draft report was released on January 18, 2007 with comments accepted through February 12. Feedback was received in the following forms:

- 44 individuals provided comments using an online comment form
- 7 organizations submitted letters:
    - Cascade Policy Institute
    - Multnomah County Health Department
    - Northwest Natural Gas
    - Oregon Department of Transportation
    - Oregon Electric Vehicle Association
    - Western States Petroleum Association
    - Portland Office of Emergency Management
- 30-40 people attended one of two public forums
- Briefings were conducted for several groups:
    - Staff from City Commissioners' offices
    - Food Policy Council
    - Metro
    - Planning Commission
    - Sustainable Development Commission

After the close of the comment period, the Task Force met to review input received and determined changes for its final report.

Impacts and Vulnerabilities

Global Context – When will production peak?

Oil and gas are finite resources, and their production will indisputably peak. Fifty years from now, the actual peak of global oil production will be a distant memory. Despite the apparent breadth of current projections of the peak year of oil production—predictions range from now until 2040, with the most common estimates between 2010 and 2020—even the most optimistic projections offer little time to adapt, given the vast public and private infrastructure built in anticipation of inexpensive fossil fuels for decades to come. The Task Force concluded that the peak is likely to occur sooner rather than later, but the actual timing has only a modest effect on the magnitude and urgency of the overall issue. (Appendix 1 summarizes issues relating to the timing of the peak.)

Several events occurred during the Task Force's work, however, that could be interpreted to suggest that peak oil is well off in the future and that any action can be delayed. In fact, a close examination of these developments confirms the need to take urgent action and helps make clear why the range of predictions is a relatively minor issue.

First, in September 2006 media reports announced a "new" oil field in the Gulf of Mexico. While large by today's standards, it is small by historical standards, and its existence has been known for years. If the early estimates are confirmed by further drilling, the field represents only one to six months worth of oil at current levels of world consumption and would have no noticeable effect in delaying the peak. In addition, the field is located in a hurricane-prone area under 7,000 feet of water and another 20,000 feet below the ground, which will adversely affect costs and production.

Second, Cambridge Energy Research Associates, a major economic consulting firm, released a report in November 2006 with the most optimistic forecast yet of ultimately recoverable reserves, proposing that world oil production will not peak before 2030. The estimate has come under heavy criticism, and the Task Force sees no reason to reverse its opinion of the seriousness of the problem or its recommendations. Even if this forecast does turn out to be accurate, it does not eliminate the problem, but only postpones it briefly, providing much-needed time to take preventive and mitigating actions. Taking no action in the near term increases the likelihood of an emergency situation in the future. The impacts of delaying action and being wrong are far more damaging than the impacts of preparing now and being wrong. In fact, the impacts of waiting until 2030 to respond will make the inevitable adjustment even more difficult, since the economy will have become still more dependent on fossil fuels in the meantime. It is only prudent to begin to plan and prepare now; if indeed the optimistic estimate proves correct, Portland would be unwise to squander the good fortune of a grace period.

Third, oil prices declined from a high of $79 per barrel in July and August to $58 per barrel in October; correspondingly, gasoline prices dropped from about $3.00 per gallon to $2.25, and predictions circulated on the internet and elsewhere that gasoline could drop to as low as $1.15 per gallon. Short-term fluctuations can be misleading, however, and it is the long-term trends that are key. Crude oil prices averaged about $15 per barrel from 1986 to 1999, with an annual average value of $20 per barrel in 1990 leading up to the first Gulf War and an annual average low of $10 per barrel in 1998 as a result of the East Asian financial crisis. Prices averaged about $25 per barrel from 2000 to 2003 and climbed to almost $37 per barrel in 2004, $51 per barrel in 2005, and $62

per barrel through November 2006. From 2000 to 2005, crude oil prices rose an average of 14 percent annually.

Several other forces may also create conditions that look and act much like peak oil and provide further grounds for action:

- Geopolitical events affect production of fossil fuels. Most of the remaining oil and natural gas is in nations that are either unstable or hostile to the U.S., and both voluntary production cuts and war-related disruptions have and will continue to limit productive capacity or output.
- The production and use of fossil fuels may have to decline rapidly to reduce carbon emissions in response to global warming.
- Economic pressure to reduce U.S. use of fossil fuels may arise if the value of the dollar declines significantly. The U.S. currently uses a disproportionate share of the world's oil and natural gas, but as the dollar declines in value the effective rise in oil prices will put pressure on the U.S. economy to reduce oil purchases. This could happen if U.S. debt is called in or nations begin to conduct more oil transactions in currencies other than U.S. dollars.[3]

Summary of Impacts

A key charge of the Task Force was to assess the local impacts of peak oil and natural gas. Recommendations can then be developed to respond to the anticipated impacts. In turn, the severity of the impacts depends on how well the community prepares.

Carrying Capacity

The human carrying capacity of the planet has been dramatically increased by the use of fossil fuels. Fossil fuels meant humans no longer had to rely on animal power or "current" solar energy in the form of wind, hydro and biomass energy. Instead, humans harnessed the stored solar energy captured by plants and converted to fossil fuels by geologic pressures over millions of years. Fossil fuels allowed a dramatic increase in humans' ability to provide shelter and produce and transport food and other products to spur a growing economy and population.

What will happen to that carrying capacity when its underlying driver is no longer available? Fossil fuels are the most productive resources known, and any combination of alternatives will be less productive. All known alternatives have a lower "energy return on energy invested" than oil and natural gas—i.e., producing alternatives requires more energy than producing oil and natural gas, leaving less net energy gain with which to do other work. As a result, it is unlikely that alternatives will fully replace oil and natural gas in the quantities they are currently used. This will have wide-ranging impacts and force broad changes in Portland's future.

Historical Experience

The energy crises of the 1970s offer insight into the kind of effects that may occur when production of oil and natural gas peak. The Arab oil embargo of 1973 cut world oil production by 6 to 7 percent. Prices rose 50 percent in October 1973 and doubled in January 1974. As a result, annual U.S. gross national product growth fell from 4 percent in 1960-73 to 1.8 percent in 1973-82; productivity growth dropped from 2.5 percent in 1966 to less than 1 percent in 1979; unemployment rose from 4.8 percent in 1972 to 8.3 percent by 1975; inflation was 8.8 percent for the 1970s; and

[3] See, for example, "Oil producers shun the dollar," *Financial Times*, December 11, 2006, page 1.

inflation-adjusted take-home pay declined 6 percent from 1973 to 1979. The impacts defied conventional economic theories which assumed an inverse relationship between inflation and unemployment. In the 1970s the two rose in tandem, giving rise to the term "stagflation."

Cuba experienced an event similar to peak oil when it lost half its oil imports after the collapse of the Soviet Union in 1990. Imports and exports both fell by about 80 percent, and gross domestic product dropped by more than one third. Transportation, industry and electricity production experienced major disruptions. Agricultural production dropped drastically, and because of the U.S. embargo and reduced production and trade, Cuba was unable to import enough food. As a result, the average daily caloric intake in Cuba dropped by one-third. In response, Cubans strengthened community networks to find alternative ways of growing food and providing essential services. While instructive of the potential impacts that withdrawal of a critical resource like oil can have on a society, Cuba's level of energy use was much lower to begin with and its mix of business and industry was very different from Portland's, as is their political structure.

Direct and Indirect Effects

The three main functions that will be directly affected by peak oil and natural gas are transportation, heating of buildings and industrial activities that use oil or natural gas. These direct effects produce indirect or ripple effects throughout the economy. For example, the availability and cost of food could be significantly affected because of increased costs for transportation, processing and fertilizer, all of which depend on oil or natural gas. As production and transportation of industrial goods become more costly, employment, wages and purchasing power may all be adversely impacted; this, in turn, will have feedback effects on what goods and services are provided, as well as the number of people needing public assistance of some type. In many cases these indirect impacts can be more significant than direct impacts. Understanding the impacts on Portland requires an examination of these interdependencies.

Structure of Impact Analysis

As noted above, the Task Force identified four broad areas that would capture the majority of impacts: Economic Change, Transportation and Land Use, Food and Agriculture, and Public and Social Services. Housing was also identified as a major area, but it had individual components that could be addressed within several of the other categories.

For each of the four categories, the Task Force first identified how direct provision of products and services would be affected. To capture the indirect impacts as well, the Task Force explored how demand for the product or service would be affected and how upstream suppliers of materials or other services would be affected. In many cases a business may not use much energy directly and may therefore appear to be relatively insulated against even dramatic energy cost increases. However, getting material from suppliers who do depend more on oil or natural gas to produce or transport their product could be problematic. Moreover, consumer demand for most products and services will weaken if and purchasing power erodes due to rising unemployment rises or declining income.

The Task Force identified three possible scenarios associated with peak oil and natural gas.

> **Scenario 1—Long-Term Transition:** The impacts of peak oil are potentially severe, but the decline in supplies and the rise in prices will occur at a fairly gradual pace, allowing time to plan for and potentially mitigate some impacts of peak oil. To provide a sense of scale, this scenario contemplates that the U.S. reduces its fossil fuel use by 50 percent over the 20

years following the peak, even as population continues to increase. While other fuel sources will be developed, they will not be sufficient to meet current levels of demand, particularly for transportation fuels.

Oil and natural gas prices would trend upward, though with significant price rises and dips. Price drops may last for as much as a year or more at a time and may give the impression that there is no problem or that the problem has been addressed. However, dips are to be expected, in part because previous price increases dampened consumption, whether by energy users conserving, substituting other inputs, going out of business, or moving their facilities. However, supply will continue to fall and consumption may increase because of temporarily lower prices, forcing prices to climb again. Each time prices drop they will not drop as low as the previous cycle, and when they rise they typically will rise higher than the previous cycle, producing a gradual upwards ratchet on prices.

Scenario 2—Oil Shocks: The long-term decline of world oil and natural gas supplies is punctuated by sudden disruptions and price hikes, triggering periodic sustained emergencies. Long-term impacts would be similar to the Long-Term Transition described above, but would require additional preparations to deal with the sudden dislocations that could persist for months or years.

Scenario 3—Disintegration: Whether sudden or gradual, the impacts become so severe that the social fabric begins to disintegrate. Unemployment, hunger, crime and violence are rampant, with socially catastrophic competition for scarce resources, including food, shelter and energy. A Disintegration Scenario could arise from failure of multiple global systems—financial, currency or trade, for example—and would force governments to dedicate an overwhelming share of their resources to basic human needs.

The scenarios are not mutually exclusive but are distinguished by the speed and the severity of the impacts. The Task Force focused its efforts on the Long-Term Transition scenario with the intent that its recommendations would reduce the likelihood of the severe disruption of the Disintegration scenario.

Impacts may manifest as economic problems

Impacts stemming from peak oil and natural gas may be difficult to recognize. The impacts will strongly resemble current economic and social problems, though they will be deeper and more persistent, and the tendency will be to treat them similarly to more traditional economic problems. However, since the source of the problem is rooted not just in economic policies but in physical constraints on a fundamental input into economic productivity, the problems will be more systemic and less susceptible to conventional economic analysis and remedies.

		SEVERITY OF IMPACTS	
		LESS SEVERE	MORE SEVERE
SPEED OF IMPACTS	GRADUAL SLIDE (STEADY OR BUMPY)	**Long-Term Transition** (focus of Task Force efforts) Long-term planning, policies, programs	**Disintegration** Limited ability to respond. Task Force recommendations are meant to help avoid this scenario.
	RAPID DECLINE PUNCTUATED BY SUDDEN SHOCKS	**Oil Shocks** Emergency Management Plan	

Impacts on Transportation and Land Use (T)

Of all the impacts of peak oil, the clearest are those on transportation, particularly use of the automobile. Transportation accounts for almost 40 percent of the energy used in Oregon, and 95 percent of the energy used for transportation is oil. With rare exceptions, cars, trucks, buses, planes, boats and trains all use petroleum-based fuels, and about 85 percent of all petroleum is used for transportation.

Peak oil has direct, major implications for movement of freight, movement of people and migration of populations into or out of an area. These, in turn, will have secondary but major impacts on land use patterns. Cheap transportation fuel after World War II strongly influenced land use patterns and roads, and buildings and roads are durable features of the landscape that are difficult and slow to change.

T1. Automobile use will decline and people will seek alternative transportation for their needs.
Rising prices for gasoline and its alternatives will force consumers to choices other than conventional single-occupancy automobile travel. Increases are expected in the use of gasoline-electric hybrids and other efficient vehicles, car pooling, combined multiple trips into one, and park-and-rides. Car trips will be fewer and shorter, and car sharing will become more common. While biofuels offer a partial replacement of petroleum-based liquid fuels, their scale is limited by agricultural capacity and the need to maintain food production.

Rising fuel prices will increase the demand for added capacity in non-auto modes. Use of public transit, bicycling, and walking will increase over time as fuel prices continue to rise. Likewise, demand for compressed work weeks and teleworking will increase. The cost of providing alternative transportation infrastructure and equipment, such as light rail, buses and bike paths, will rise as oil and natural gas prices rise. The longer action is delayed, the more expensive it will be. In addition, the operating costs of transit systems will rise.

If the number of car trips declines, traffic congestion and demand for parking will decrease. This would lead to a reduced demand for road capacity, improved freight movement, and improved safety for bicycles, pedestrians and motorists. Land could potentially become available for other uses. However, improvements in congestion and parking availability will encourage some to get back in their cars, at least in the short run.

Land use planning, high quality public transportation, and relatively good walking and bicycling infrastructure have kept the percent of household expenditures on transportation in Portland relatively low compared to other major U.S. cities (see Table 1). Vehicle miles traveled in the Portland area have been flat or declining in recent years (see Figure 1). Even with gasoline sales flat, however, expenditures on gasoline in Multnomah County have increased dramatically (see Figure 2).

Table 1. 2003 Household Expenditures on Transportation by Metropolitan Area

Rank	Metropolitan Statistical Area	% of Household Expenditures on Transportation
1	Houston	20.9%
2	Cleveland	20.5%
3	Detroit	20.5%
4	Tampa	20.4%
5	Kansas City	20.2%
6	Cincinnati	20.0%
7	Anchorage	19.9%
8	Dallas-Forth Worth	19.7%
9	Phoenix	19.6%
10	Miami	19.6%
11	Denver	19.2%
12	Seattle	19.0%
13	St. Louis	18.7%
14	Atlanta	18.7%
15	Los Angeles	18.4%
16	San Diego	18.4%
17	Honolulu	18.0%
18	Boston	17.2%
19	Minneapolis-St. Paul	17.2%
20	Chicago	16.9%
21	Milwaukee	16.6%
22	San Francisco	16.6%
23	Pittsburgh	16.6%
24	Philadelphia	15.9%
25	Washington, D.C.	15.4%
26	New York	15.4%
27	**Portland**	**15.1%**
28	Baltimore	14.0%
	United States	19.1%

Source: Center for Neighborhood Technology and Surface Transportation Policy Project, "Driven to Spend: Pumping Dollars out of Our Households and Communities," June 2005. Based on average annual expenditures and characteristics, Consumer Expenditure Survey, 2002-2003, for selected metropolitan statistical areas

T2. People and businesses will relocate to be closer to each other and to transportation options; population will likely shift to city centers, and density and mixed-use development will increase.

Land use patterns are strongly interrelated with transportation options. Inexpensive gasoline over the past half-century allowed for dispersed land use patterns, resulting in relatively lower population densities and longer distances between residential and commercial areas. This has made alternatives such as walking and public transit less attractive and viable.

In the long term, one of the responses to increasing costs and difficulties in transportation will be a spatial realignment of people and businesses. The question is whether it will happen quickly enough to minimize disruptions from peak oil. In addition, without public guidance or intervention, some of these realignments may leave vulnerable and marginalized populations worse off.

As automobile travel becomes more expensive, demand for housing closer to jobs, retail stores, services, schools, parks and other frequent destinations will increase, as will demand for housing that is more accessible to transportation options, such as public transit. These needs will likely spur two other changes.

Figure 1. Vehicles Miles Traveled

Portland metro (excluding Clark Co.) and United States

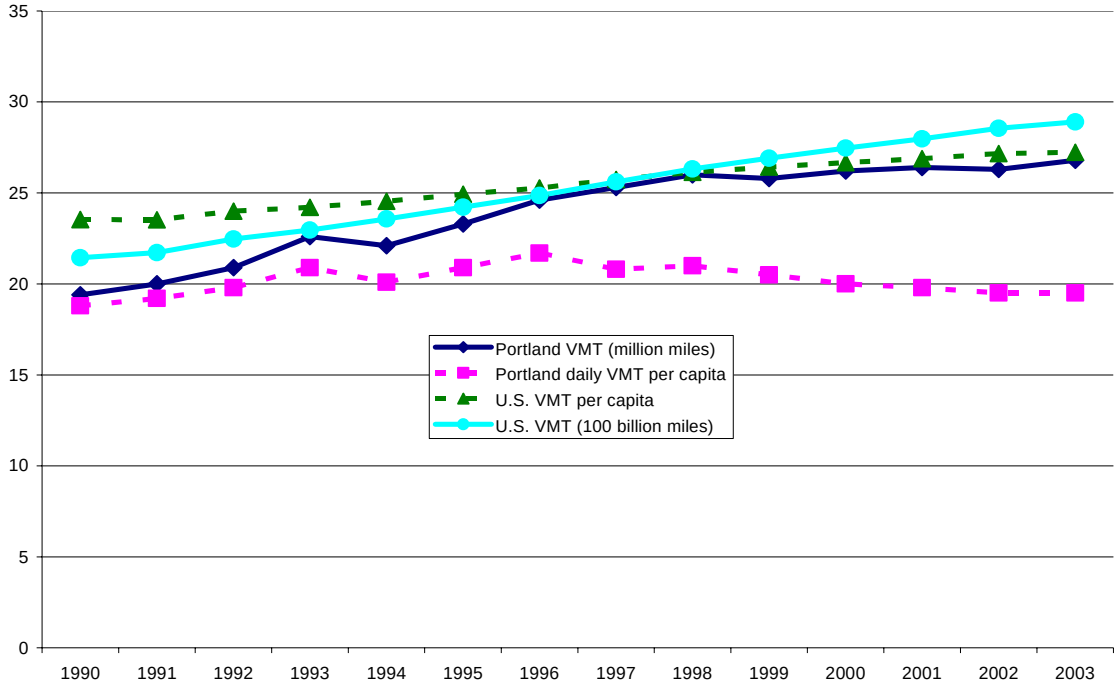
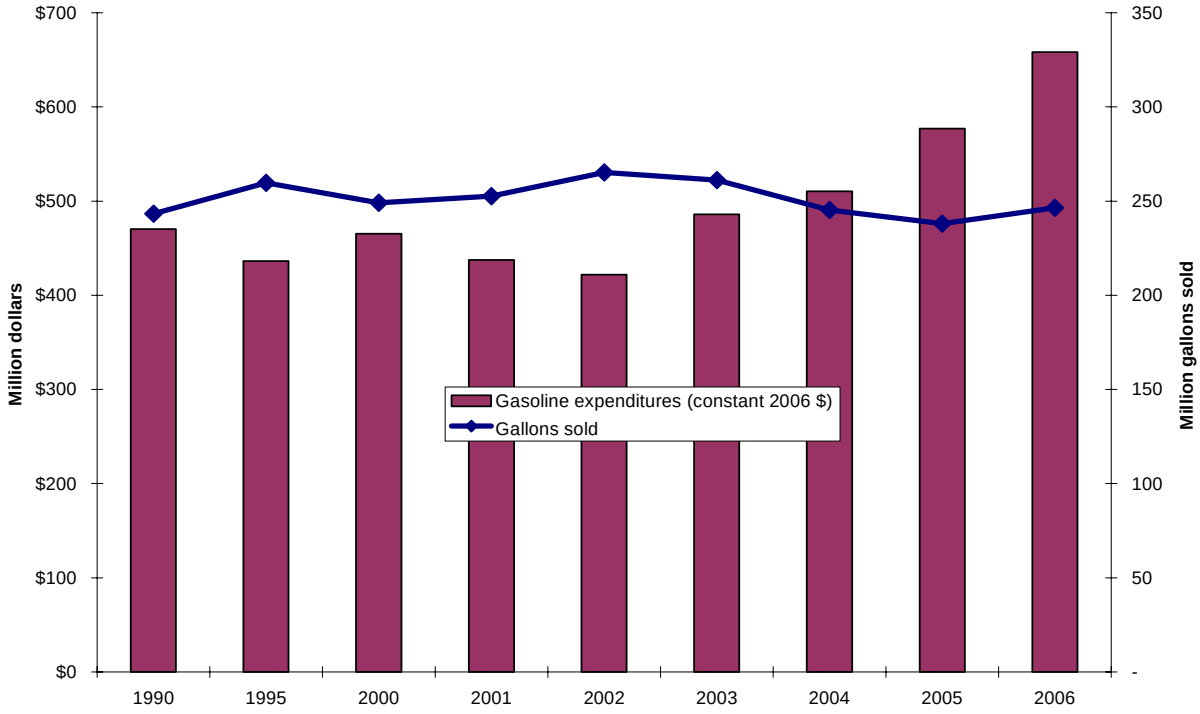


Figure 2. Gasoline sales and expenditures (Multnomah County)



First, there could be increased movement to city centers and reduced demand for suburban and exurban housing. As a result, homes will lose value in some areas and gain value in others,

depending on the convenience of shopping, schools, work and other services. Low-income and vulnerable populations will be displaced, with residents likely relocating to "edge" areas with poor access to these services. Low-income households already spend a much higher percentage of income on transportation, and the added transportation costs associated with living farther from city centers will make life increasingly difficult, causing these populations to be further marginalized. At the same time, the relocation of businesses, housing and services as a result of higher oil prices may create new neighborhood and town centers throughout Portland, including areas that currently have poor access to essential services.

Second, the attempt to move closer to jobs and services will increase pressure to allow mixed-use and high density development, which may conflict with current land use regulations. Densities may increase even without new development, because average household size could grow once again. Demand for and stress on public spaces will also increase.

Not only will people want to be closer to jobs and services, but the location of workplaces will shift as well. Businesses may want to be closer to customers, employees or intermodal transportation. Transportation system constraints are likely to drive changes in location and extent of supply-chain facilities and retail outlets.

T3. Transportation of freight will become more costly, likely leading to mode shifts from air and truck to rail and boat.

Freight is critical to the economy, both locally and globally. Portland is a trade-heavy economy, strongly influenced by the intersection of two interstate highways, two railroads, two navigable rivers and major port facilities, including an international airport. Raw materials, semi-processed goods and finished products must be brought into the region, and products produced locally must make their way to market. In addition, many products travel through Portland en route elsewhere. Two-thirds of energy used for freight transportation in the U.S. is for trucking and 23 percent for air. Trucks carry 75 to 80 percent of the weight and freight value shipped in Oregon; air freight accounts for about 1 percent of the weight and 7 percent of the value of goods transported nationally. Increases in oil prices could diminish the movement of freight through the region and harm the export sector.

Peak oil could reduce freight moved by long-haul truck and air. As a result, fewer goods would travel long distances, and the array of goods moved may be narrower. This will be particularly evident for products and materials that have relatively low value for their weight. Although air is the most fuel-intensive freight mode, the products transported by air are high value and therefore may be less affected.

Rising fuel prices will shift the comparative costs of shipping by truck, air, boat and rail, with the greater fuel efficiency of rail and boat providing a stronger competitive advantage than it does today. As a result, demand for shipping by rail and boat will increase. However, railroads are operating close to capacity now, and adding railroad capacity will be difficult, expensive and slow.

The shift to rail and boat will increase demand for intermodal connections, with implications for land use. Transportation by rail and boat is also slower than truck or air freight and will influence warehousing strategies and other business practices, which could also affect land use. The most dramatic change will be in time-sensitive goods and the widely used inventory-control strategy of "just-in-time" delivery.

Sudden changes in the price or availability of oil for transportation will have significant effects on freight transportation, with ripple effect on jobs and the economy.

T4. Air travel may decline significantly.
Personal air travel will be one of the first activities to be affected. Fuel accounts for half of airlines' costs, and this will rise post-peak. Air travel will be less affordable for discretionary trips. As with freight, some passenger travel could shift to more fuel-efficient intercity passenger transportation, most likely rail and bus.

T5. Maintenance of road infrastructure will be increasingly difficult because of loss of revenue and reliance on asphalt.
Gas tax revenues will decline as fuel conservation increases, reducing current funding sources for maintenance and construction of infrastructure. Alternatives such as tolls or weight-mile taxes will also be sensitive to reduced travel. Roads and bridges may handle less traffic and experience less wear-and-tear, but the present maintenance backlog is large and growing.

In addition to revenue constraints, road maintenance and repair will be made more difficult and costly because asphalt is a petroleum-based product. In 2005 road maintenance was hampered in some U.S. localities because of the high cost of asphalt. Concrete, which is currently more expensive than asphalt, is also energy-intensive and will increase in cost as fuel prices climb.

Impacts on Food and Agriculture (F)

Food is a critical resource, and the American food system has become highly dependent on fossil fuels in recent decades. Energy flow into agriculture has increased several-fold since World War II, and productivity of American agriculture has increased 82 percent since 1960. The "Green Revolution," fueled by fossil-fuel-based fertilizers, has increased calories available per person almost 20 percent worldwide. The food system now accounts for about 17 percent of the energy used in the U.S., the equivalent of about 400 gallons of oil per person annually. This includes the energy used to produce (e.g., fertilizers, irrigation, tractors and other farm equipment), transport, process and distribute the food. The production of nitrogen fertilizer, for example, requires natural gas, and there is no practical substitute currently available. As natural gas prices rise, use of nitrogen fertilizers will likely decrease, resulting in a reduction in world food production of as much as 60 percent. Moreover, food routinely travels thousands of miles to reach our tables. An estimated 5 to 10 calories of energy are typically used to produce one calorie of processed food.[4] In a very real sense, we are eating fossil fuels.

Oregon possesses some of the most productive agricultural land in the world. Oregon farmers produce over 225 different crops, fewer than only California and Florida, and agriculture accounts for 10 percent of the state's economic activity. Eighty percent of Oregon's agricultural production leaves the state, and one-half of that goes overseas, including 90 percent of Oregon's wheat production. The Port of Portland is the largest wheat exporter in the U.S., shipping wheat primarily from Oregon, Idaho and Washington overseas. About 60 percent of agricultural goods in the U.S. move by long-haul truck, including most processed foods.

[4] The term "processed foods" includes food items that are processed in any way. For example, meat is not generally considered a processed food, but in order to make bacon, the meat needs to be cut, cured, packaged and refrigerated before reaching the store. Even apparently "raw" foods such as produce are routinely washed, bagged, cut and/or boxed.

Oregon produces more than enough dairy products, wheat, potatoes, green peas, green beans, sweet corn, onions, pears, cherries and hazelnuts to be self-sufficient, and is close in a number of other products including various fruits, vegetables, nuts and seafood. Nonetheless, an estimated 65 to 75 percent of the food consumed in Oregon is grown out of state. Sixty-two percent of Oregon's harvested cropland relies on irrigation, and irrigated farms produce 77 percent of the total value of harvested crops.

Much of this bounty is within reach of Portland. The Willamette Valley accounts for more than 60 percent of the value of all crop production in the state, and almost 30 percent of the value of animal production. More than 40 percent of the crops produced are specialty products, such as nursery crops, turf, bulbs, seed stock and Christmas trees.

Food security today is affected more by access to food than production of food. While Oregon is a major agricultural producer, Oregon ranks among the worst in the nation in outright hunger and sixth for food insecurity. More than 650,000 people received emergency food assistance from the Oregon Food Bank network in 2000. In terms of food consumption, about 46 percent of American food dollars are spent in restaurants. About a quarter of our food is wasted, of which about half is edible.

In examining food production, transportation, processing, distribution and preparation, the Task Force identified the following major impacts.

F1. The amount and variety of food produced will decrease.
The globalized food industry relies heavily on inexpensive fossil fuels. Modern farm production is highly dependent on diesel-powered equipment; fertilizers are produced from natural gas and pesticides from oil. As the costs of these critical inputs rise, their use will decline, which will lower crop yields over time. (The increasing cost of North American natural gas has already caused almost half of U.S. fertilizer production to move offshore.) Corn and wheat, two staple crops, are particularly dependent on fertilizer and could experience significant declines. Impacts on diet and nutrition will be determined by the severity of the decline and which crops are most affected.

Some farmers will choose to leave farming as they struggle to maintain profitability. Reduced profitability also may increase pressures on farmers to sell their land for development. The result could be a combination of farm consolidation and reduction in acreage farmed.

Complicating factors such as drought years or fuel price spikes could lead to short- or medium-term food shortages. Long-term water availability may decline, in part due to the impacts of climate change. In extreme cases, farm acreage will go out of production due to a lack of water.

As transportation fuel costs rise, some farmers may choose to grow crops as feedstock for biofuel processing, leading to a reduction in acreage farmed for food. Like food crops, however, biofuel feedstock growers will face similar constraints on the cost and availability of inputs. As prices rise for both fuel and food, farmers will adjust crops accordingly.

F2. Food will cost more.
Peak oil will increase the cost of growing, transporting, processing and distributing food, and the costs of food to the consumer will rise. Foods that are highly dependent on fertilizer inputs, transported over long distances, require time-sensitive refrigerated transport, or are highly processed (e.g., ready-to-eat meals, many boxed foods, frozen foods and vegetables out of local growing

season) will experience the most significant cost increases. Many fresh fruits and vegetables, meats and dairy products are also vulnerable.

Rising fuel prices will increase pressure to transport food that is currently shipped by truck or air to rail or ship/barge. Some foods that are extremely time sensitive in shipping or that do not have enough value per unit weight or volume may not be shipped at all. Given that much of the food grown in Oregon is processed out of state, rising transportation costs may make more local processing attractive and financially viable.

F3. Low-income households are most vulnerable to higher prices and could see a decline in diet and nutrition.

Low-income households already spend a larger fraction of their household budgets on food than do families with higher incomes. As food prices rise, low-income households will be the hardest hit and may experience a decline in nutrition.

Rising food prices will put added demand on food assistance programs. At the same time the costs of food assistance will rise and donations and government funding may falter as a result of a broader economic downturn. The effectiveness and adequacy of the food assistance and emergency food distribution system will suffer without targeted efforts to bolster its resources and, perhaps more importantly, targeted efforts to prevent families from needing such assistance in the first place.

F4. The kinds of foods produced and processed will shift, introducing business pressures and opportunities for food producers and processors.

The relative costs associated with the production, processing and shipping of different kinds of food crops will cause some crops to be favored over others in the post-peak energy environment. Some will become relatively unprofitable and others relatively more so. As farmers and processors react to these realities, processors and consumers will see changes in the foods available to them.

The most energy-intensive foods, which today tend to be meats such as beef and pork, will see the most serious market declines. Processes that produce frozen or refrigerated foods, thereby requiring constant energy inputs for preservation, may be replaced by canning, drying or other kinds of preservation that allows storage in ambient conditions. More generally, fewer foods are expected to be affordable out of season.

Crops processed and grown locally, processed less, and shipped over shorter distances, without refrigeration, will be the most available and least expensive. New investments will likely be needed in processing capacity for these crops, with scale changes as indicated by the new cost structures. Some existing infrastructure investments may be stranded. Energy prices will be a much larger factor in determining where and how many plants are operated.

As pesticides, herbicides and fungicides grow more expensive and are used less, the visual quality and yields of many crops may diminish. Consumers may learn to become more concerned about the nutritional value of their food and less concerned with its appearance.

F5. Households will experience increased pressure to grow, process and handle their own food.

As the price of purchased food rises, many households could turn to growing and processing more of their own food. Local organic agriculture and residential gardens are least vulnerable to rising

fossil fuel costs and will likely contribute a growing share of the food consumed by Portlanders. Since many households do not have adequate or appropriate space for gardening, demand for community gardening space will increase.

Since few households now grow and process a significant amount of their own food, there will be a need for educational programs to teach these skills. Likewise, demand will increase for equipment and supplies used for home processing and storage of food. Many people will not have the cooking skills required to make the best use of food that is not significantly processed.

F6. Food retailing options will shift.

Large grocery chains currently source their products from a wide geographic area, and many foods travel a long distance to arrive on shelves in Portland. Time-sensitive and frozen and refrigerated foods are especially energy intensive to transport. Locally grown and produced food should be less energy intensive to the extent that much less transportation is needed. The closer to Portland the foods are grown and processed, the more likely it is that there will be direct relationships between producers and sellers, and possibly between producers and consumers. Large chain stores would benefit by becoming more local and less dependent on high-cost shipping methods. Consumers may start to migrate toward smaller-scale local retailers, including farmers' markets and community-supported agriculture, especially for fresh foods such as produce, meat and dairy.

Convenience will be less of a decision factor in shopping decisions, and cost will become more important to more households (this is already the most important concern in low-income households). Many highly processed or imported foods, such as processed meats and frozen foods, will see a decline in sales as they become optional in household food budgets.

Full-service restaurants are typically one of the first businesses affected in times of economic difficulty.[5] Alternatively, there may be an increase in patronage at fast-food restaurants, which provide the most calories at the lowest cost. However, fast-food chains are heavily dependent on the long-haul trucking and refrigeration of foods purchased and processed at regional plants, and the cost advantage may narrow over time.

F7. There will be less food waste and changes in packaging.

Food production and consumption generates large amounts of waste. Recent estimates suggest that only 50 to 60 percent of food is actually consumed, with nearly half lost through on-farm, retail and in-home wastage. Most of this food waste is landfilled today, with little composted. Metro and the City have been aggressively trying to divert edible food to food banks and have begun a program of commercial food waste composting. Metro also provides support for home composters. Plans call for moving to residential food waste collection in Portland when the current commercial composter locates a facility in the region.

As food costs rise, it is likely that food waste will decline. Similarly, current food packaging is largely derived from fossil fuels, and as prices rise, the use of such packaging will likely decline. The bio-based packaging that replaces today's materials will likely be more expensive as well, suggesting a trend toward more efficient packaging.

[5] For example, the restaurant chain Applebees reported that it "lost 5 percent to 6 percent of its customers in June and July [2006], when gasoline prices were at their peak." "Dip in Gas Prices Helps Consumers, Hurts Investors," *Morning Edition*, September 27, 2006.

Impacts on Business, Economy and Jobs (E)

Portland's history is rooted in its location at the confluence of two major rivers and ready access to the ocean and a great agricultural valley. Because of its location, Portland also became the hub of significant rail service. This network allowed Portland to develop as a production and shipping center for heavy and bulk products that can be transported by boat or rail. Portland also enjoys a head start on many other urban areas in terms of energy efficiency, renewable energy, alternative fuels, sustainable design and green building, all of which promise to be growth industries post-peak oil.

The economy serves to produce and distribute goods and services and to provide people with the income to afford these products and services. Portland's economy faces two big questions with respect to peak oil:

1) How will businesses remain viable in the face of constricted oil supplies?
2) How can Portland citizens remain employed in high quality jobs?

It is important to emphasize that Portland will not experience peak oil in a vacuum, and local changes will be felt relative to those taking place regionally, nationally and globally. Portland differs in important ways from other cities and regions and holds certain competitive strengths and weaknesses. In examining vulnerabilities in the local economy, Portland's economy must be considered together with the regional economy, which includes the greater Portland-Vancouver Metropolitan Statistical Area. Major export-oriented sectors of the economy include high technology, nursery stock, metals manufacturing and fabrication, transportation equipment and sports apparel. Other important sectors include construction and real estate, health care, retail and government.

Peak oil will affect the economy both directly and indirectly. Direct impacts are experienced in the actual operations of a business or industry. This includes fossil fuels used in building energy use, the transportation of goods, and in manufacturing, such as for process heat or as a raw material for chemical or plastic products. Indirect impacts, by contrast, occur upstream with suppliers of raw materials or semi-processed goods, or downstream in consumer demand for products and services. These impacts are more difficult to measure and forecast. While transportation and energy represent only a small portion of many businesses' costs, indirect impacts stemming from upstream supply problems or consumer demand may often be more significant.

The Task Force considered four key questions for various industry clusters:

1) How will peak oil affect production costs?
2) How will demand for the product or service be affected?
3) How will upstream suppliers of raw materials or semi-processed goods be affected?
4) What reasonable substitutes or alternatives are available to mitigate these effects?

The Task Force also considered the possibility that large shifts in international financial and currency markets could undermine the U.S. economy as a whole, including serious impacts in Portland. The recent decline in the value of the dollar, the possible shift away from the dollar in international oil transactions, and the complex interrelationships among these and related macro-economic issues merit close attention and further study, which is beyond the scope of the current report.

Below are potential major impacts the Portland economy may experience.

E1. Prices will rise, and the number of business start-ups and failures will increase.
Improvements in energy efficiency will enable businesses partially to buffer themselves from the impacts of peak oil, but the direct and indirect effects of rising energy prices will result in economic disruptions and dislocations, adversely affecting businesses and employment.

To the extent that energy prices rise while the aggregate size of the population (i.e., the supply of labor) increases, the cost of labor relative to the cost of energy will fall. This shift will provide new opportunities for skilled and manual labor as well as for efficient alternatives to existing technologies, materials, processes and services.

In general, rising production costs will lead to higher prices for goods and services, and both consumer purchasing power and consumption are likely to decline, as they did in the 1970s. In many industries, production may also take place on a smaller scale in decentralized locations, thereby sacrificing current efficiencies of scale that are largely the result of access to inexpensive fossil fuels.

The combination of increased production costs and decreased consumer purchasing power likely will increase the number of businesses that fail each year. To the extent that increased unemployment accompanies business closures, more people may try to create their own businesses. On a larger scale, this increase in the number of business start-ups and failures per year will increase the risks and uncertainties about economic downturns and what goods and services are provided, how and by whom.

E2. Some businesses will experience significantly higher production and distribution costs; others may be more impacted by changes in demand for their products and services.
Businesses will be affected by increases in the direct costs of producing and transporting their products or inputs. Businesses will also be affected indirectly, however, by significant changes in demand for some products. Every economic sector is likely to produce both winners and losers.

Manufacturers of products that are energy-intensive to produce will likely be among the first businesses to experience the adverse impacts of peak oil. In particular, suppliers of inexpensive raw materials that require high amounts of energy to extract or harvest and imported semi-processed components that are energy-intensive to manufacture may be some of the first to face increasing costs.

In addition to changes in the way that inputs are shipped, distribution of finished goods to consumers may change as well. Fewer non-essential or low-value products may be distributed to retail outlets and consumers by air and long-haul truck. Proximity to transportation hubs may also become a more important factor in the location of production facilities in order to limit exposure to rising freight costs. Similarly, proximity to employees and customers will become a more important factor in business decisions about where to locate.

Businesses that are located farther from population centers or that depend on the willingness of consumers to drive significant distances to shop may experience a sharper decline in sales than centrally located businesses. Neighborhood retail and other consumer services may gain customers as larger, more distant stores become less economic. At the same time, however, while local businesses may experience increased sales, they also may experience a disproportionate increase in

the transportation cost of supplying such retailers as a result of the inability to carry large inventories.

Businesses that depend heavily on discretionary consumer spending are at risk, especially those goods and services for which there are readily available substitutes, that are considered luxuries, or whose purchase can be put off. Industries that may experience a particularly strong decline in sales include restaurants, tourism, personal services, recreation, home furnishings and consumer electronics. Additionally, there may also be disproportionately less demand for consumer products that require oil or natural gas to operate.

Overall, the effects are difficult to predict. Policy makers should be aware that the challenges faced by businesses will be large and that the risk of business failure is great.

E3. Unemployment will likely increase in the short term.
Unemployment is likely to increase, at least initially, as businesses struggle to adjust to higher energy prices by changing business models or closing their doors. The middle class may shrink as people fall into lower income brackets and purchasing power is reduced. Increased numbers of unemployed workers will add stress to social services systems, including the Oregon Food Bank, the Oregon Health Plan, Low-Income Home Energy Assistance Program, Section 8 Housing and others.

It is unclear how severe or permanent this impact will be. If the decline in oil and natural gas production is rapid or unsteady, the unemployment problem will be more serious. Over time opportunities in renewable energy, goods and services that increase energy efficiency and other fields that may experience growth in the post-peak environment could offset job losses in other sectors, although the extent of this is uncertain.

E4. Impacts will vary in intensity by industry and business division.
Portland has a significant high-technology sector, and energy comprises a relatively small proportion of delivered high-tech product costs, despite using commercial aviation as the primary delivery mode. Although chip production is energy-intensive, electricity still accounts for a small proportion of producers' overall cost structure. Even as the cost of air freight increases, customers in the high-tech sector likely will be willing to pay more for the chips because chips are a high-value commodity. Peak oil's greater impact on the high-tech sector will be through the possibility of declining demand for some of its products as peak oil negatively impacts its customers and decreases demand. These negative impacts may be partially offset or even balanced by increasing demand for high-tech components in devices that increase energy efficiency. In general, the high-tech sector is probably less vulnerable than many to increased oil prices and has many opportunities to benefit.

Portland is home to several major transportation equipment manufacturers. Any shift from long-haul trucking and aviation shipping modes to rail and ocean shipping clearly will have significant impacts on these industries. The effect on individual firms is unclear but would likely represent a significant departure from current business plans, and some manufacturers would fare better than others.

Similarly, the Portland region includes several major employers in the highly globalized apparel industry that will likely experience the impact of peak oil in a variety of ways. The first is a decline in retail sales as consumer discretionary spending shifts away from luxury items to essential goods.

Second, distribution costs may increase dramatically because these companies rely heavily on trucking for national distribution of their products. Third, because petroleum products are used in the manufacture of many synthetic fibers, current raw materials will become more expensive. Business models are likely to undergo significant change, with uncertain impact on the various design, marketing, financial and other functions that provide employment in the Portland area.

The metals industry in Portland focuses mostly on steel manufacture and the fabrication of special products. Production costs of metal fabrication may not be hit hard, although electricity prices may increase as natural gas prices rise. However, to the extent that consumer demand shifts as a result of higher fuel prices, sales may be impacted depending on the type of products in which these manufacturers' goods are used.

Much of Oregon's nursery product is currently shipped long distances. As transportation costs rise, demand for low-value nursery products such as spruce trees likely will decrease. However, high-value products such as hazelnuts can withstand a rise in transportation costs. To the extent that nursery production declines, production and employment likely will shift from growing nursery stock to food crops.

The construction industry will be significantly impacted. Demand for new homes may decline as incomes are stretched to provide food, heat, transportation and clothing. In addition, production, processing, and transportation of construction materials will increase costs. The decline in the housing market will have ripple effects on the mortgage finance industry and real estate.

For many employees in the service sector, such as health care and retail, it will no longer be economical to commute long distances by car to reach low-paying jobs. Unemployment in these sectors could rise.

The public and non-profit sectors may also experience job cuts, as revenues from conventional sources will likely decline. The arts and creative sectors may be especially hard hit, as their products and services may be perceived as non-essential.

E5. Portland's population may grow faster than forecast as a result of in-migration.

The Portland metropolitan area may experience significant population growth as a result of peak oil. Oregon has long been heralded for its environmental ethic and livability, and Portland is a national leader in sustainable development. In addition, Portland offers a temperate climate with ample fresh water in the midst of some of the most productive and diverse agricultural land in the world. As a result, Portland is seen as better prepared than most areas to adapt to the impacts of peak oil and could attract people from other areas.[6] Population may also shift within the metro area, with greater concentrations of people in areas with better transportation options.

However, population growth will put added pressure on the very systems that make Portland attractive. For example, population growth could lead to increased conflict between urban development and agricultural land, which will be increasingly valuable post-peak as rising fertilizer costs reduce agricultural yields throughout the U.S. food system.

[6] For example, SustainLane released a ranking of the "peak oil preparedness" of 50 U.S. cities that placed Portland sixth based on commute mode trends, transit use, sprawl, local food and availability of wireless connectivity (www.sustainlane.us/peak-oil.jsp).

Impacts on Public and Social Services (S)

The Public and Social Services subcommittee examined a wide range of impact areas including health care and public health, education, social services, housing, energy utilities, police, fire, water, sewer and solid waste. In exploring the impacts of peak oil and natural gas on these essential services, the Task Force made several cross-cutting observations that are important to set the context:

- Public, health and social services are already stretched to their limits and are feeling the effects of trying to serve more people than funding allows. Additional stressors on these systems from peak oil would only worsen a situation in which serving those in need is already difficult.
- Because these systems are so focused on providing services for today and the impacts of peak oil and natural gas are mostly indirect, public and social service agencies are largely unaware of or unable to consider the long-term, potentially severe effects of peak oil.
- In providing social services, there is a complex network of City, County, Metro, and State governments. The City provides relatively few public health and social services on its own and depends heavily on these other entities for services. However, when systems fail, the City is forced to attend to the needs of its citizens in other ways (e.g., an inadequacy in mental health care, which is provided by the County or State, may result in Portland Police being forced to intervene on an emergency basis).

S1. Vulnerable and marginalized populations will grow and will be the first and hardest hit by peak oil.

The impacts of increasing oil and natural gas costs are felt first and deepest among vulnerable and marginalized populations. Rising oil and natural gas prices increase the cost of transportation, housing, food, and other goods and services. The sharp rise in gasoline prices in 2005 provided direct evidence of the effects of increasing fuel costs as people shifted their budgets from food to fuel. As a consequence of this, demands on food banks increased dramatically. In addition, the disabled, elderly, and people with the least economic resources are more likely to depend on public transportation. Increasing fuel costs and decreased social program funding may price even public transportation out of reach, or decrease special public transportation options. This can dramatically impact mobility and may lead to loss of jobs for some and further isolation for others.

Vulnerable and marginalized populations are already among the most at-risk members of society. They are least likely to have information or understanding about peak oil or to see it as a pressing issue. This population has the fewest resources to meet increased costs stemming from peak oil. Their housing and vehicles are often the least efficient, and they have little control over housing improvements or access to programs that would help.

In addition, these populations are the least likely to have the resources needed to protect their rights. Many are already vulnerable to being displaced by growth and development. Lack of integration or isolation of people and populations within Portland places them on the outside of both communication and information networks, as well as having fewer resources to adapt to changing circumstances. These are groups who are also frequently not represented in policy and planning discussions.

The economic impacts of peak oil will spread beyond those who are on fixed or marginal incomes. People who are currently better off will have less disposable income to spend on things other than energy and goods and services affected directly by peak oil. This is critically important, because public and social services are already highly dependent on private organizations to meet the demand for community programs such as food banks, cultural integration, services for the homeless and outreach to elders. Traditional citizen and business contributions to these private organizations will likely decline, as will foundation resources.

It is essential to recognize that marginalized communities have strengths, knowledge and skills that can benefit the broader community. The elderly have the experience of surviving in a much less energy dependent world, along with critical human skills that automation and mass production have replaced. Different cultural communities have social, health and other knowledge which has largely been lost in mainstream society. Poor people have skills for getting by with less and creatively stretching resources that the more advantaged population may lack. Most of all, different communities offer different perspectives and broaden the range of strategies and solutions brought to the table.

S2. Increasing costs and decreasing incomes will reduce health coverage and further stress the health care system, a system already in crisis.

About 16 percent of the population is presently uninsured, and another large proportion is underinsured Health care expenses have been rising at about 15 percent per year, four times the rate of inflation. In addition, an aging population is utilizing higher levels of health care. The medical/health care system functions on tight profit margins, and affordable health treatment for illnesses is becoming inaccessible for many. The effects of peak oil will exacerbate the trends of rising costs and decreased medical coverage.

Peak oil will cause several direct impacts on the medical/health care system. Peak oil will increase costs of medical services, from the cost of transportation and maintaining expensive facilities to the cost of medical equipment, supplies and pharmaceuticals. These increasing costs will accelerate current cost trends and could possibly result in reduced operating hours for clinics and/or closure of some facilities. As economic stresses stemming from peak oil take their toll, needs for mental health care and substance abuse treatment may increase.

The biggest impact, however, is the indirect impact of peak oil on health coverage. As the overall economy is stressed due to peak oil, businesses will continue to shift the costs of health coverage to employees and the number of uninsured and underinsured will increase. As a result, there will be less preventive treatment for a growing segment of the population. People will let health problems fester until they need emergency treatment in clinics and hospitals, at which point the advanced illness will be more difficult and expensive to treat. In combination with current cost trends, the conventional health care model may become unworkable.

S3. Protection of public health will be at increased risk.

Public health services (immunizations and control of contagious disease, sanitation, vector control, environmental health, etc.) are interrelated, and problems in one area may exacerbate problems in others. Increasing costs will challenge the budgets of governments, businesses and individuals.

To the extent that provision of public health services declines, associated public health risks will increase. This will put additional stress on the health care system, family budgets and absenteeism. The probability of these public health impacts occurring is uncertain, but impacts are serious if they

occur. Putting resources into public health toward preventive care ultimately saves money for both society and individuals as later costs for medical health services decrease.

Contagious disease in particular may pose a specific risk to populations. These risks may occur for two reasons. First, the rate of immunizations may decline due to lower family incomes and loss of health coverage. The uninsured, low income, elderly and immigrant communities are likely to be most impacted. Second, people may be more susceptible to contagious diseases because of weakened immune systems due to physical and emotional stress.

S4. Demand for social services will increase, but the ability to provide service will decline.
Social services are most likely to be accessed by vulnerable and marginalized populations. This includes such services as child protective services, unemployment, food stamps, intimate partner violence, and private non-profit social services agencies like the Food Bank and Meals on Wheels. These services will also likely be utilized by low- to middle-income households that may not previously have needed them.

Many private and publicly funded social service organizations are already overstretched and cannot meet the needs that exist. Under a peak oil scenario, both the number of people needing services and the amount of services will increase. However, the ability to serve the increased needs will decrease as tax revenues and charitable contributions decline. In addition, current laws, statutes, administrative rules and standards may not apply well in a society struggling to serve those suffering the economic effects of peak oil.

S5. Heating, maintenance and monthly housing costs will consume a larger share of household budgets and push people toward lower-quality housing choices.
The housing options available to people form a hierarchy: 1) homeownership; 2) rental; 3) assisted housing (including public, subsidized and transitional housing); and 4) homeless shelters. It is in the community's best interest to keep people as high on this hierarchy as possible. In Portland, it is becoming steadily more difficult to keep people adequately housed. This situation has been aggravated by the recent rise in home prices in the Portland metro market. Increasingly risky mortgage instruments (e.g., interest-only, 50-year, minimal down payment) have been used to make housing "affordable." These mortgages pose potential financial concerns to homeowners in a severe economic decline, threatening to push people lower on the housing hierarchy.

Housing costs will continue to consume a larger share of household budgets due to higher heating cost and general economic pressures such as unemployment, wage loss and inflation. This would exacerbate an already over-leveraged housing market and increase foreclosures. There will be downward pressure on the hierarchy of housing options as more people slide toward shared housing, assisted housing or homelessness. Eventually, lower incomes may force housing prices and rents down, but not soon enough to avoid crisis situations for many households. As incomes are stretched, home and facility maintenance may suffer, causing the city's housing stock to deteriorate. This would affect people's comfort, and eventually safety or sanitation. The price of housing located near jobs, services, and accessible transportation may increase, forcing low-income and vulnerable populations to move to areas without these attributes, making it more difficult and expensive for them to get to services and jobs.

As the cost of heating a home increases, existing federal and utility bill-reduction programs will struggle to meet the increasing demand for their services. While Portland's relatively mild climate

may not place people living in unheated homes at direct risk of dying from the cold, both the frequency and severity of illness are likely to increase substantially.

S6. Demand for public school services may increase at the same time that costs of maintaining public school facilities increase.

Schools in the Portland metro area are exposed to a limited number of impacts due to peak oil, but they are critical issues, as the education system is a core societal activity. The cost of heating and lighting schools, especially older buildings, will rise. This could result in budget reductions in other areas, such as routine and capital maintenance expenditures, which are already squeezed. In addition, the cost of transporting students will increase, and some parents who currently drive their children to school may stop doing so, placing a greater transportation burden on the school system. As school budgets are squeezed by higher prices, the current trends of teacher, curriculum, school year and program cuts could get worse, and the quality of education could decline.

Public school enrollment may increase as private school tuitions rise and population moves back into Portland, although this could be partially offset by an increase in home schooling. Marginalized populations will be affected if there is a reduction in federal funding for food programs in the schools. Finally, there may be increased pressure for schools to become more of a multi-function community resource, putting more pressure on the schools' maintenance and capital upgrade budgets.

S7. It is unclear whether demand for electricity will increase or decrease; electric loads served by natural gas-fired generation will have to be reduced or replaced by renewable energy.

Portland's electricity is provided by Portland General Electric (PGE) and Pacific Power; natural gas is provided by Northwest Natural. To meet the demand for electricity, electric utilities must either produce power from their own generating plants or purchase electricity from other producers under contract or on the spot market.

As demand for electricity grows, utilities must expand capacity to meet the load. The Oregon Public Utility Commission requires utilities to develop Integrated Resource Plans (IRP) identifying the least-cost ways to meet load growth, including energy efficiency and renewable energy. Since the early 1990s the least-cost way to meet load growth has routinely appeared to be natural gas generation. Natural gas currently is used to generate between 7 and 25 percent of the electricity distributed in Oregon, depending on weather conditions and utility company. Utility IRPs use or modify forecasts of natural gas prices from one of several national economic consulting firms. These forecasts show natural gas prices dropping for the next several years, then increasing back to current prices and holding steady for the foreseeable future. These price assumptions do not appear to take into account any impacts from peak oil on energy prices.

Though utilities serving Portland do not rely on oil as an energy source, they do use large quantities of natural gas. World natural gas production will eventually peak like oil; natural gas production in North America has already peaked, and it is questionable whether imported liquefied natural gas (LNG) will be sufficient to maintain current levels of natural gas use, much less allow an increase. In addition, since oil and natural gas are substitutes in many uses, higher oil prices are likely to drive up natural gas prices as well.

The biggest impact of peak oil on both electric and natural gas utilities will be the effect that rising prices and limited supplies of natural gas will have on their costs and rates charged to consumers. The more dependent electric utilities are on natural gas generation, the more electric rates will rise

along with natural gas prices. In the long run, current natural gas generation will have to be replaced with non-fossil alternatives. Any utility commitments to more reliance on natural gas generation in the short run will increase long-term exposure to increased costs. Even if utilities generate electricity from alternative resources, these currently cost more than power from natural gas plants, so rates could increase in any event. Over the long term, however, less dependence on natural gas generation should reduce electricity prices.

The effect of peak oil and natural gas on demand for electricity is uncertain. As oil and natural gas prices rise, some businesses may scale back or shut down operations, which would cause demand for electricity to drop. In addition, business and residential electric customers will conserve electricity as rates increase and budgets and incomes are stretched. Significant demand destruction could cause rates to increase as utilities try to recover fixed capital investments. Over the long run, there may be an increased demand for electricity as consumers convert to electric heating, plug-in hybrid or electric cars and other substitutes for oil and natural gas.

S8. First responders, especially police, may become primary service providers as social services struggle to meet demand.

Police and fire services are critical and are expected to be given priority access to fuel (whether gasoline, diesel or biofuels) at all times. Police are expected to be affected more than fire services.

In a scenario of gradual energy decline, peak oil will cause dislocations in employment. As neighborhoods, families and individuals become more stressed, there may be an increase in drug and alcohol use, domestic disputes and violence, loitering and property crimes (shoplifting, burglary, larceny, robbery, etc.). As social services are reduced, police may become the primary social service provider. Demand for fire protection services may increase because of unsafe heating methods and weather-related medical emergencies.

If peak oil is punctuated by sudden price spikes or supply cutoffs, impacts will be more severe and may include sudden and severe dislocations in transportation, employment and the price and distribution of goods. Tempers will flare and panic could set in. Police and fire personnel will be first responders in such situations.

S9. Water, sewer and solid waste services are not expected to be affected significantly.

These services are critical to the health of Portland's citizens. However, the impacts of peak oil on these services would be minimal. Portland's water system is primarily gravity fed, and most of the energy used in the water and sewer systems is electricity. To the extent that water and sewer services require energy to continue operation, they are anticipated to be given priority. Rates may rise slightly as a result of higher energy prices, but probably not dramatically.

Solid waste pickup depends primarily on diesel for its trucks, so would be more at risk than water and sewer. However, as with water and sewer, solid waste pickup is assumed to be a priority if resources become limited. It is also possible that solid waste may be reduced post-peak as packaging is reduced and people use less, make more efficient use of scarce resources, and recycle or compost more.

S10. Competitive, individualistic responses could erode community spirit and cohesion.
The worst-case scenario associated with peak oil and natural gas is the unraveling of the social fabric. The Task Force does not predict this will happen, and its recommendations are intended to help guard against it. However, the potential impacts are so large that social unraveling deserves mention.

Society will not collapse simply because of a sudden or extreme reduction of oil and natural gas supplies. Severe social disruption could occur, however, if the collective response breaks down. Without community cohesion, self-organization and teamwork, individuals may feel isolated and focus only on their own survival. This outcome would severely magnify the impacts of economic dislocations, mental health problems and crime described elsewhere in this report.

A strong community is therefore critical to finding and implementing solutions to overcome the impacts of peak oil. Equally importantly, a major part of the response to peak oil will come from the citizens themselves, not just government programs. These solutions will be fostered if there is a sense of community and stymied if there is not.

Recommendations: Act Big, Act Now

The Task Force findings illustrate the central role that oil and natural gas play in our daily lives. They depict the profound economic and social vulnerabilities that could result as fuel supplies cease to be abundant and inexpensive. The magnitude of this issue led the Task Force to explore bold and far-reaching solutions. The Task Force is unified in urging strong and immediate action.

Goals

The Task Force recommends preparedness on two different levels. Most of the recommendations seek to reduce Portland's exposure to rising fuel prices, anticipating the economic and lifestyle adjustments that will be needed in the future. Other recommendations prepare Portland to maintain community stability as volatile energy markets trigger conditions ranging from emergency shortages to longer-term economic disruption.

***Reduce Portland's exposure**:* The Task Force proposes a dramatic reduction in fuel use, far beyond the level of change achieved by current or past efficiency and conservation initiatives. It envisions cutting oil and natural gas consumption in half, transforming how energy is used in transportation, food supply, buildings and manufacturing. It proposes strategies to maintain business viability and employment in an energy-constrained marketplace.

***Strengthen community cohesion*:** However well Portland succeeds in its energy transition, it will not be able to isolate itself from global energy crises or the resulting economic impacts. A strong, dynamic community is essential to responding to the social and economic stress of such a major transition, and Portland must accelerate its efforts to foster a resilient, interconnected community. The Task Force sees the potential for profound economic hardship and high levels of unemployment, and it recommends having plans in place to adapt social and economic support systems accordingly. Similarly, contingency plans are needed for emergency fuel shortages.

Principles

As the Task Force developed its recommendations, several guiding principles emerged. These themes apply across the identified strategies and should be consulted as points of reference as the community refines and implements the recommendations.

City leadership: Change on the scale suggested requires broad participation from all sectors of society. Neither the City of Portland nor any other government can accomplish such change alone. The City can, however, play a catalytic role by informing and mobilizing the community, setting a positive example and convening partners to develop solutions.

Immediate action: A "wait and see" approach to this issue will diminish opportunities Portland now has to reduce its exposure in a meaningful way. The recommended changes will take years to implement and will be easier to afford while the economy is still relatively strong. Uncertainty concerning oil and natural gas supplies, rather than being an excuse for delay, is in fact an argument for urgency. The tightening of energy supplies could well occur quite soon and suddenly. Even if it occurs later, buildings and infrastructure being planned and built today will last for many decades and should be designed for a more constrained energy future.

Economic and social benefits: The recommendations propose major changes for Portland, but the Task Force believes their implementation will have an overall positive social and economic impact. Local residents and businesses will enjoy the health benefits and financial savings of cleaner air and walkable communities. They will also benefit economically as dollars spent on imported fuels are redirected into the local economy. This presents a significant economic development opportunity for Portland businesses and residents.

Demand reduction: While the recommendations include development of biofuels and other renewable sources, these sources can replace only a fraction of the oil and natural gas used today. The solution is a multi-faceted approach, with greatest emphasis on reducing energy demand through energy efficiency, frugality and reorganizing lifestyles and the urban landscape.

Vulnerable and marginalized populations: The impacts of increasing oil and natural gas costs are felt first and deepest among vulnerable and marginalized populations. Portland's energy strategies must pay particular attention to the needs of these populations, recognizing that many people lack the resources to adapt (e.g., by buying a hybrid car or installing a solar water heater) and tend to be under-represented in planning or policy decisions.

Global warming: Global warming is a defining issue of our time, and it will grow as a focus of international policy and action. The recommendations presented in this report align closely with those in the Portland-Multnomah *Local Action Plan on Global Warming*. The urgency and level of action required are similar. The City should continue to connect these issues as it communicates with the public and implements the recommended strategies. It should also be cautious that efforts to reduce reliance on oil and natural gas do not lead to increased use of coal (for production of liquid fuels or electricity), which would greatly increase greenhouse gas emissions.

In applying these principles, the Task Force outlined a comprehensive package of recommendations, proposing strategies to initiate institutional change and to motivate action by households and businesses. Of these recommendations, the first and most fundamental is to reduce oil and natural gas use by 50 percent over the next 25 years. While all the recommendations are important, without meaningful implementation of this first one—actually achieving a significant reduction in oil and natural gas use—Portland will experience a more economically and socially damaging transition to an energy-constrained future.

Collectively, the recommendations address the need for:

Achieving a significant reduction in oil and natural gas use, to ease the transition to an energy-constrained future.

Leadership, *to* build the public will, community spirit and institutional capacity needed to implement the ambitious changes.

Urban design, *to* address the challenge at a community scale.

Expanded efficiency and conservation programs, to shape the many energy choices made by individual households and businesses.

Sustainable economic development, to foster the growth of businesses that can supply energy-efficient solutions and provide employment and wealth creation in a new economic context.

Social and economic support systems, to keep the impacts of fuel price increases from evolving into broader disruption for Portlanders, particularly for lower-income households.

Emergency preparedness, to improve Portland's ability to respond in the event of sudden price increases or supply interruptions.

The Task Force recommendations and proposed action steps are detailed below.

1. Reduce total oil and natural gas consumption by 50 percent over the next 25 years.

With the *Local Action Plan on Global Warming*, the City of Portland has already adopted goals for reducing consumption of fossil fuels both in its own operations and in the community as a whole. However, the potentially imminent vulnerabilities posed by peak oil, paired with the increasing urgency of global warming, call for more aggressive and far-reaching goals.

A dramatic reduction in fuel use will help buffer Portland from the vulnerabilities of a volatile global energy market. This inevitable transition away from oil and natural gas will be made much easier if Portland takes action immediately rather than waiting until the marketplace forces a response.

A 50 percent reduction over 25 years (an absolute, not per capita reduction) is a meaningful goal from the perspectives of both peak oil and global warming.

- The Oil Depletion Protocol is a proposed international agreement under which nations would reduce their consumption at the rate at which known oil reserves are being depleted. This rate is estimated to be 2.6 percent reduction annually, or approximately 50 percent over the next 25 years.
- A recent global policy analysis from the United Kingdom calls for steep reductions in carbon dioxide emissions, which are primarily attributable to fossil fuel use. Reducing oil dependence helps Portland stay ahead of policy changes that may result as international will to address climate change grows.

> The risks of the worst impacts of climate change can be substantially reduced if greenhouse gas levels in the atmosphere can be stabilised between 450 and 550ppm CO2 equivalent (CO2e) … Stabilisation in this range would require emissions to be at least 25% below current levels by 2050, and perhaps much more … Ultimately, stabilisation—at whatever level—requires that annual emissions be brought down to more than 80% below current levels.
>
> —Stern Review on the Economics of Climate Change, 30 October 2006

- As the City seeks to reduce reliance on oil and natural gas, it should be cautious that its efforts do not lead to increased use of coal (for production of liquid fuels or electricity), which would greatly increase greenhouse gas emissions. [7]

The Task Force proposes the 50% reduction recognizing that it is a challenging target considering Portland's continued population growth. While Portland is known for its successful transportation and building-efficiency programs, reductions in per capita energy consumption have been offset by growth of the population. Cutting total consumption in half will require a two-thirds reduction on a per capita basis. While daunting, a number of factors suggest this target is achievable.

[7] Because of its high carbon content, conventional coal use releases large amounts of carbon dioxide, the primary cause of global warming.

- Over 25 years, the fleet of vehicles in the region will turn over twice, offering opportunity to switch to more efficient options. Similarly, older, less-efficient appliances and furnaces will require replacement.
- Because of the state energy code, new construction is much more efficient than the existing building stock; even more promising is that green building projects are dramatically surpassing the energy code. For example, Oregon Health Science University's new building exceeded energy code requirements by over 50 percent, while actually reducing construction costs. Residents of the most efficient new housing projects enjoy utility bills less than one-third the amount they would have to pay in older, comparably-sized buildings.
- The American Institute of Architects Board of Directors and U.S. Conference of Majors adopted The 2030 Challenge, a program that calls for all new buildings to reduce fossil fuel use by 50 percent with a goal of gradually reaching carbon neutrality for all new and existing buildings by 2030. Building operations currently consume 40 percent of all energy used in the U.S.
- Just 50 years ago, the average American home was half the size it is today. Even a partial reversal of this growth trend would yield significant reductions in home energy use.
- In other wealthy countries such as Denmark and the United Kingdom, per capita energy consumption is already half the level in the United States.

Action items:

a) Adopt a resolution declaring an **overall reduction goal.** Portland City Council can play a key leadership role by articulating a vision for our energy future.

b) Develop specific reduction targets necessary for achieving the overall reduction goal. These include **targets** for specific residential and business sectors. Annual and five-year targets should also be established.

c) Require **City bureaus** to set reduction targets for their operations. Bureau sustainability plans may be a vehicle for establishing and tracking these targets.

d) Initiate a **data gathering and analysis system** to assess progress toward meeting goals. This system would track progress on an aggregate and per capita basis, quantify reductions in specific residential and business sectors, and monitor implementation of action plans. This effort would augment the carbon emissions tracking that currently takes place.

e) Develop mechanisms to keep community decision-makers informed of **trends in energy markets**, including the global fuel supply situation and local impacts such as how residents are being affected by higher fuel prices.

2. Inform citizens about peak oil and foster community and community-based solutions.

The transition from oil and natural gas will be a time of tremendous change, both in the way we live and in the shape of the economy. The communities that make the smoothest transitions are those whose residents, businesses, and public and non-profit agencies know how to work together to adapt, to create solutions, and to support one another as they face economic and social disruption. Community is therefore the glue underlying the Task Force recommendations.

The Task Force recommends a community campaign to raise awareness and unite Portlanders around a vision of sustainable energy. In a more general sense, the Task Force sees a need for ongoing programs and systems that build community. Without strong community cohesion, the economic impacts of rising energy prices could readily devolve into broader social problems with people feeling isolated and with little or no hope for help or for the future.

Peak oil is part of a broader context in which escalation of oil and gas prices provides one powerful reason to move even faster in the direction of sustainability. Portland's community visioning project, visionPDX, shows the promise of demonstrating once again that Portlanders have a vision of a community that is connected, accessible, independent and sustainable. The changes that Portlanders have already made in development patterns, transportation choices, green building and clean energy have slowed the upward trend in consumption at the same time that the local economy has generated jobs for a growing population.

The Task Force believes that integrated community-wide efforts, led by a City Council that provides unwavering support for further progress, can achieve dramatic reductions in energy consumption while at the same time improving quality of life. The Task Force believes strongly that success is possible, but only if Portlanders mobilize their creativity and desire to change and plan for the future. While it is necessary for the City Council to align its services, investments and regulations with our recommendations, that alone is not sufficient. The greater task is to foster a can-do spirit in support of a truly sustainable community.

Action items:

a) **Research public understanding** of Portland's energy future, including peak oil, and develop effective ways to communicate regarding energy issues.

b) Leverage **existing programs** to communicate with the public about Portland's energy future, including global warming, peak oil, and potential for oil supplies to be interrupted by geopolitical events. Messages can be integrated into programs that promote transportation options, reduce waste, encourage recycling, encourage energy efficiency and promote local food.

c) Design and implement a highly visible **information campaign** which would integrate peak oil issues into a broader context of energy and sustainability. Provide resources that connect households and businesses to assistance programs and information they need to take action. **City Council** members play an important role focusing community attention on its energy goals and helping people see how their actions contribute.

d) Work with **community-based organizations** to provide information about options and resources to help citizens prepare to mitigate the impacts of oil and natural gas price increases on their lives. Strengthen community networks.

e) Design **competitions or incentives** for neighborhoods or businesses to meet reduction targets.

f) Work with **schools** to educate students about peak oil and related issues.

g) Integrate peak oil into **visionPDX** and other **strategic planning** projects**.** Peak oil should be discussed wherever Portlanders envision and plan for the future.

h) Plan for public schools to be used as **distribution points for public services** and community support. Design mechanisms to cover the full costs to the schools of providing these services.

i) Facilitate development of **local business networks or barter systems** that build community and broaden economic opportunity.

3. Engage business, government and community leaders to initiate planning and policy change.

Beyond the initial community-wide assessment conducted by the Task Force, more detailed work needs to continue, with public and private institutions weighing the impacts of peak oil and developing plans to address the specific vulnerabilities and opportunities they face. Civic and business leaders need to be encouraged to:

- Identify ways to reduce energy use in their facilities, activities and transportation systems;
- Assess how suppliers will be affected and develop alternatives for products and materials that are dependent on petroleum and natural gas (for example, the health care industry uses many petroleum-based products, and agriculture uses fertilizers made from natural gas);
- Consider how customer purchasing patterns or client demand will change;
- Prevent over-expansion of facilities that may see a reduced demand in the future;
- Develop strategies to protect vulnerable and marginalized populations who will be particularly impacted by peak oil; and
- Develop new business opportunities and circumstances that will result from peak oil.

The City has an important leadership role to play in encouraging preparedness planning and determining what types of incentives are needed to assist in the transition. Because Portland is part of a regional economy and transportation system, it will need to build partnerships with other jurisdictions in order to address issues at the regional and state level.

Action items:

a) Directly involve civic and business leaders in **issue briefings.** Task Force members can support this outreach. Important audiences include:
   - **City of Portland**: City Council, bureau heads, citizen advisory groups
   - **Infrastructure providers**: Port of Portland, Oregon Department of Transportation, Portland Office of Transportation, Metro, and railroads
   - **Business leaders**
   - **Freight and logistics industry**: Individual airline, trucking, rail, and marine companies
   - **Building industry:** Architects, builders, developers, and owners
   - **Food industry**: Farmers, processors, grocery stores, restaurants, food relief agencies
   - **Health care providers**
   - **Public agencies**: Schools, social service agencies, partners in local, regional and state government
   - **Major non-profit organizations**
   - **Utilities and Oregon Public Utility Commission**
   - **Faith communities**

b) Educate key **City employees.** Share the Task Force report, emphasizing that all bureaus should incorporate the report's recommendations into their plans. Bureau sustainability plans are also a potential vehicle for tracking bureau progress.

c) Provide **regional and national leadership** by collaborating with leaders in other jurisdictions within the metropolitan region, and working with organizations such as the U.S. Conference of Mayors.

d) Seek partnerships with businesses, universities and other governments to develop **economic analysis** that will investigate the implications of rising energy prices and inform planning by businesses and economic development agencies.

4. Support land use patterns that reduce transportation needs, promote walkability, and provide easy access to services and transportation options.

When people decide to reduce the number and length of their auto trips and turn to walking, biking and transit, they need development patterns that put stores, services and employment opportunities within easy reach. The City has already committed to a walkable development pattern by designating the "Central City" and a series of "Regional Centers" and "Town Centers" as places linked by high-capacity transit and offering a full range of retail and civic services. To complement this pattern and bring retail services within walking distance of people who live outside these Centers, the City should designate and encourage smaller-scale "Neighborhood Centers," many of which remain from pre-WWII streetcar days. Neighborhood Centers should put every Portlander within walking or easy biking distance of a full-service grocery store and other essential stores and services.

Action steps:

a) Designate a series of Neighborhood Centers throughout the city and apply flexible **mixed-use zoning** designations to allow neighborhood-scale retail, professional and civic services in those neighborhoods that do not have these services within walking distance.

b) **Change zoning and other regulations** to encourage the types and number of housing units that would make neighborhood-scale retail, professional and civic services more feasible financially.

c) Develop a **rating system** to evaluate each Portland neighborhood on its degree of accessibility to transportation options and services. Use this rating system to encourage the development of more walkable neighborhoods.

d) Ensure zoning allows the types and amount of housing near **transit stops** that will support the use of transit and generate fares to make transit more sustainable.

e) Resist expansion of the **urban growth boundary** in order to allow all types of Centers to thrive and to relieve pressure on agricultural land (see also the discussion of food production in Recommendation 8).

f) Fund programs to ensure a **mixture of income levels**, affordable housing, mixed-income housing and workforce housing.

g) Build and maintain a **street network** that supports pedestrian and bicycle trips. Achieve a high degree of street connectivity.

h) Provide **pedestrian-friendly public spaces** and other amenities near Centers and other areas of compact development.

i) Commit to urban growth patterns that follow **sustainable development guidelines** and **green building strategies**.

5. Design infrastructure to promote transportation options and facilitate efficient movement of freight, and prevent infrastructure investments that would not be prudent given fuel shortages and higher prices.

Transportation infrastructure is a long-term investment that needs to consider long-term community needs and costs. Rising petroleum prices influence infrastructure planning at several levels. Transportation modes and patterns will shift at the same time that transportation agencies face inflated construction costs with rising prices for fuel, asphalt and other materials. Gas tax revenue will also be affected. Combined, these factors call for transportation agencies to adapt infrastructure plans to meet mobility and access needs in a post-peak environment.

Action items:

a) Facilitate fuel-efficient **freight movement.** Portland's competitiveness is largely dependent on the region's role as a gateway and distribution center for domestic inland and international markets**.** Efficient movement of freight is critical to maintaining business viability and jobs.
   - Protect existing inter-modal freight facilities to ensure options in response to fuel price increases.
   - Continue to protect industrial and manufacturing land, particularly areas that already have rail access or are close to inter-modal transport to allow for economic diversification if the global economy falters.
   - Encourage rail to serve industrial clusters.
   - Work with freight vendors such as individual airline, trucking, rail and marine shipping companies to encourage efficient and sustainable transportation technologies and fuels and to identify incentives needed to promote transition.
   - Reduce delay for high value trips, like freight or bus, through congestion pricing for one or more lanes on highly congested corridors.

b) **Prevent infrastructure investments** that would not be prudent given fuel shortages and higher prices. Air, long-distance truck and car travel are likely to be reduced in response to peak oil, and land use patterns are likely to become more compact. Thus, investments in expanding road and air capacity may not be prudent. The Port of Portland, the Oregon Department of Transportation and other agencies need to consider the impacts of peak oil when developing capital construction plans for major facilities.

- Encourage the **Port of Portland** to examine the timing and impacts of a peak oil scenario on air traffic when developing plans to expand the airport.
- Recognizing that the majority of transportation investment funding comes from non-city sources and that the uses of these funds are not flexible, direct the **Portland Office of Transportation** to consider the impacts of rising oil prices when deciding where to invest those scarce transportation funds under its control.
- Invest in infrastructure that meets **access and mobility** needs with less fuel.

c) Continue to identify and promote the use of **recycled paving materials and other methods** that require less petroleum.

d) Support the work of the Oregon Department of Transportation to develop a sustainable funding structure for transportation that will eventually replace **declining gas tax revenues.** As people shift to more efficient vehicles and transportation options, gas tax revenue will not keep pace with needs to maintain roads and improve transportation infrastructure. This impacts all modes, since pedestrians and bicyclists as well as auto and truck users need permanent smooth surfaces. The City should explore new revenue options for transportation, including a carbon tax, congestion pricing, and a vehicle-miles-traveled fee, and should also encourage the state and federal government to investigate revenue options that do not rely on declining gas taxes. The new funding structures should be flexible to enable significant investment in services and infrastructure for fuel-efficient modes of transportation.

e) Work with regional agencies to accelerate development of **inter-urban transit options**, including **commuter rail**. Continue to expand the **light rail, street car and bus systems**.

f) Advocate for **state and federal funding** for transportation options, such as in ConnectOregon 2 and in the next Federal Surface Transportation Act.

6. Encourage energy-efficient and renewable transportation choices.

Land use and infrastructure set the context, but in the end, transportation fuel use is driven by individual choices. Portland has proven strategies that can be expanded to promote a variety of transportation options. It also needs to develop new strategies to promote both energy-efficient vehicles and energy-efficient transportation modes.

Alternative fuels cannot replace the amount of transportation fuels used today, but they can play an important role in decreasing Portland's vulnerability to energy markets. The City should determine how to encourage production and use of alternative fuels that give a good return on energy used.

Action items:

a) Encourage "**paid parking environments**" wherever possible, since there is a direct connection between free parking and automobile dependency. Parking costs and supply are the most effective tools for encouraging transportation options. The City should extend metering for curbside parking to congested retail commercial districts throughout the city. Metering will reduce cruising for a parking space because it reduces the number of cars and promotes turnover of parking spaces. The City should earmark a portion of parking revenues for pedestrian, bicycle

and transit accessibility improvements, and for other improvements to the vitality of the commercial districts.

b) Expand programs and policies that promote specific efficient **transportation options** including walking, bicycling, transit use, car- and vanpooling, car-sharing and flexible work hours.

c) Expand **individualized marketing programs** which use personal contacts to identify and support the transportation options people want to use. These programs have consistently reduced single occupancy vehicle trips by 8 to 10 percent in the four Portland neighborhoods in which they have been implemented. Still, they have reached only 20 to 25 percent of residents and few businesses, and then only for one year.

d) Encourage businesses to take advantage of **ride-sharing** and **car-sharing**.

e) Work with Oregon Department of Transportation and other responsible agencies to provide incentives and remove barriers to the purchase and use of **hybrid vehicles, electric vehicles, small vehicles and alternative vehicles** that currently are restricted in use.

f) Investigate **incentives** to reduce single occupancy trips or congestion:
- Taxes based on vehicle miles traveled in single-occupancy vehicles
- Road user fees based on transponder technology
- High occupancy vehicle lanes

g) Encourage **production and distribution of biofuels.** Identify strategies, incentives and taxes to promote existing and new technologies.
- Attract alternative **fuel manufacturers and distributors**.
- Foster **neighborhood co-op** fueling stations.
- Pair **Oregon farmers** making biofuels with neighborhoods that purchase fuel from their own co-ops.

Table 2. City of Portland transportation fuel use by agency, FY 05-06 (gallons)

Bureau	Diesel	Gasoline
Development Services	-	41,634
Environmental Services	15,465	40,582
Fire	97,306	53,192
General Services		
Printing & Distribution	-	4,666
Communication	-	293
Facilities	-	4,458
Fleet	7,482	50,209
Government Relations	-	467
Parks & Recreation	45,910	104,793
Police	14,256	643,183
Transportation		
Traffic Management		36,553
Maintenance	365,306	100,409
Water	96,199	111,571
Total	**641,924**	**1,192,010**

h) Adopt policies and programs to **prioritize biodiesel (and diesel) supplies for heavy uses** including freight, buses, and heavy equipment. These require the concentrated power that diesel and biodiesel provide. More alternative fuel options are available for personal transportation than for heavy-duty uses.

i) Use the most fuel-efficient flex-fuel vehicles available for the **City fleet** (see Table 2 for recent fuel usage by bureau).

7. Expand building energy-efficiency programs and incentives for all new and existing structures.

Buildings account for 40% of energy use in the United States. Portland and Oregon have long-standing energy-efficiency programs that address the residential, commercial and industrial markets. Expanding these initiatives will become increasingly important as natural gas supplies become more constrained. Not only is natural gas used directly in building systems, it accounts for a growing percentage of electrical generation in the Northwest. Strategies should include retrofitting existing buildings and influencing the design of new ones to maximize energy efficiency.

Action items:

a) Increase funding and availability for programs and demonstration projects to increase **energy efficiency** and the use of **renewable energy**. All buildings in Portland should have energy-efficiency upgrades over a 20-year period.

b) Adopt **The 2030 Challenge** put forward by the American Institute of Architects and implement policies and programs to achieve the reductions in fossil fuel use for all new and renovated structures.

c) Use City leverage in **building permitting processes** to promote efficiency of both new and existing buildings.

d) Actively participate in the State of Oregon **energy code** adoption process to push for changes that align with the City's sustainability goals.

e) Provide incentives to encourage energy-efficiency improvements at the time of **real estate transfer**.

f) Work with **utilities** and the **Oregon Public Utility Commission** to ensure that peak natural gas considerations are incorporated into utility Integrated Resource Plans and into utility rates, policies and programs. Conventional coal-fired generation is not an acceptable alternative fuel, given its high emissions of carbon dioxide, the primary cause of global warming.

g) Ensure weatherization programs are available for **renters**.

h) Assist businesses and residents in installing **solar energy** systems.

i) Continue the City's green building program, offering technical assistance, resources, and financial incentives to residents, developers, and the **design and construction industry**. Accelerate outreach and services to the mainstream building community.

j) Promote efficiency and renewable energy for **Police, Fire, Water, Sewer, and Solid Waste** services. Demand and provision of these services are not expected to be greatly affected by peak

oil and natural gas, but they are critical services that should be made as energy efficient as possible and transitioned to renewable fuels.

8. Preserve farmland and expand local food production and processing.

The global food industry depends heavily on inexpensive fossil fuels. Fertilizers are produced from natural gas, pesticides from oil, and energy is required to grow, process, transport and store food. A constrained energy future calls for a less energy-intensive food supply, with crops grown locally, processed less, processed locally and shipped over shorter distances. In this regard, Portland is relatively well positioned with its location in the Willamette Valley, which has fertile soils and ample water. By preserving this farmland and expanding food production and processing, the region can create the flexibility needed to adapt to a changing agricultural economy. Portland can expand its options further by developing the land and know-how for small-scale food production by residents within the city itself.

Action items:

a) Take an active role in preserving the productive capacity of Portland's foodshed.
   - Encourage appropriate agencies to preserve existing farmland and protect productive soils for agricultural use. This could include the creation of **agricultural sanctuaries and conservancies** as well as resisting the expansion of the **urban growth boundary** onto productive farmlands.
   - Maintain and strengthen current **farmland protections** through the "New Look" at Metro and the "Big Look" at the state level.
   - Where there is no natural "hard edge" or natural feature available to protect farmland, establish **compatible land uses** adjacent to farmland.
   - Hold on to and preserve **City land** that could be suitable for urban agricultural uses. Such lands have been identified by the Diggable City project.
   - Direct additional resources toward the **Diggable City** project, the community garden program and other urban agriculture possibilities.
   - Explore options to **open public and private land** for food growing such as financial incentives for leasing private land to the City for community gardens.

b) Work to reduce the harm from **Measure 37** to agriculture in the greater Portland region.

c) Examine current policies to increase **sales directly from farmers to** consumers, such as making it easier for farmers' markets and farmstands to operate and establishing a public market.

d) Continue assistance and incentives for the **food processing industry** as one of Portland Development Commission's priority development clusters

e) Accelerate planning for a large-scale local **commercial composting** site.

f) Provide **education** about growing, processing, preserving and preparing foods.
   - Work with Multnomah County to reinstate the **Oregon State University Extension Service**. Their programs educate residents about food growing, processing, preserving, composting and cooking.

- Work with the State and Multnomah County to increase **nutrition knowledge.**
- Encourage **schools** to teach more about nutrition, where food comes from, how to grow, harvest, process, preserve and prepare foods, and how to compost food waste.

9. Identify and promote sustainable business opportunities.

Rising energy prices pose substantial challenges to the economy and community, but they also introduce new opportunities. Some businesses will gain a competitive edge through efficient practices. Others will profit directly by providing the goods and services that will be in demand as energy becomes more expensive. To maintain business viability and employment, Portland must equip its business community with the information and tools to adapt.

Action items:

a) Identify and promote **sustainable business sectors** that will create local jobs in an energy-constrained future. Promising areas include:
   - sustainable building design services;
   - renewable energy and conservation services and products;
   - sustainable industrial design;
   - repair and re-use services, including remodeling of existing buildings, that extend the lifetime of products; and
   - substitution of locally produced products for those now mainly imported.

b) Expand **workforce training** to support sustainable industries and increase job opportunities for workers dislocated from conventional industries.

c) Conduct a comprehensive review of existing **City business assistance programs** to see if they are adequate to help businesses adapt to changes required by peak oil, including providing assistance to existing businesses to survive, and new ones to get started. This includes regulations, incentives, infrastructure, business assistance and job retraining programs.

d) Provide **case studies, personal impact calculators and business evaluations** as tools to help businesses assess impacts on their business sector. Extend Office of Sustainable Development education efforts, coordinating with Portland Development Commission and business associations.

e) (See Recommendation 2i, page 35, to facilitate the development of local business networks and barter systems.)

10. Redesign the safety net and protect vulnerable and marginalized populations.

Because peak oil and natural gas presents a serious threat to the economy as a whole, Portland's preparedness needs to encompass more than energy efficiency. Economic downturn creates more demand for public services, while public revenue declines. Energy and food price increases are especially burdensome for lower-income households, pushing more people into need of assistance. Resources for public health, social services and housing are already stretched thin and may have to

be reprioritized and reallocated. People living in poverty will be the most vulnerable to peak oil impacts.

A wide variety of organizations and programs comprise the safety net protecting vulnerable and marginalized populations. Although Portland is just one of many partners, it can participate with County and State partners working to improve coordination and service delivery across agencies. The City can advocate for maintaining funding and support.

A preventive approach is needed to minimize the impacts. Reducing poverty now will mean fewer people who will require assistance in the future. By ensuring reasonable employment, housing, nutritional and educational opportunities for low-income and marginalized populations, more expensive mental health- and health-related problems will be averted.

Action items:

a) Support state and national efforts and explore City options to encourage or mandate health care providers and insurers to emphasize **preventive care**. Prevention is by far the lowest-cost societal approach to health care.

b) Facilitate a discussion among health care providers to expand **health care** and **health care access** (e.g., prescription drugs, immunizations, universal care, reproductive and perinatal health services). Increasing health care costs and numbers of uninsured will lead to more contagious diseases and more severe health issues before treatment is sought, and generally inefficient use of resources (e.g., indigent patients going to emergency rooms for treatment of non-emergency problems). Similar facilitation served a key role in bringing parties together on the Healthy Communities Initiative several years ago.

c) Support **prioritization models** like an expanded Oregon Health Plan. Health care needs are rising independent of peak oil as the baby boom generation ages, and peak oil threatens to aggravate the problem by limiting resources to meet the increased need.

d) Work with the **Oregon Public Utility Commission** to provide financial assistance so that marginalized populations can maintain utility service, thereby preventing health or infrastructure problems. Expand **energy assistance programs** to keep utility services affordable. (See also Recommendation 7f and 7g for discussion of efficiency and weatherization programs.)

e) Police and other service providers should plan for a gradual increase in drug and alcohol abuse, domestic violence, and other problems associated with an increase in unemployment, homelessness and marginalized populations. For example, this may require an increase in staffing or a reallocation of resources, such as reinforcing the emphasis on **community policing**.

f) Strengthen current **hunger relief** systems. Work with the Oregon Food Bank to develop plans to prepare for increased food demand from a higher percentage of the population. The Oregon Food Bank has systems in place to provide food to low-income citizens, but this system is already stressed.

g) Plan for City subsidization of **school breakfast and lunch** programs in the event of lower levels of federal support.

h) Review rules such as **program eligibility requirements** to see whether they should be adjusted as a broader segment of the population is in need.

i) Develop strategies for coping with **widespread unemployment** (as severe as during the Great Depression), including working with the state to examine how the current unemployment

system will require modification. [See also recommendations on sustainable job creation and retraining included with Recommendation 9.]

j) Expand efforts to move Portland households out of **poverty**, building on coordinated initiatives such as the Ten-year Plan to End Homelessness and the Multnomah County Poverty Advisory Committee.

11. Prepare emergency plans for sudden and severe shortages.

As fuel supplies become more constrained, they will become more susceptible to disruption from natural or political events. Sudden price spikes or supply cut-offs can lead to severe dislocations in transportation, employment and the price and distribution of goods. Portland should have contingency plans in place to address these logistical challenges and also the public unrest or panic that takes place during shortages. Plans should address sudden shortage situations that persist months or years, well beyond the shorter-term events for which emergency agencies typically prepare.

Action items:

a) Use the structures already in place in the **City's Emergency Management System** for immediate disasters and add items necessary to address a "long emergency" brought about by oil supply constraints and lasting months or years. Ensure that Portland collaborates with all levels of government and non-governmental organizations.

b) Have strategies in place for **rapid reduction of fuel use**. An assessment of options was recently conducted in the Puget Sound area.

c) Develop **fuel allocation systems**. Ensure that fuel is available for police, fire, waste collection, medical response and supporting transportation responders. Also consider transportation needs of food, medicine and other essential freight, as well as agricultural fuel needs.

d) Develop a **comprehensive food plan** to ensure that food supplies are adequate in a short-term or mid-term emergency. Portland Office of Emergency Management should develop this working with the Oregon Food Bank, Multnomah County and Oregon Voluntary Organizations Assisting in Disasters (ORVOAD).

e) Establish a major **food warehousing system** capable of meeting food needs beyond the 72-hour supplies recommended for home emergency preparedness.

f) At the **neighborhood level**, provide training and planning help for emergency response.

Next Steps

A number of the recommendations imply the need for a central program to coordinate goal setting, tracking and communications. Other recommendations are policies, programs or projects to be implemented by specific bureaus or groups of bureaus. The Task Force proposes that a team of city staff be appointed to translate these recommendations into a funded, operational course of action.

Acting on this report, however, does not need to await further study or analysis. City bureaus can immediately look for ways to respond to these energy concerns and impacts into ongoing planning activities and educational programs around sustainable development. City Council can challenge bureaus to align their investment and activities with the recommendations outlined in this report.

Finally, the Task Force members would like to express their willingness to continue assisting the City of Portland as it informs City staff and the public about peak oil.

Appendix 1: Resolution Establishing the Peak Oil Task Force

RESOLUTION No. 36407

Establish a Peak Oil Task Force to assess Portland's exposure to diminishing supplies of oil and natural gas and make recommendations to address vulnerabilities (Resolution)

WHEREAS, U.S. oil and natural gas production have peaked and are now in decline, ensuring our nation's continued and growing dependence on oil and natural gas imported from politically unstable regions; and

WHEREAS, a growing body of energy industry experts believe that the world has already arrived at, or will soon arrive at, the peak of global oil production, which will be followed by an inevitable decline in available supply thereafter; and

WHEREAS, global demand for oil and natural gas continue to increase; and

WHEREAS, following the global peaks of oil and natural gas production, the interaction of decreasing supply and increased demand will cause the price of oil and natural gas to become more volatile; and

WHEREAS, the United States Department of Energy's National Energy Technology Laboratory has stated that, "The problems associated with world oil production peaking will not be temporary, and past 'energy crisis' experience will provide relatively little guidance. The challenge of oil peaking deserves immediate, serious attention, if risks are to be fully understood and mitigation begun on a timely basis"; and

WHEREAS, the City of Portland and its citizens and businesses depend on oil and natural gas for their economic welfare and their most critical activities, including transportation and food supply; and

WHEREAS, a large majority of money spent on fossil fuels leaves Oregon and provides no local economic benefit, while many of the solutions to lessening dependence on fossil fuels result in local jobs and substantial economic benefits;

WHEREAS, Portland residents and businesses are not currently aware of the full implications of an impending decline and will greatly benefit from an objective source of information on this topic; and

WHEREAS, the City of Portland has adopted the *Local Action Plan On Global Warming*, the success of which depends upon reducing carbon dioxide emissions from burning fossil fuels; and

NOW, THEREFORE, BE IT RESOLVED, a Peak Oil Task Force will be established to assess Portland's exposure to diminishing supplies of oil and natural gas and make recommendations to address vulnerabilities. The Task Force will be lead and staffed by the Offices of Sustainable Development and will coordinate with the Office of Transportation, the Bureau of Planning and other applicable bureaus. It will include up to 11 members representing a broad range of community and business interests.

BE IT FURTHER RESOLVED, the Task Force's charge is:

a. To acquire and study current and credible data and information on the issues of peak oil and natural gas production and the related economic and other societal consequences;

b. To seek community and business input on the impacts and proposed solutions;

c. To develop recommendations to City Council in this calendar year on strategies the City and its bureaus can take to mitigate the impacts of declining energy supplies in areas including, but not limited to: transportation, business and home energy use, water, food security, health care, communications, land use planning, and wastewater treatment. These recommendations will be considered as amendments to the Local Action Plan on Global Warming when it is revised in 2007 and integrated into citywide long term strategic planning; and

d. To propose methods of educating the public about this issue in order to create positive behavior change among businesses and residents that reduce dependence on fossil fuels.

Adopted by the Council, May 10, 2006
Commissioner Sam Adams
Commissioner Randy Leonard
Commissioner Dan Saltzman
Commissioner Erik Sten
Mayor Tom Potter
Prepared by: Brendan Finn
May 10, 2006

GARY BLACKMER
Auditor of the City of Portland
By: /S/ Susan Parsons
Deputy

BACKING SHEET INFORMATION

AGENDA NO. 601-2006

ORDINANCE/RESOLUTION/COUNCIL DOCUMENT NO. 36407

COMMISSIONERS VOTED AS FOLLOWS:		
	YEAS	NAYS
ADAMS	X	
LEONARD	X	
SALTZMAN	X	
STEN	X	
POTTER	X	

Appendix 2: Peak Oil — An Overview

This document was prepared by John Kaufmann of the Oregon Department of Energy and provided to Task Force members as part of the initial Peak Oil Task Force Briefing Book.

PEAK OIL – AN OVERVIEW

Much has been written about the concept of "peak oil" in recent years. Peak oil does not mean that no more oil exists. It means is humans have used about half the Earth's endowment of oil. Once the peak is reached, global oil production can no longer be maintained or increased. Annual oil production will level out and begin a long-term decline. Production will no longer be able to meet growing demand as it has in the past.

Peak oil typically encompasses the idea of peak natural gas as well. Natural gas follows a production curve similar to oil. World natural gas is expected to peak perhaps a decade or two later than oil. However, the U.S. is expected to experience the effects of declining natural gas production sooner than that. North American gas production appears to have peaked in the past few years. It is more expensive to import natural gas than oil. It has to be liquefied for transport and storage and then re-gasified for distribution.

Oil accounts for about 40 percent of the energy we use, and natural gas accounts for another 25 percent. Oil provides virtually all our transportation energy, and natural gas heats nearly half our building space and generates 7-15 percent of Oregon's electricity. In addition, oil and natural gas are used for numerous industrial processes, including use as a feedstock for thousands of products such as asphalt, fertilizers, pesticides, plastics, chemicals, paints, medical products, vinyl, and shoes and apparel.

Peak oil could have a major impact on the U.S. and world economies. All the major recessions of the past 35 years were preceded by sharp increases in the price of oil. The energy crises of the 1970s provide a preview of the impact of peak oil. U.S. oil production peaked in 1970 and started a decline, which continues to this day. We turned to imports to make up the shortfall. OPEC used this growing dependency for political purposes, cutting production 6-7% in 1973 and tripling prices. As a result:

- GNP growth fell from 4% in 1960-73 to 1.8% in 1973-82;
- productivity growth dropped from 2.5% in 1966 to less than 1% in 1979;
- unemployment rose from 4.8% in 1972 to 8.3% by 1975;
- inflation was 8.8% for the decade; and
- take home pay dropped 6% from 1973 to 1979.

High prices stimulated energy conservation and development of more expensive, harder-to-get supplies from places like Alaska and the North Sea, and eventually OPEC was forced to reduce prices. However, this time there's no major new resource areas to develop. The impacts could be deeper and last longer than they did after U.S. oil production peaked.

Opinions differ as to when production will peak. Some experts believe the peak is imminent or has already happened. Many believe it will occur in the next 10 to 15 years. The most optimistic opinions place the peak around 2030 to 2040. The primary difference revolves around estimates of earth's ultimately recoverable reserves and the effect of prices in stimulating advanced recovery and development of unconventional resources. Generally speaking, the lower estimates tend to come from petroleum geologists and physicists, the higher estimates from economists.

A review of the data leads us to conclude the peak likely will occur sooner rather than later. Among our observations are the following:

1) Trends of both discoveries and production point to a global resource base of about 2.2 trillion barrels of oil. The world has already used more than one trillion barrels, and is currently using more than 30 million barrels per year.

2) Optimistic estimates that the earth holds 3 trillion barrels of recoverable oil would require a reversal of historic discovery trends and a doubling of estimates of remaining reserves.

3) In the long run, production cannot exceed discoveries. Experience in many oil-producing nations indicates that production lags discovery by 25 to 40 years. For example, in the U.S., discoveries peaked in the early 1930s, and production peaked in 1971. World discoveries of oil peaked in the mid-1960s, and have declined ever since.

4) Discoveries fell below production in the mid-1980s and have continued to fall. The world currently finds one barrel for every four or more that it uses.

5) Higher oil prices and increased drilling have not resulted in increased discoveries. New discoveries have tended to be fewer, smaller, deeper, more remote, and more costly. The largest, most easy-to-find deposits are likely to already have been found. For example, a much-heralded discovery in the Gulf of Mexico recently is located in a hurricane-prone area under 7,000 feet of water and another 20,000 feet below the ground, and contains 1 to 6 months worth of oil at current rates of consumption – the costs of producing this would be high, and it would not noticeable delay the peak.

6) About two-thirds of oil-producing nations have already peaked and are in decline, including the U.S., Mexico, and the North Sea (U.K. and Norway). At least two of the world's five largest fields ever found – Burgan in Kuwait and Cantarell in Mexico – have peaked and begun to decline, and there is concern that Saudi Arabia is having difficulties maintaining production from the world's largest field, Ghawar.

7) Knowledge of where oil may or may not be located is more extensive than ever. Geologists have identified what kind of geological formations are likely to produce and hold oil, and the earth's geology has been extensively mapped. In addition, millions of wells have been drilled looking for oil and other resources. The likelihood of finding new fields comparable to those in Middle East, Texas, Russia, Mexico, or the North Sea, is very low.

8) Estimates of existing reserves are unreliable. Reserve estimates of OPEC member nations jumped 60 percent in the late 1980s. This was likely due to a link between proved reserves and production quotas. In the past two years, Shell Oil and Kuwait downgraded their estimates of proved reserves by 20 and 50 percent, respectively.

Several other forces could also create conditions that would also require reductions in U.S. oil consumption like peak oil.

- Geopolitical events affect production of fossil fuels. Most of the remaining oil and natural gas is in nations that are either unstable or hostile to the U.S., and both voluntary production cuts and war-related disruptions have and will continue limit productive capacity or output.
- The production and use of fossil fuels may have to decline rapidly to reduce carbon emissions in response to global warming concerns.
- A decline in the value of the dollar relative to other currencies could reduce our purchasing power and force the U.S. to reduce its share of oil use to levels commensurate with its share of the world population. The U.S. currently has about 5 percent of the world's population, but uses about 25 percent of the world's oil production.

Many believe higher prices will stimulate either new discoveries or the development of alternatives. For example, Cambridge Energy Research Associates, a major economic consulting firm, released a report in November 2006 claiming that world oil production will not peak before 2030. This is based on the highest estimate of developable resources to date, and has come under criticism from many. In particular, CERA's projects that the market will stimulate more production from advanced recovery techniques, Canadian oil sands, and oil shale than others forecast. Our review of the literature suggests these resources will cost more and be developed more slowly than CERA assumes.

Below is an assessment of some of the major supply alternatives. While alternatives will be used in some measure, they are unlikely to fully replace oil and natural gas. All have a lower energy return on energy invested (EROEI) than oil or natural gas – that is, they take more energy to produce and yield a smaller net energy gain. For example, most of the alternatives yield 2 to 5 units of energy for every unit needed to produce them. This compares to oil and gas which historically have had net energy ratios of 20:1 and greater. As a result, the alternatives are less productive and more expensive.

In addition, the alternatives produce electricity rather than liquid transportation fuels, have significant environmental problems, or will have their own supply constraints, particularly if production is increased to offset declining oil and gas resources. All would take decades to replace a significant amount of declining oil and natural gas reserves.

1) *Coal* is abundant in the U.S., with 240 years worth of reserves at current use rates. It can be used to generate electricity or can be made into gaseous or liquid fuels. However, increased use of coal would seriously aggravate global warming. Much of the CO2 could be sequestered, but it would require about one-fourth of the energy in the coal to do so. In addition, coal use would have to quadruple or more to displace oil and natural gas. But if U.S. coal use increased just 2 percent per year, the lifetime of our coal reserves would drop to 85 years and lead to a "peak coal" problem in the not-too-distant future.
2) *Nuclear power* produces only electricity, which means it is not well suited to replace oil as a transportation fuel. Even if nuclear power could meet all U.S. energy needs, the 10-fold increase in nuclear power plant capacity would require massive infrastructure costs. With

that many plants in operation, known reserves of uranium would be depleted in about 20 years. Breeder reactors could extend the life of uranium reserves, but safe, affordable breeder reactors are not currently available. Nuclear power also poses the problems of nuclear waste disposal and nuclear weapons proliferation. Oregon has had strong opposition to nuclear power, and Oregon's only nuclear plant was closed early because of leaking steam tubes.

3) *Oil sands* in Canada and Venezuela are abundant. However, the oil is not in liquid form, but rather more like sand-impregnated asphalt. This makes oil sands extraction land- and water-intensive, polluting, and high in carbon emissions. In addition, it has an EROEI of about 3-to-1, meaning it takes about one-third of the energy in the oil sands to produce it.

4) *Oil shale* has many of the same environmental problems as oil sands. In addition, oil has never been produced commercially from shale. Shale oil has an estimated EROEI of about 1.5-to-1, meaning two-thirds of the energy it yields must be used to produce it. This would increase the amount of CO2 emitted. Capturing the CO2 would further reduce net energy.

5) *Enhanced oil recovery* involves advanced methods to extract more oil from a field, such as in-fill drilling, horizontal drilling, hydraulic fracturing, and injection of solvents like CO_2, nitrogen or steam to make the oil move more easily. Because of costs, enhanced recovery is unlikely to affect an oil field's peak since it is not typically applied until after production has peaked. Recent studies also suggest these methods simply allow the oil to be extracted a little faster, with the total amount of oil produced from a field remaining about the same.

6) *Biofuels (biodiesel and ethanol)* are highly touted to replace oil for transportation. Biofuels are carbon neutral, meaning the CO_2 they emit is balanced by the CO_2 they need to grow. However, biofuels would compete with other uses of the land, such as food, forest, erosion control, and habitat. In addition, most ethanol in the U.S. is now made from corn, which is oil- and natural gas-intensive to grow and, as a result, has a low energy return – best-case analysis estimates the EROEI at about 1.67-to-1. There are hopes that ethanol will be able to be made from cellulosic plants such as switchgrass, which are less energy intensive and can be grown on marginal lands. However, this is still in the research stage. Biodiesel has a better EROEI (3-to-1 or slightly greater) than ethanol, but will probably require dedicated crops and cropland, thereby limiting the amount that can be produced. While biofuels hold some promise, they are unlikely to replace more than a small share of the petroleum-based liquid fuels currently used.

7) *Hydrogen* is often touted by many as the clean, renewable fuel of the future. However, hydrogen is an energy carrier, not an energy source. It is not found in its most useful state–H_2–but must be separated from other atoms to which it is attached, such as carbon or oxygen. Most hydrogen today is produced from natural gas. This is not sustainable when natural gas is in decline. In the long run, if hydrogen is to be used as a transportation fuel, it will have to be electrolyzed from water using renewable power. But because of thermodynamic losses in producing and transporting the hydrogen, it may be more efficient to use the renewable power directly. In addition, because of its volume and because it leaks so easily, hydrogen is difficult to store and distribute. The current storage and distribution infrastructures for natural gas and gasoline would have to be replaced, at huge costs, to accommodate hydrogen.

8) *Clathrates* are ice crystals containing methane (i.e., natural gas) found at the bottom of oceans. The potential resource is immense. However, methane is a more potent greenhouse gas than CO_2, and release of even part of this methane could trigger runaway global warming. At this time it is not technically feasible to capture the methane for commercial use without a large portion escaping.

9) *Renewables (wind, solar, biomass, wave power)* will need to be developed to the fullest extent possible, and fortunately Oregon is well-endowed with them. However, aside from biofuels, most renewables produce electricity or thermal power (heat). Their applications rarely include transportation. While abundant, it is not clear how much of our total energy needs renewables will be able to meet. The immediate need for renewables is to meet electric load growth, then to begin displacing coal and natural gas in electrical generation to reduce CO_2 emissions. In addition, fossil fuels are required to build renewable power plants. We need to begin building the infrastructure now while cheap oil and natural gas are still available. They will be more expensive and difficult to build once oil and natural gas supplies are declining.

In addition to alternative supplies, it will be necessary to reduce how much energy we use. While we cannot conserve our way to zero, we will need to use less energy in the future than we use today. With the peak of world oil production approaching, we need major improvements in energy efficiency – we need to improve the efficiency of our cars, our homes and buildings, our lights and appliances, our industrial processes. In addition to technology improvements, we will need to restructure various institutions and systems. For example, we should reinvigorate our rail system, develop mass transit, and change land use patterns to reduce the need to travel. We will also need to change behaviors. We should ride share, walk and bicycle more often, and vacation closer to home.

Regardless when the peak occurs, the implications are potentially profound. It would be prudent to begin act now. Robert Hirsch, co-author of the highly regarded SAIC report completed for the U.S. government entitled "Peaking of World Oil Production: Impacts, Mitigation, and Risk Management," concludes that peak oil is going to happen, although the timing is uncertain, and that it could cost the U.S. economy dearly. The report further concludes that to have substantial impact, mitigation options must be initiated more than a decade in advance of peaking and will cost in the range of $1 trillion. The costs of acting too late will exceed the costs of acting too early.

The solution will require a massive effort. It took decades to develop coal, oil, and natural gas into significant energy sources. It will take decades to transition to a new way of doing things, and will require large amounts of capital and energy. If we wait until the peak occurs, we will be trying to build the new infrastructure at the same time that energy supplies are declining, prices are rising, and we're struggling to maintain other services. Energy efficiency and renewable energy technologies will provide a strong base for jobs and profits in the post-peak oil-and-gas economy, and can serve as an economic development tool for Oregon. We must begin now.

Appendix 3: Peak Oil Scenario

The following scenario was developed by the Peak Oil Task Force for use in summarizing the issue to stakeholders who participated in interviews and discussions through the task force process.

PEAK OIL SCENARIO

Our society is dependent on massive quantities of energy. In particular, oil accounts for about 40 percent of the energy we use, and provides virtually all the fuel to transport people and freight. Natural gas accounts for another 25 percent of the energy we use, meaning oil and natural gas combined account for about two-thirds of the energy we use.

However, recent evidence strongly suggests that the world is near the maximum, or "peak," of oil production, after which supply will begin a long-term decline. World natural gas production will peak a few years after oil, but evidence indicates that natural gas production in North America (U.S., Canada, Mexico) has already peaked. As a result, supply will have trouble meeting demand – prices will rise, productivity will decline, and shortfalls may occur. In addition, it is unlikely that energy efficiency or alternate energy forms will allow us to maintain our prodigious energy use anywhere near current levels.

This will have profound impacts on society. In many cases we will have to prepare for the impacts and learn to do things differently. Some of the mitigation measures may require capital investment or lead times to develop.

To begin to prepare, we must anticipate what the impacts will be. The City of Portland has established a Peak Oil Task Force to identify potential impacts so preventive steps can be taken. Examples of some likely or potential impacts include:

- Air travel, which is very energy intensive and sensitive to fuel prices, will be one of the first industries to be affected.
- Fertilizer is made from natural gas, pesticides are made from oil. As oil and natural gas become scarcer and prices rise, agricultural production may decline. Food will become more expensive, and there may be an increase in hunger.
- Trucking will be one of the first industries to feel the pinch. However, this could have a ripple effect throughout the economy. Prices of all goods may rise, and some goods may remain undelivered. Some industries are critical and will survive the squeeze, others may not. This will have ripple effects on employment, which could affect homelessness.
- Individual travel will be affected. Long vacations and other recreational or discretionary trips likely will decline, with economic impacts on those businesses which depend on it.
- Heating costs will increase. Combined with employment impacts, many people will be squeezed economically. This could affect some people's ability to maintain or own a

home, and put strain on individuals, families, and communities requiring additional services.

We ask you to think about the effects that rising oil and natural gas prices or declining supplies could have on the business or service your organization provides. Some specific questions are:

- How will demand for your product or service be affected?
- How will costs or the ability to produce your product or provide your service be affected?
- Looking up the supply chain, how will your suppliers of raw or finished materials be affected?
- How would these impacts affect your revenues and/or profit margins? Your employment base?
- What steps do you think your organization will take to respond to continual increases in energy prices or scarcity of supply? What are some changes or alternatives you could implement?

Appendix 4: Land Use & Transportation Subcommittee Materials

POTF Land Use & Transportation – Materials and Contacts

Individuals Consulted

Eileen Argentina	Portland Office of Transportation
Constance Beaumont	Department of Land Conservation and Development
Rob Bertini	Portland State University
Dan Bower	Portland Office of Transportation
Rex Burkholder	Metro
Roland Chlapowski	Commissioner Adams' Office
Stuart Cowan	Autopoiesis
Michael Dennis	Willamette Pedestrian Coalition
Steve Dotterrer	Portland Bureau of Planning
Damon Fordham	Oregon Department of Transportation
Roger Geller	Portland Office of Transportation
Lavinia Gordon	Portland Office of Transportation
Bob Hillier	Portland Office of Transportation
Peter Hurley	Portland Office of Transportation
Jim Karlock	Citizen
John Kaufmann	Oregon Department of Energy
Susie Lahsene	Port of Portland
Beth Meredith	Living Spaces Design
Jim Newcomer	Confluence Point Consulting
Pam Peck	Metro
Deena Platman	Metro
Bob Robison	Pedestrian Advisory Commission
Julie Rodwell	Oregon Department of Transportation
Peter Schoonmaker	Illahee
Phil Selinger	TriMet
Eric Storm	Living Spaces Design
Bridget Wieghart	Metro

Materials Reviewed

architecture2030.org – online documents from
www.architecture2030.org/current_situation/current5.html
"U.S. Energy Consumption" data and "2030 Challenge Targets"

Berkowitz, Edward. Something Happened: A Political and Cultural Overview of the Seventies. Columbia U. Press, NY: 2006.

Sightline Institute – Cascadia Scorecard 2006 Focus on Sprawl & Health

City of Portland Bureau of Planning – online documents from
http://www.portlandonline.com/planning/index.cfm?c=42773
"Comp Plan Context: 1980 to Today", Chapters 1-8

"Maslow's Hierarchy of Needs"

"Funding Peak Oil and Climate Change Preparedness and Schools" by Eli Lamb – source unknown

American Trucking Associations – FHWA Talking Freight Seminar Series: Energy Issues and the Impacts on Freight Transportation by Richard Moskowitz, May 17, 2006 (copy of a presentation)

Owner-Operator Independent Drivers Association, Inc. – Effect of Fuel Prices on Professional Truckers by Todd Spender, OOIDA Exec. VP, August 23, 2006 (copy of a presentation)

Global Insight – Global Economic Trends and Trade Patterns by Paul Bingham, October 12, 2005 (copy of presentation)

Jim Karlock – "A Comparison of Energy Consumption of Cars, Transit Buses, Rail, and Air" based on data found in The Transportation Energy Data Book: Edition 25-2006

Metro – New Look at Regional Choices February 2006

Cambridge Systematics, Inc. – Oregon Transportation Plan Policy Analysis 3.0 Sensitivity Scenarios

Oregon Transportation Plan (in particular, Pages C-50 – C-52)
http://www.oregon.gov/ODOT/TD/TP/docs/ortransplanupdate/05otpVol1jul.pdf

ODOT – Transportation Key Facts 2006.
http://www.oregon.gov/ODOT/COMM/docs/key_facts/04KeyFacts_final.pdf

Pew Research Center – History Repeats Itself: As the Price of Gas Goes Up, The Nation's Odometer Slows Down

"The Cost of Congestion to the Economy of the Portland Region."
http://www.portlandalliance.com/pdf/Congestion_Report.pdf

Portland Office of Transportation – one page outline on bicycles and walking statistics

Portland Office of Transportation – summary of Transportations Options program

Metro – Regional Transportation Options 2004-05 Program Evaluation, Final Report, July 12, 2006

TriMet – "Notes on Transit Responsiveness to a Peak Oil Shift" by Phil Selinger, August 28, 2006

Land Use and Transportation Subcommittee
October 16, 2006

Proposed Recommendations on Accessible Development Patterns

Overarching Recommendations:

I. Foster a land use pattern and transportation system that will make it easier for people to shift trips to walking, biking and transit when oil prices stimulate changes in travel behavior.

II. Prioritize investments in improvements to the city's network of pedestrian and bicycle facilities, especially in areas of low accessibility.

Specific Recommendations

The city should:

1. Rate each Portland neighborhood on its degree of "accessibility": the degree to which retail, profession and civic services (such as grocery stores, schools, doctors' offices, libraries, transit stops, day-care centers, cafes and restaurants, dry cleaners, hardware stores, parks, banks) lie within convenient walking and bicycle distance from households within the neighborhoods.

2. Map those portions of Portland neighborhoods that do NOT lie within ½-mile of a grocery store of neighborhood size (15,000 to 35,000) or larger.

3. Develop an action plan of measures to improve neighborhood accessibility, such as improved pedestrian and bicycle facilities; more flexible zoning to allow neighborhood-scale retail, professional and civic services, or to allow additional dwelling units to create a market for such uses.

4. Implement Metro's Corridor Study: designate Corridor stretches (portions of 82nd Avenue, e.g.) for revitalization (residential/retail/office), supported by frequent transit service.

5. Develop "location-efficient mortgage" programs in neighborhoods with a high degree of accessibility.

6. Encourage Metro to refine its modeling capabilities to enable it to evaluate the effects of combustion engine fuel increases on land use patterns and travel behaviors.

7. Encourage Metro to minimize expansion of the urban growth boundary (UGB).

8. Encourage Metro to provide permanent protection to prime farmland close to the UGB.

9. Place parking meters in well-developed retail districts (Hawthorne; NW 23rd; Gateway); earmark a portion of parking revenues for pedestrian/bicycle improvements within district.

10. Enhance “individual marketing” in those neighborhoods with low neighborhood accessibility to determine which measures would be most likely to reduce the number and length of SOV trips in the neighborhood.

Impacts Addressed

1. People living in neighborhoods without affordable travel options will spend an increasing portion of their disposable incomes on travel.

2. There will be reduced funding for transportation improvements – for transit, pedestrian and bicycle improvements as well as for road capacity for cars - due to reducing travel by gas-powered vehicles.

3. There will be reduced funding for transit operations.

4. The cost of housing will rise in more “accessible” neighborhoods.

5. Lower income households will be forced to the edges of communities, where transit service is poorer.

6. There will be fewer car trips.

7. There will be a shift of trips to walking, biking and transit.

8. There will be increased demand for telecommuting and compressed work week.

9. Mode shift is most likely to occur in discretionary, non-work trips.

10. There will be a reduced demand for parking.

11. There will be increased demand for housing and retail services near transit stops, especially near light rail and street car stops.

12. There will be an increased demand for retail, professional and civic services within walking and biking distance of more households.

13. There will be increased demand for new housing types, such as accessory dwellings, co-housing and live-work space.

Triple Bottom Line:

These recommendations also help achieve other recommendations from the Peak Oil Task Force and other important city and regional objectives:

- Improve citizens’ health (residents of compact, pedestrian friendly places suffer fewer chronic ailments than those of sprawling communities; residents of walkable

communities are less likely to be overweight; residents of compact communities spend 20 minutes a day less in a car than those in a low-density suburb; Cascade Scorecard, Sightline Institute, 2006)
- Reduce the capital and maintenance cost of services (asphalt up 13 percent since 2004, adding $100 million to highway projects on state's books; Oregonian, 7/31/06, Mayer)
- Reduce pressure to expand UGB
- Save nearby farmland for food security
- Improve air quality (motor vehicles are the largest source of air pollution; Cascade Scorecard, Sightline Institute, 2006)
- Reinforce city's carbon dioxide reduction plan.

Other Recommendations:

- Set an ambitious but achievable goal for the people of Portland: reduce the number of gallons of gas consumed by the average Portlander in a week from 8 to 5.3 gallons.
- Protect intermodal freight facilities to facilitate shift in freight modes in response to fuel price increases.

Impacts Addressed

1. Higher fuel costs will force companies to consider shifting from trucks to other modes.

2. Rail and ship freight facilities will become relatively more important f or movement of goods.

Findings:

- Vehicle Miles Traveled/Capita is dropping in region (from approx. 21.7 to 19.8 from 1996 to today). Cotugno class at PSU; PDOT handout.
- Cycling traffic in Portland has risen 257% in last ten years. BBC News series
- Crossings over four Portland bridges by bicycle commuters increased 15% in 2004 and 18% in 2005. PDOT
- Transportation consumes 28% of energy in U.S. U.S. DOE, Energy Information Administration, John Cogan
- If one in ten Americans used transit regularly, U.S. reliance upon foreign oil could be cut by 40%. APTA
- A doubling of density results in a 25-30% reduction in VMT. Reid Ewing, "Is Los Angeles-Style Sprawl Desirable?" Journal of the American Planning Association, Vol. 63, No. 1, Winter, 1997, p. 113.
- Increased density correlates with increased use of transit and walking. Age-Related Shifts in Housing and Transportation Demand: A Multi-disciplinary Study Conducted for Metro by PSU's College of Urban and Public Affairs, August 14, 2006.
- An average urban household uses 320 million BTUs/year; an average suburban household uses 440. Jennifer Henry, U.S. Green Building Council.
- Lower-income households are more likely to change their travel behaviors in response to rising gas prices than average households. Pew Research Center Survey of 1,182 Americans

- Lower income families are migrating to the suburbs.
- Portland is eliminating over 62 million car trips a year. BBC News series
- Greenhouse emissions have risen 13% over last 10 years in U.S.; down to 1990 levels in Portland. BBC News series
- Trips in downtown area are shifting to bicycle. Geller PSU slides.
- Work trips comprise only 20% of all trips in Portland.
- Mode use for work trips virtually unchanged from 1997 to 2004-05 (slight increase in drive-alone from 71 to 71.5%). PDOT citizen survey handout
- Cars and trucks are responsible for 38% of carbon monoxide emissions in city. PDOT "Facts About Portland 2003-04.
- Mode split comparisons with European cities shows that the big difference is pedestrian trips.
- Mode shifts are more likely to go to pedestrian/bicycle than transit (Europe; data: transit costs).
- Walking is the easiest mode shift to make; also the #1 choice of those considering a shift.
- Cost of parking is the most-often cited reason for not driving.
- People who live in walkable, mixed use neighborhoods have a 35% lower risk of obesity. L.D. Frank, American Journal of Preventive Medicine, 27, 87-96 (2004).

Potential Recommendations discussed by Land Use & Transportation Committee at October 5, 2006 meeting

Freight and Fuel

1. Charge taxes based on vehicle miles traveled.

2. Since each City resident gets a benefit from public rights-of-way (fire trucks, delivery vans, garbage trucks provide services to everyone), charge each resident a City of Portland transportation user fee for system maintenance and improvement.

3. Restrict types of vehicles allowed on roadways to specific times of day to reduce overall congestion.

4. Have dedicated freight lanes on roads and highways.

5. Create central passenger vehicle parking areas and move vehicles off of residential streets.

6. Create toll lanes that charge single-occupancy vehicles more or charge a toll to enter Portland in a single-occupancy vehicle.

7. Tax higher-weight passenger vehicles more than lower-weight ones.

8. Have truck delivery-only streets within the City.

9. Create short-sea shipping lines along the West Coast to move products between Mexico and Canada by water not by truck.

10. Ban package delivery by truck to individual addresses. Create distribution centers within urban areas where individuals can come and pick up their packages.

11. Build new rail transfer stations that are closer to the product.

12. Electrify the rail system to save on diesel fuel usage.

13. Build fuel refineries.

14. Attract alternative fuel manufacturers and distributors.

15. Tax alternative fuels the same as other fuels to help pay for transportation system maintenance.

16. Develop citizen-owned co-op fuels.

17. Take money earmarked for airport expansion and put it into other transportation programs like commuter rail, bridge maintenance, etc.

18. Continue to protect industrial and manufacturing land to allow for economic diversification if global economy falters.

Public Transportation – Potential Recommendations

19. Look for the most cost-effective ways to fully utilize the capacity of existing alternative modes of transportation. This is the short-term solution and is a marketing challenge.

20. Charge taxes based on vehicle miles traveled in a single-occupancy vehicle.

21. Since each City user gets a benefit from public rights-of-way and all modes can use streets, charge each resident and city-based employer/employee a City of Portland transportation user fee for system maintenance and improvement.

22. Have dedicated HOV lanes and bike lanes on roads and highways. Seattle currently has a more extensive HOV network and more company financial incentives.

23. At least double the on-street and garage parking fees in the City Center and other major shopping/employment areas like Lloyd Center, Gateway. This may push drivers into parking in residential areas. May also need to implement a residential zone parking permit system similar to Chicago's.

24. Develop viable intra-urban rail systems now. Could effectively connect Portland to Astoria, McMinnville, the Valley, perhaps even Bend, The Dalles and Pendleton.

25. Take money earmarked for airport expansion and put it into other transportation programs like commuter rail, bike lanes, sidewalks, etc.

26. Expand vanpools and carpools to special destinations like Ikea, casinos, coast resorts, ski areas, State Fair, etc. NYC/NJ does this.

27. Charge car-sharing companies a nominal on-street parking fee or no fee at all.

28. Make walking seem like a recognizable mode of transportation. This is a marketing challenge.

29. Continue to expand the light rail, streetcar, and bus systems now while there is funding still available.

30. Provide incentives for employers to change work patterns – compressed work weeks, job sharing, telecommuting, proximate commuting (transfer people to the branch office closest to their house).

31. Continue to expand the bike lane system, putting bike lanes on the most traveled routes for commuters, including large streets like Sandy Blvd and Foster. More bikes on even these high traffic routes makes for a better overall environment.

32. Continue to fund and implement the already existing alternative transportation programs and incentives, and the existing land use policies to encourage the continued reduction of personal trips-per-day.

33. Create more flexible multi-use zoning designations that will allow for the creation of employment centers around the City. Find ways to accommodate manufacturing, office, light industrial, service, and residential next to each other.

Potential Solutions to Peak Oil Impacts

34. Educate other cities within the State to the potential impacts of peak oil and help them develop into sustainable, well-planned communities to lessen the pressure on Portland to be the main economic driver and population growth supporter in the state.

35. Create a design-advisory team to help push high-quality building design as density increases.

36. Continue to acquire and retain large land parcels to be developed into public areas and public open space. Think about holding onto school lands for this reason.

37. Create even more flexible zoning to allow for live-work, light manufacturing, and urban agriculture within the City.

38. Focus on developing Regional and Town Centers outside the central city into viable "villages". Do not overlook already existing smaller neighborhood centers based on old streetcar suburbs – while these may not be listed in Metro's development scenario, many of the pieces of a "village" already exist in these areas and they may only need a single development investment to be re-energized.

39. Continue to fund several affordable housing programs, including those for workforce housing in an effort to have a city of mixed income levels, not just rich and poor.

40. Continue to educate people about ADU options.

41. Look at current parking policy and see if the required minimums for schools, and other large land users could be reduced or even dropped.

42. UGB – look at what really makes good agricultural land, consider it's economic impacts as well.

43. UGB – protect agricultural land from development by creating conservation easements.

44. Develop metrics to measure how effective our land use policies are so we can be proactive in spotting development trends instead of being reactive.

45. Increase development fees to reflect the true cost of development. Automobile-dependent development would pay the highest fees, sort of a fuel use charge.

46. Continue to create pedestrian-friendly, dense neighborhoods with access to employment, retail, social institutions, and public transportation.

Additional recommendations considered by Land Use & Transportation

Expand the "Drive less. Save More" campaign to include Peak Oil awareness.

Encourage businesses to adopt a "car sharing" mentality
Fostering the adoption of "multi-rider" transportation to reduce single occupancy trips

Offer consulting for businesses and citizens looking to prepare and make changes for Peak Oil
This can be paid for by citizens and businesses by passing a reasonable "Peak Oil Preparation" tax or diverting funds from other programs

Create or expand neighborhood introduction programs
Foster programs that help neighbors get to know one another (like City Repair)

Continue to encourage use of public transportation, biking, walking, and carpooling
Cities can learn from other cities leading the charge with success (Portland, San Francisco, etc.)

Foster neighborhood co-op owned fueling stations
Pair Oregon farmers making alcohol in their own micro-refineries / distilleries with neighborhoods that purchase the fuel from their own alcohol fuel co-op. (Fact: Alcohol can be used as a fuel)

Offer free parking for new Scooter riders
Encourages commuters to shift to efficient modes of transport. Exclude scooters that do not meet California air emissions standards.

Peak Oil Kits to hand out at the DMV
The City of Portland can internally create or outsource the creation of a "Peak Oil Intro Kit" to hand out along with all DMV transactions. This allows the city to track who has received this information for measuring awareness and outreach statistics.

The city could create a requirement that all new and renewing licensed drivers be required to watch a video covering the basics of changes people need to consider, and how they can help reduce the problems.

Appendix 5: Food & Agriculture Subcommittee Materials

Individuals Consulted

Pam Barrow, Northwest Food Processors Association
Jeff Boden, West Union Gardens
Rachel Bristol, Oregon Food Bank
Steve Cohen, Portland Office of Sustainable Development
Rosemarie Cordello
Judy Crockett, Portland Office of Sustainable Development
Jim Johnson, Oregon Dept of Agriculture
Mark Kendall, Oregon Department of Energy
Pam Leitch, Portland Permaculture Institute
Jack Mulder, Tillamook Creamery
Jeremy O'Leary
Oregon Agricultural Information Network, Oregon State University
Anthony Radspieler
Brian Rohter, New Seasons Markets
Patty Rueter, Portland Office of Emergency Management
Andy Schneider, Portland Office of Sustainable Development
Brent Searle, Oregon Department of Agriculture
Stuart Simon, Safeway
Mark Smith, Summit Foods
Mark Steele, NORPAC Foods
Lynn Youngbar, Portland Farmers' Market, Oregon Department of Agriculture Advisory Board

Materials Reviewed

Kenneth S. Deffeyes, *Hubbert's Peak, the Impending World Oil Shortage*

The Diggable City, a Portland State University student capstone project, June 2005. http://www.diggablecity.org/

Chad Heeter, *My Saudi Arabian Breakfast*

Richard Heinberg, *The Party's Over, Oil War* and T*he Fate of Industrial Societies*

Michael T. Klare, *Blood and Oil*

James Howard Kunstler, *The Long Emergency, Surviving the End of Oil*

Metro Fair Growth and Farmlands Project Committee Report

Richard Manning, "*The Oil We Eat*," from the book *Against the Grain*

Oregon Department of Agriculture, responses to questions asked by Peak Oil Task Force

Oregon State University Extension Service, 2005 Oregon County & State Agricultural Estimates; Special Report, Revised April 2006

Portland Multnomah Food Policy Council Conservation Easement Report

Portland Multnomah Food Policy Council Sub Committee on Land Use Recommendations

Paul Roberts, *The End of Oil: On the Edge of a Perilous New World*

Background Information about Oregon Agriculture

(compiled and editorialized by Marcus Simantel, August 2006)

1. **Oregon Agriculture is Big**
    a. Agriculture makes up over 10% of the state's economic activity
    b. 94% of Oregon's farms are family owned – in contrast to most U.S. agriculture
    c. 80% of Oregon's farm production is shipped out of state, and nearly half of that is shipped internationally
    d. Oregon's farmers produce over 225 different crops, only California and Florida have a more diversified agricultural industry
    e. Currently non-food crops are crucial for Oregon farm economic viability (nursery, grass seed, xmas trees, etc.) This "land banking" could be a positive for future local food production.
    f. Probably 95+% of current Oregon agricultural production would be considered "industrial " farming contrasted to less than 5% organic. (In the larger picture of ag much of organic is also produced using "industrial" methods and is shipped long distances.)
    g. Farm direct marketing such as CSAs, farmstands, u-pick operations, farmers markets – is a small but growing segment of Oregon agriculture

2. **Some Things Already Being Done** – that are related to our scope of work and are possible resources for us
    a. Tri-County Farm Fresh Produce Guide – a group of 60 – 70 local farmers that do direct marketing from their farms
    b. Portland Community Gardens - currently 30 – trying to expand, overseen by Portland Parks and Recreation
    c. Portland/Multnomah Food Policy Council – established in 2002 by city council and the county commission to advise on food issues such as land use/zoning, food access, institutional purchasing, etc. It has done a lot of work that fits in with our scope of work.
    d. The Diggable City Project Last year through the efforts of commissioner Saltzman and the Food Policy Council the city inventoried city owned properties that are under-utilized and that could be used for urban agricultural activities. Over 200 sites were identified. Three pilot projects are currently being pursued.
    e. Learning Garden Laboratory – SE 60th; Zenger Farm – SE Foster Rd; Jean's Farm – SE Johnson Creek Blvd; Try/On Life Community Farm – SW Boones Ferry Rd; all are efforts to reconnect children and adults with where their food comes from. These would be worth field trips for our group.
    f. Growing Gardens – an organization that teaches gardening, also has a school component
    g. ODA The Oregon Dept. of Agriculture will continue to be a key player in all aspects of our state's food system from production, processing, marketing, and regulating.
    h. Oregon State University Extension Service – not currently very active in Multnomah County due to county budget woes, but has a wealth of resources and

programs such as Master Gardener Program, 4-H program, nutrition education, food preparation and preservation, etc.

i. USDA United States Dept of Ag the elephant in the room, administers the farm bill – which is up for reauthorization in congress.
j. Portland's Office of Sustainable Development (OSD) an obvious player in our work
k. EcoTrust's efforts
l. The Chef's Collaborative
m. Slow Food Portland
n. Peak Oil Portland
o. Oregon Food Bank
p. And many more local groups that concern themselves with food

3. Some Land Use Items
    a. Senate Bill 100 Passed by the 1973 Oregon Legislature, SB 100 created Oregon's statewide land use planning system. The result is most of the best farmland in Oregon was protected from urban sprawl and development. (Measure 37 now puts that protection in jeopardy.)
    b. The "Big Look" The 2005 legislature passed SB 82 which says we need to take another look at our land use rules. Food people, especially those with peak oil concerns, need to pay attention to this. It is a three to four year project which just got under way this spring.
    c. The "New Look" Metro, our regional government in charge of planning and transportation for the region, is taking a "New Look" at its planning policies. Again, food people need to pay attention. Dick Benner on our task force is very involved in this and is an excellent resource.

FOOD/AGRICULTURE SUB GROUP RECOMMENDATIONS
DRAFT #4 - November 21, 2006

I. Educate The city needs to take actions that will help all citizens understand what is at stake with peak oil… individual, institutions, businesses, agencies.

- Key stakeholders in the food system need education about peak oil and its impacts so they can make appropriate plans.
- The city needs to provide financial incentives or similar measures so that farmers, processors, grocery stores, restaurants, food relief agencies, the Port of Portland, etc. have a plan in place for peak oil impacts.

II. Preserve Farmland The city should take an active role in preserving the productive capacity of its foodshed.

- The city should encourage appropriate agencies to preserve existing farmland and protect productive soils for agricultural use. It could include the creation of agricultural sanctuaries and conservancies as well as preventing the expansion of the urban growth boundary onto productive farmlands.
- The city should lobby to maintain and strengthen current farmland protections through the "New Look" process at Metro and the "Big Look" process at the state level.
- Where there is no natural "hard edge" available to protect farmland, uses compatible with adjacent farmland should be sought.
- The city should hold on to and preserve any land it already owns that would be suitable for urban agricultural uses such as lands identified by the Diggable City project.
- The city should direct more resources toward the Diggable City project, the community garden program, and other urban agriculture possibilities.
- The city should explore options to open up public and private land for food growing, e.g. financial incentives for leasing private land to the city for community gardens.

I**II. Expand direct marketing opportunities for local farmers**. The city should examine and adjust regulations to help farmers sell directly to consumers through additional farmers markets, farmstands, CSAs, and a public market.

IV. Strengthen current hunger relief and emergency agencies and systems. The Oregon Food Bank has systems in place to provide food to low income citizens. However this system is already stressed.

- The city should work with the Oregon Food Bank to develop plans to prepare for increased food demand from a higher percentage of the population.
- Working with ORVOAD and especially the Oregon Food Bank and Multnomah County, POEM should develop a comprehensive food plan to ensure that in case of a short-term or mid-term emergency, food supplies are adequate for Portland.
- The city should play a role in establishing major food warehousing in addition to current Oregon Food Bank and personal efforts. If there is a major societal breakdown, where would Portlanders get food after supermarket shelves are empty? We see this as a risk management must do.

V. Increase local food processing. PDC should prioritize food processing as an economic cluster, including incentives to encourage development.

VI. Educate citizens about growing, processing, preserving, and preparing foods.

- The city should work with Multnomah County to reinstate the OSU Extension Service to help address an increased need to educate citizens about food growing, processing, preserving, cooking, and composting.
- The city should work with the State and Multnomah County to increase nutrition education.
- Schools need to include a comprehensive study of "peak oil" and its implications. Schools need to teach more about nutrition, about where food comes from, how to grow, harvest, process, preserve and prepare foods, and how to compost food waste.

VII. Increase composting. The city should start planning for a local composting site.

Appendix 6: Economic Change Subcommittee Materials

Individuals consulted by the Economic Change Subcommittee

Art Ayers
Marge Bare, Meadows Group Realty Oregon
Joe Cortright, Impresa Consulting
Dave Ervin, Portland State University
Regina Hauser, Oregon Natural Step Network
Sheila Martin, Portland State University
Tom Potiowsky, Oregon Office of Economic Analysis
Ted Reichelt, Intel
Brian Rohter, New Seasons
Sarah Severn, Nike
Stuart Simon, Safeway
Amy VanVliet, State of Oregon
Dennis Wilde, Gerding Edlen

ECONOMIC CHANGE SUBCOMMITTEE
PRELIMINARY RECOMMENDATIONS
OCTOBER 25, 2006

1. The City should adopt recommendations of the Transportation and Land Use committee to foster alternative transportation and land use. Two of the biggest challenges to business competitiveness are commuting and moving freight. For example, we should support mixed use zones, that include small decentralized (neighborhood) manufacturing.

2. Set some big goals regarding reduction of fossil fuel use. Establish benchmarks and measurable goals with timeframe by industry sector. Consider adoption of the Oil Depletion Protocol, with a plan to meet the goal. Determine how much fossil fuel use comes from which sectors, from which activities, etc. This information may also be broken down per capita, per household, by square mile/neighborhood/block.

3. Identify and promote post-peak oil business opportunities. These might include sustainable building design services; renewable energy and conservation services and products; sustainable industrial design; repair/re-use/extending lifetime of various products, including remodeling of existing buildings. Catalog/inventory what we import from out-of-state and abroad, what products and services we will need, what resources we have available locally and establish programs (or plans) to produce those products or substitutes locally.

4. Encourage businesses to assess how they will be impacted by peak oil and natural gas taking into account their own energy intensity, that of their suppliers, as well as their customer's purchasing changes. Encourage business to re-invent themselves. Some businesses or business divisions may have to be re-invented in order to thrive in a less energy intensive environment.

5. Conduct a comprehensive examination of existing programs to see if they're adequate to help businesses adapt to changes required by peak oil – to assist existing businesses to survive, and new ones to get started. This includes regulations, incentives, infrastructure, business assistance and job retraining programs.

6. Outreach and education. Use case studies, personal impact calculators, business evaluations as tools to determine what impacts will be on their business sector. Ramp up OSD education efforts, coordinate with PDC and other industry specific business associations.

Appendix 7: Public Services Subcommittee Materials

Individuals consulted by the Public Services Subcommittee

Trell Anderson, Bureau of Housing and Community Development
Margery Bare, realtor
G. Daniel Bednarz, author "Public health in a post-petroleum world"
Elizabeth Baxter, Archimedes Movement
Pam Brown, Portland Public Schools
Catherine Diviney, Portland Public Schools
Andy Fridley, Portland Public Schools
Brian Hoop, Office of Neighborhood Involvement
Former Governor John Kitzhaber, Archimedes Movement
David Labby, Care Oregon
Wayne Lei, Portland General Electric
James Mason, Director of Multicultural Health for the Oregon Department of Human Services Public Health
Cathy Mincberg, Portland Public Schools
Judy Mohr-Peterson, Oregon Department of Human Services Client Caseload Forecasting Unit
Jim Newcomer, ConfluencePoint
Eric Pippert, State of Oregon Environmental Pubic Health
Carole Romm, Care Oregon; Central City Concern Board member
Patty Rueter, Portland Office of Emergency Management
Jeri Shumate, 211info
Bryan Winchester, Portland Public Schools
Kay Hall, consultant to the hospital industry
Deborah Ward, Oregon Department of Human Services Public Health Division

Materials Reviewed

Hirsch Report, February, 2005, "Peaking of World Oil Production: Impacts, Mitigation, & Risk Management." Report commissioned by the U.S. Dept. of Energy http://www.netl.doe.gov/publications/others/pdf/Oil_Peaking_NETL.pdf

Hirsch Report II, July, 2006, "Economic Impacts of U.S. Liquid Fuel Mitigation Options." Report commissioned by the U.S. Dept. of Energy http://www.netl.doe.gov/energy-analyses/pubs/Economic%20Impacts%20of%20U.S.%20Liquid%20Fuel%20Mitigation%20Options.pdf

U.S. Army Corps of Engineers Report, Sept. 2005, "Energy Trends and their Implications For U.S. Army Installations." Report on U.S. Army's understanding of the "known lifetime supply" of various fuel sources and the corresponding implications of shortages http://stinet.dtic.mil/cgi-bin/GetTRDoc?AD=A440265&Location=U2&doc=GetTRDoc.pdf

Jim Bell's San Diego/Tijuana Energy Sustainability Case Study**,** 2005. See the self-sustainability suggestions for city energy on pages 11-18. http://www.jimbell.com/Book2/Book2.pdf

The Oil Drum's Stuart Staniford charts and analyzes total global oil production each quarter as the information is released by the EIA and EIA to determine where we are. http://www.theoildrum.com/tag/plateau

Energy: Healthcare's Preconditional Crisis, Dan Bednarz, Energy & Healthcare Consultants, Pittsburgh, Pa.

Australian Association for the Study of Peak Oil & Gas, Health Sector working group, http://www.aph.gov.au/senate/committee/rrat_ctte/oil_supply/submissions/sub138.pdf

Australian Association for the Study of Peak Oil & Gas *Supplementary Submission to the Senate Inquiry into Australia's Future Oil Supply*, http://www.aspo-australia.org.au/References/Senate-ASPO/ASPO_HSWG_supplementary_submission-25-Sept.pdf

Australian Association for the Study of Peak Oil & Gas, Social Services Sector Working Group, http://www.aph.gov.au/senate/committee/rrat_ctte/oil_supply/submissions/sub134.pdf

Proposed Recommendations
Public and Social Services Subcommittee
November 8, 2006

Many of the recommendations from this subcommittee respond to the effects of the expected general economic downturn that will result from peak oil. Impacts of this downturn are already being felt among economically vulnerable populations. These populations will increase significantly as the economy worsens, increasing the demand for a wide range of social services.

OVERALL RECOMMENDATIONS FOR PUBLIC AND SOCIAL SERVICES

1. Ensure that funding and support for public health, social services, and housing at the City, County and State levels does not degrade in the event of revenues falling in an economic downturn. Resources may have to be reprioritized and reallocated to ensure necessary funding. Failure to do this may cause severe stress on the social fabric that will exacerbate peak oil impacts.
2. Strengthen community support networks and provide information about options and resources to help citizens prepare to mitigate the impacts of peak oil and natural gas on their lives. Peak oil will require increased reliance on local and community-based responses. It is critical to have cohesive, cooperative communities rather than individualistic, isolated, competitive ones.
3. All City bureaus should plan for the growth of vulnerable and marginalized populations in developing policies, plans, programs and budgets. They should be prepared to identify resources and measures to help these populations cope with the impacts stemming from peak oil and natural gas in their daily lives.

PUBLIC HEALTH AND MEDICAL HEALTH CARE

The focus of the recommendations related to health and public health focus on management of health care and the health care system rather than actual treatment of medical problems.

1. Support state and national efforts and explore City options to encourage or mandate health care providers and insurers to emphasize preventive care. Prevention is by far the lowest cost societal approach to health care. Lowering costs will leave more money for those who truly need medical help. For example, immunizations are essential to public health but could decline as the marginalized population increases due to the economic impacts of peak oil – ensuring immunization to all citizens will help protect public health and avert more expensive treatment later.
2. Facilitate a discussion among health care providers to expand health care and health care access (e.g., prescription drugs, universal care, immunization). Increasing costs of health care and numbers of uninsured will lead to more contagious diseases, more severe health issues before treatment is sought, and generally inefficient use of resources (e.g. indigent patients going to emergency rooms for treatment of non-emergency problems). Similar

facilitation served a key role in bringing parties together on the Healthy Communities Initiative several years ago.

3. The City should support prioritization models like an expanded Oregon Health Plan. Health care needs are rising independent of peak oil as the baby boom generation ages, and peak oil threatens aggravate the problem by limiting resources to meet the increased need. In the absence of a prioritization model, resources will be allocated by one's ability to pay.
4. Develop policies and programs to ensure reasonable employment, housing, nutritional and educational opportunities for low-income and marginalized populations. This will help prevent mental health- and health-related problems that would eventually wind up needing more expensive treatment by the medical or social services systems.
5. Encourage health care providers to identify how peak oil and natural gas will affect their ability to provide care. For example, they should inventory products dependent on declining oil and natural gas supplies, and identify and begin to transition to alternatives. They should also accelerate efforts to reduce energy use in their facilities as a hedge against rising energy costs.

HOUSING AND COMMUNITY DEVELOPMENT

1. Review rules, requirements and qualifications for program participation for housing, utility, and food assistance to determine which ones may need to be modified to respond to the effects of Peak Oil. For example, the City could allow renters to access weatherization programs even if the owner is not eligible for assistance. It may also include expanding programs to help low-income household provide necessary maintenance to prevent dilapidation or future problems which could threaten their ability to stay in the house.
2. Community (re-)development efforts should focus on improving and maintaining the existing community base, targeting areas where people have the least ability to respond. In a Peak Oil scenario, the ability of displaced people to maintain their standard of living will be reduced. Programs should therefore minimize both physical and economic displacement.

UTILITIES/ENERGY

1. The City should work with utilities and the Oregon Public Utility Commission to ensure that peak natural gas considerations are incorporated into utility Integrated Resource Plans. The City should also work to ensure that these considerations are incorporated into utility rates, policies, and programs, including provision of service or financial assistance to marginalized populations to prevent health or infrastructure problems related to inability to pay.
2. Accelerate efforts to improve energy efficiency and the increase the use of renewable energy. This includes programs and policies to improve efficiency of new and existing homes and buildings, reduce use of gasoline and diesel fuel in the city, and encourage the production and use of biofuels and renewable energy throughout the city. The City should

also work to influence policies and programs to accelerate energy efficiency and renewable energy in the Metro area and at the state level. The goal should be to reduce use of fossil fuels.

PUBLIC SCHOOLS

1. Plan for public schools to be used as distribution points for public services and community support. Design mechanisms to cover the full costs to the schools of providing these services.
2. Plan for city subsidization of school breakfast and lunch programs in the event of lower levels of federal support.

POLICE/FIRE/WATER/SEWER/SOLID WASTE

1. Police should plan for a gradual increase in drug and alcohol abuse, domestic violence, and other problems associated with an increase in unemployment, homelessness and marginalized populations. For example, this may require an increase in staffing or a reallocation of resources, such as reinforcing the emphasis on community policing.
2. Neither demand for nor provision of fire, water, sewer or solid waste services is expected to be greatly affected by peak oil and natural gas. However, to the extent they are affected, they are critical services and should be accorded priority access to necessary resources. In the meantime efforts should be make operations as energy efficient as possible and to transition to biofuels and renewable energy.

Overarching Subcommittee Recommendations
Public and Social Services Subcommittee
November 1, 2006

1. Establish indicators and metrics to know if and when peak oil effects are being experienced.
2. While change usually begins at the local level, Portland can be a voice for change nationally. Portland should consider working with the National Conference of Mayor's as an advocate for planning for Peak Oil Preparedness on the national level.
3. Investigate what options city has to raise revenues to adequately cover costs under a peak oil scenario. This is particularly true given the loss of gasoline revenues, and possible loss of other revenues due to economic impacts.
4. Support family planning, contraceptive use, and other reproductive health services.
5. All city bureaus should incorporate the consequences of peak oil in their strategic planning for staffing and modes of transportation.

6. Use the structures already in place in the City's emergency preparedness system for immediate disasters and add items necessary to address a Peak Oil "Long Emergency". Ensure that Portland collaborates closely with State emergency preparedness systems.
7. Portland should focus on planning and working with neighborhood communities for provision of food, shelter and water for its citizens.
8. If Peak Oil leads to increased local/regional dependence, carrying capacity should be determined to ensure that the city/region can support the population.
9. The city should consider integrating peak oil with the current climate change efforts into a standing, long-term initiative that includes, but is not limited to communications. The intention should be to educate citizens on an on-going basis as a way to increase community awareness and behavior change regarding use of energy.

Appendix 8: City of Portland Peak Oil Task Force Members

Task Force members served as volunteers representing their personal views. Affiliations are provided for identification purposes and do not indicate formal participation of an organization.

Richard Benner is an attorney for Metro. He previously served as director of the Oregon Department of Land Conservation and Development, was the first director of the Columbia River Gorge Commission, and was a senior staff attorney with 1000 Friends of Oregon.

Christine Caruso is a licensed architect and current vice president of the Portland Planning Commission. She has also served as Land Use Chair for the Roseway Neighborhood Association and Chair of the LivingSmartPDX design competition.

David Cohan is representing Portland Peak Oil and works for the Northwest Energy Efficiency Alliance. He has worked in the field of building energy efficiency for 16 years.

Angela Crowley-Koch is the executive director of the Oregon Chapter of Physicians for Social Responsibility. She has a background in public education campaigns in the areas of public health, global warming, the environment, peace and security.

Lesa Dixon-Gray is a social worker and public health professional with the Oregon Department of Human Services. She has extensive work experience in social services, public health systems and with low-income populations.

Allen Lee is a project director for Quantec, an energy consulting firm. He has worked in the energy consulting and analysis area for 30 years, including working on California's energy shortage contingency plan and serving as a senior scientist at Pacific Northwest National Laboratory. He has served on the Portland/Multnomah Sustainable Development Commission.

Jeanne Longley is a senior associate with the Zero Waste Alliance and has owned a consulting firm providing process improvement services. She is a board member of the Linnton Neighborhood Association and has an academic background in social psychology.

Bill Scott is the General Manager of Flexcar. He was chief of staff to Portland Mayor Neil Goldschmidt during the 1970's energy crisis and worked for PacifiCorp subsidiaries in coal mining, oil and gas exploration, and real estate. He was director of the Oregon Economic and Community Development Department and served two terms on the Oregon Progress Board.

Sallie Schullinger-Krause is a program director for the Oregon Environmental Council focusing on global warming and transportation. She previously worked for the Northwest Energy Coalition and Greenpeace, USA on global warming and clean energy issues.

Marcus Simantel is a retired farmer. He has served as chair of the Portland-Multnomah Food Policy Council as president of the Agri-Business Council of Oregon.

Randy White is an advertising executive for KPOJ talk radio and previously worked as marketing director of a software company.

Rowan Wolf is a sociologist at Portland Community College and has published widely on social inequality and resource scarcity. She advises a student group addressing peak oil.

PEAK OIL RESOLUTION

IN THE HOUSE OF REPRESENTATIVES
October 24, 2005

Mr. BARTLETT of Maryland (for himself), Mr. UDALL of New Mexico, Mr. GOODE, Mr. GRIJALVA, Mr. JONES of North Carolina, Mr. TANCREDO, Mr. GINGREY, Mr. KUHL of New York, Mr. ISRAEL, Mr. BUTTERFIELD, Mr. UDALL of Colorado, Mr. VAN HOLLEN, Mr. GILCHREST, and Mr. WYNN submitted the following resolution; which was referred to the Committee on Energy and Commerce

Co-sponsors are Tom Udall, Virgil Goode, Raul Grijalva, Walter Jones, Tom Tancredo, Phil Gingrey, Randy Kuhl, Steve Israel, G.K. Butterfield, Mark Udall, Chris Van Hollen, Wayne Gilchrest, Al Wynn, John McHugh, Jim Moran, and **Dennis Moore**.

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RESOLUTION
Expressing the sense of the House of Representatives that the United States, in collaboration with other international allies, should establish an energy project with the magnitude, creativity, and sense of urgency that was incorporated in the `Man on the Moon' project to address the inevitable challenges of `Peak Oil'.

Whereas the United States has only 2 percent of the world's oil reserves; Whereas the United States produces 8 percent of the world's oil and consumes 25 percent of the world's oil, of which nearly 60 percent is imported from foreign countries;

Whereas developing countries around the world are increasing their demand for oil consumption at rapid rates; for example, the average consumption increase, by percentage, from 2003 to 2004 for the countries of Belarus, Kuwait, China, and Singapore was 15.9 percent;

Whereas the United States consumed more than 937,000,000 tonnes of oil in 2004, and that figure could rise in 2005 given previous projection trends;

Whereas, as fossil energy resources become depleted, new, highly efficient technologies will be required in order to sustainably tap replenishable resources;

Whereas the Shell Oil scientist M. King Hubbert accurately predicted that United States domestic production would peak in 1970, and a growing number of petroleum experts believe that the peak in the world's oil production (Peak Oil) is likely to occur in the next decade while demand continues to rise;

Whereas North American natural gas production has also peaked; Whereas the United States is now the world's largest importer of both petroleum and natural gas;

Whereas the population of the United States is increasing by nearly 30,000,000 persons every decade;

Whereas the energy density in one barrel of oil is the equivalent of eight people working full time for one year;

Whereas affordable supplies of petroleum and natural gas are critical to national security and energy prosperity; and Whereas the United States has approximately 250 years of coal at current consumption rates, but if that consumption rate is increased by 2 percent per year, coal reserves are reduced to 75 years:

Now, therefore, be it Resolved, That it is the sense of the House of Representatives that--
(1) in order to keep energy costs affordable, curb our environmental impact, and safeguard economic prosperity, including our trade deficit, the United States must move rapidly to increase the productivity with which it uses fossil fuel, and to accelerate the transition to renewable fuels and a sustainable, clean energy economy; and
(2) the United States, in collaboration with other international allies, should establish an energy project with the magnitude, creativity, and sense of urgency of the `Man on the Moon' project to develop a comprehensive plan to address the challenges presented by Peak Oil.

The Peak Oil Caucus, founded by Rep. Roscoe Bartlett (Rep, MD) includeS James McGovern, Vern Ehlers, Tom Udall, Mark Udall, Raul Grijalva, Wayne Gilchrest, Jim Moran, **Dennis Moore**.