Energy Descent Pathways:
evaluating potential responses to Peak Oil.
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Abstract.

This dissertation reviews the literature on the subject of 'peak oil', the hypothesized peaking in world oil production. For Western societies dependent on supplies of cheap oil and gas, a rapid and unplanned for discontinuity in supply could be disastrous, affecting everything from food distribution to transportation. Some writers call for a 'wartime mobilisation' engagement on a societal scale as the only appropriate response given the scale and severity of the challenge. The dissertation explores the literature relating to the likelihood, timing and implications of the peak, what might emerge from it, and how a transition can be facilitated to minimise its disruptive effects. The purpose of the work was to provide a synthesis that might inform how such a mobilisation might be brought about.

Although far from undisputed, it was concluded that peak oil offers a plausible theory of how oil production functions and assessment of the scale and implications of the potential energy crisis. It found that despite much uncertainty, the exact date of the peak itself is of lesser importance than the timescale required for mitigation and adaptation. Evaluation of a range of post-peak scenarios suggests likely disruptions in liquid fuel supplies may lead to a more localized approach to the provision of essentials, such as food and energy. Within the literature, a significant number of people see economic relocalisation as inevitable and as a positive opportunity to create more sustainable production and consumption patterns rather than as a crisis. There is, however, a lack of structured literature on how such a transition could be brought about. Three perspectives are examined to assess the insights they might provide: sustainable consumption, transition management, addiction studies. The literature on addiction and dependency offers some useful, though not unproblematic, analogies with society's relationship with oil, in particular with regards to how change occurs and also how to manage resistance to change.

A model is also devised to collate different post-peak scenarios in the literature and arrange them around a spectrum to clarify underlying paradigms and worldviews. Insights from the field of addictions are explored, and the FRAMES model for dealing with dependency is found to be a useful tool for understanding approaches to a collective 'weaning' from fossil fuels. From this a number of stages are hypothesized as part of a community-led process of designing a response to peak-oil impacts. It is concluded that peak oil represents a challenge unique both in its scale and implications, and that a new synthesis of approaches and thinking is required to deal with it.

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Chapter 1.

1.1. Introduction

The hypothesised peaking in world oil production provides the conceptual background to this dissertation. An increasing number of commentators with backgrounds outside the oil industry, (Bentley 2002; Heinberg 2003; Simmonds 2005; Mobbs 2005), as well as many who have worked within it (Deffeyes 2005; Campbell 2005a; Skrebowski 2004), argue that 'peak oil' will happen sometime in the next few years, or may indeed have already happened (Deffeyes 2005). Peak oil does not mean that humanity will 'run out' of oil, rather that beyond certain ratios of available resources to demand, oil becomes increasingly difficult to extract and increasingly costly (financially and in terms of the energy required) to bring to the market. Peak oil, writes Campbell (2006:14), "is a turning point in history of unparalleled magnitude, for never before has a resource as critical as oil become headed into decline from natural depletion without sight of a better substitute".

Many agree that the converging challenges of climate change and peak oil will necessitate profound societal and structural changes (FEASTA 2004). Mobbs (2005) estimates that the UK will have to reduce consumption of oil and gas by three quarters over the next 50 years, both to tackle climate change and to live within the diminishing availability of fossil fuels. Inevitably, this will have profound impacts for society. Some writers (Douthwaite 1996; Odum and Odum 2001; Holmgren 2003a) have stated the need for a concerted effort to move *towards* independence from oil, but few have actually begun to sketch out the detailed *practicalities* of how this might happen. Others (Hines 2000a; Norberg-Hodge et al. 2002; Shuman 2000), have called for a concerted programme of *relocalisation*, rebuilding infrastructure to provide core essential needs locally, making settlements less dependent on imports and more resilient in the face of international disturbances.

Some argue that relocalisation will not come about by choice but rather by necessity as the implications of peak oil begin to manifest. If so, this would be a challenge unique in human history, both in character and extent. Such is the scale of the challenge, I will argue, that what is required is a unique synthesis of strategies drawing on many diverse areas.

1.2. The Research Gap

Within the emerging body of literature on peak oil there are many arguments and counter-arguments, but most tend to focus on the timing of the peak rather than the *mitigation* of its effects. Generally speaking, it neglects to set out coherent responses – an issue not helped by the fact that much of this literature is apocalyptic about future scenarios (Kunstler 2005; Savinar 2004).

Many writers, (Brown 2006a; Hirsch et.al. 2005), argue that the only effective response to peak oil is a concerted response on the scale of a "wartime mobilisation". However, how this might be motivated has yet to be fully explored in the literature. Oskamp (2000:383) summarises the question which is central to this dissertation, "how can we motivate ourselves and other people to make these vitally needed changes?"

There are many studies into the reasons behind individuals' environmental behaviour, especially with regard to what influences people into behaving in more sustainable ways (Olander & Thogersen 1995; Barr 2003; Jackson 2005). Yet, most of this literature refers to *changes in practices* such as recycling, rather than to *wholescale reconfiguration* of society and associated meta-behavioural responses. The question of how one might engage a community in the shift to a low energy and perhaps relocalised economy, as part of a positive transition, is barely touched on in the literature.

Useful insights can be drawn from the study of addiction. Many writers have made a speculative or metaphorical connection between individual addictive behaviour and societal addiction to oil, but it is argued here that a deeper study of the processes by which individuals enter and exit the addiction cycle, in particular that formulated in the Transtheoretical Change Model, can yield important insights. The question as to how tools from the addictions field can be used on a community scale has yet to be explored, and this dissertation will make some tentative explorations into this.

1.3. Rationale and Aims

This dissertation has arisen both out of my past in terms of the work that has led me to this point, and also my future, in terms of the PhD that I will be shortly beginning. My background has been in the teaching of practical approaches to sustainability such as permaculture for the last 10 years, and in the creation of a number of sustainability projects. Around the end of 2004 I became aware of peak oil which led to a profound re-evaluation of my life and of my work. It led to my developing the Kinsale Energy Descent Action Plan (Hopkins 2006a) with students at the college where I was teaching, the first attempt anywhere in the world to design a conscious pathway down from the peak. This has been hugely influential and is being used as a model by many communities around the world (Hopkins 2006c).

This work raised a number of questions about replicability and also created the desire to develop the approach in a more rigorous way for a larger settlement. My PhD research will look at the development of such a process for the town of Totnes in Devon, but for this Masters dissertation, I wanted to explore the thinking around how such a process might be best designed in order to engage as many people as possible.

This dissertation has two aims. The first is to review the literature on the whole area of peak oil, its implications, responses to it and the various areas I then explore for elements of the solution. The second is to draw from that review a set of principles that might underpin a community response to peak oil. This will include a discussion about how an energy descent planning process might best be facilitated.

It takes the form of a literature review (Hart 1998) with no empirical element (the latter will be a central part of the PhD research). It is important here to observe that while for some parts of this paper a sizeable body of academic literature exists (i.e. sustainable consumption and petroleum geology), in other areas it is virtually non-existent. Peak oil and the movement exploring what we shall term 'energy descent' is as yet unrecognised by mainstream academia, and is a very fast-moving field.

Therefore, secondary sources are used quite extensively. These also include relevant internet 'blog' sites and online news clearinghouses with an interest in energy issues, which are often the best places for very current information and thinking. Also used are newspaper articles, magazines, Government reports and studies. The final secondary source is interviews and personal correspondence.

1.4. The Structure of this Dissertation

Chapter 2 looks at the literature on the peak oil concept, its proponents, critics, history and core concept. It also reviews the views of government and oil companies, to establish an overview of when peak oil might begin to affect society. Chapter 3 looks beyond the timing of peak oil into how it might be planned for and mitigated. A number of scenarios put forward by various writers are explored and compared to highlight possible outcomes.

Chapter 4 begins with the question "is peak oil a crisis or an opportunity?", and suggests that one possible outcome of peak oil will be a much more localised future. It then explores the notion of relocalisation, its proponents and critics, and assesses the role it might play in a post peak future. Chapter 5 explores the literature on behaviour in relation to sustainable consumption to explore what makes people change their behaviour. Also evaluated is the Dutch approach known as 'Transition Management'.

Chapter 6 introduces the metaphor of addiction, and asks whether as a society we are addicted to oil, and if so, what insights might that yield? It argues that the term 'dependency' is more appropriate and that tools for treating dependency, could have an important role to play on a community scale. Finally, Chapter 7 explores related areas such as mechanisms for public participation and visioning and backcasting, and uses the FRAMES model from the addictions field to pull together the strands covered previously. This then leads into a sketching out of a number of key elements that any community response to energy descent might include, and how they might be practically implemented.

Chapter 2 – The Peak Oil Concept.

2.1. Introduction
Peak oil is a term used increasingly to highlight the potential problems in future world oil supply, as well as by activists who propose profound structural changes in energy supply and food production/distribution systems to enable the world to move beyond oil. The origins of the concept, its central proponents and the debates that have arisen in relation to it are explored, along with the views of the oil companies and national Governments on the subject. Finally, this chapter assesses common trends emerging from the literature to see whether and what form of consensus might exist.

2.2. Energy Use

Availability of energy is a critical concern to any civilization, and the availability of cheap fossil fuels has underpinned society since the time of the industrial revolution. Cheap energy made possible a huge expansion in the human population (Catton 1982) and is the lifeblood of the global economy (Kunstler 2005). The UK has moved from being energy independent (in coal) up to the beginning of the Second World War, to an increasing dependence on imported oil in the 1960s and early 1970s, and then back to energy independence from 1975 with the discovery of North Sea oil and gas. In the early 21st century, Britain is once again becoming a net importer of energy, and increasingly dependent on imports of, for example, Russian natural gas. This increasing dependence leaves the UK vulnerable in energy security terms and raises a range of issues about the future of energy supply and demand and societal adaptation to their potential decline.

Porritt (2005:59) argues that "without that massive and exhilarating infusion of plentiful hydrocarbons, our world today would look *very* different". It is predicted by the International Energy Agency that the world will be consuming over 40% more energy per annum in 20 years (EIA 2003). Many people, even within the oil industry, are now questioning the reality of this statement. De Margerie, head of exploration for Total, referring to IEA predictions that global demand would reach 121 million barrels per day by 2030, recently said "numbers like 120 million barrels per day will never be reached, never" (Mortished 2006:unpaginated).

2.3. The Peak Oil Concept

The peak oil concept was first formulated by the geophysicist M. King Hubbert (1956) and refers to the point at which the world reaches the maximum achievable level of oil production, and beyond which production will irreversibly decrease on an annual basis (Heinberg 2003). It is not that humanity will 'run out' of oil, rather that once the point of having used about half of it is reached, it becomes increasingly difficult to extract, and increasingly costly, both in energetic and financial terms.

On the basis of his reserve estimates and study of the lifetime production profile of typical US oil reservoirs, Hubbert predicted that peak oil production in the US would occur between 1966 and 1972. He was widely derided as at the time America was awash with oil and people could see no end to it. With hindsight, US oil production peaked in 1971 (Deffeyes 2001).

According to Mobbs (2005:40), "the value of Hubbert's method isn't just the prediction of when production will peak. It also provides an analysis of the potential for new finds, based upon historical experience, and the levels of production that might be achieved from the existing reserves and any new finds". Hubbert observed that before the peak in production there should be a similar curve and peak that describes the level of discoveries. This is usually around 30 years ahead of the production curve, which many subsequent researchers use as one of the arguments for imminent peak, as world peak in oil discovery took place in the 1970s (Mobbs 2005).

2.4. The 'Hubbertians'

After Hubbert's death in 1989, his work and ideas have been further developed by others, who Deffeyes (2005:28) refers to collectively as the "Hubbertians", most of whom have backgrounds as petroleum geologists. Colin Campbell has been referred to as "the dean among Hubbert's followers" (Heinberg 2003:92). In 1998 he published in *Scientific American*, together with Laherrère, a paper called '*The End of Cheap Oil*', which brought Hubbert's ideas to a new generation, and applied them to more up-to-date scenarios. Campbell's hypothesis is essentially that regular conventional oil (defined to exclude heavy oils, deepwater oil, polar oil and Liquids from Gas Plants) is of most importance, with heavy oils and tar sands being only of minimal relevance to the global picture. He gives a world ultimate recoverable reserve figure of 1.85 trillion barrels (Campbell 2005a.).

Hubbert's techniques were also explored and explained by Deffeyes (2005)*,* who calculates an ultimate recoverable reserve figure of 2.12 trillion barrels, and places oil peak on Thanksgiving Day 2005. Simmons (2005) evaluates the Saudi oil fields and concludes that reported Saudi oil reserves have been over-inflated for political and economic reasons and concludes that the Kingdom's largest oil fields are already in decline.

Skrebowski's *'Oil Field Mega Projects'* study uses a different technique to Hubbert and Campbell's, but arrives at similar results. Speaking of Campbell, Skrebowski says "I tried hard to prove him wrong. I have failed for nine years. I am now with him. In fact, I think he's a bit of an optimist" (in Leggett 2005b:85). By 'mega-projects', he refers to those exceeding 500 million barrels of oil, which account for around 80% of world supply. New oil fields take at least 6 years to come into production from when decisions are made. Therefore, Skrebowski argues, production for the next 6-8 years is already known and can be calculated against demand. His findings place peak oil at 2010, with two years room for error each side.

Hirsch (2005b) re-evaluates Hubbert's model and challenges the assumption that the peak will actually take the classic bell curve shape. He looks at 7 countries or regions who can be safely assumed to have already peaked: Texas, North America, UK, Norway, Argentina, Columbia, and Egypt, and studies their depletion curves. Focusing on the Lower 48 States in the US, he observes that their peak was more a triangular point than a gentle curve. He defines a decline rate of less than 2% as gradual, over 2% as steep. He shows how increasingly sophisticated technology made no difference to the rate of decline in their production.

This undermines the idea, put forward by many who criticize the Hubbert model (Odell 1984, 1991, 1994; Lomborg 2001; Lynch 2003; Bailey 2006), that high oil prices and advancing technology will mitigate decline. Section 2.9 explores in greater depth the critics of the Hubbert model. Hirsch's findings (2005b) are that in all the cases studied, decline took place at between 3 and 13%, a far greater rate than the 2-3% decline rate projected by Campbell (2005a). He concludes "if historical patterns are appropriate indicators, the task of planning for and managing world conventional oil peaking will indeed be very challenging" (Hirsch 2005b). This is corroborated by recent reports indicating that Saudi production is falling by as much as 8% per annum (Carey 2006).

2.5. Other Peak Oil debates

Another group of writers, outside the oil industry, have explored Campbell et.al's assumptions more deeply. Heinberg (2003) explores the range of perspectives put forward above, as well as those who claim that peak oil is not a problem (see Section 2.9) and concludes that the truth lies close to Campbell's scenarios. Savinar (2004) conjectures a world beyond the peak, of social breakdown, dispersed self-reliant communities and unrest, with no hope for a government-initiated response to peak oil. Ruppert (2004) makes a similarly dark prognosis.

Kunstler (2005) sees no alternatives emerging to take the place of oil, and that for oil addicted Western societies this will mean huge changes. He describes suburbia, an urban form made possible by cheap oil, as the "greatest misallocation of resources in the history of the world" (in Greene & Silverthorn 2004:unpaginated). In his evaluation, the effects of peak oil make it unlikely that the US will survive as a unified political entity, instead splitting into autonomous regions.

Mobbs (2005:47) assesses the different arguments on the date of peak, but is reluctant to commit himself to a specific date, saying "there's a good chance that Peak Oil will occur within 10 years". He argues that the UK needs to urgently reduce energy consumption by three-quarters by 2050. "Energy efficiency is meaningless" he argues, "in the face of actual energy shortages. You can only reduce energy use if you have the energy to use in the first place. Choosing what uses of energy to cut or reduce is not the same as using energy more efficiently for the continuation of an existing use" (Mobbs 2005:143).

For Porritt (2005:63) peak oil is one of the key factors alongside exponential growth that necessitates a profound rethink of economic systems; "conventional economic growth and cheap oil have marched hand in hand for the best part of 60 years; within just a few years, it will have become increasingly apparent that both are on their last legs". Leggett (2005b) links the issues of climate change and peak oil, arguing that they are both symptoms of the same problem.

2.6. Estimating world reserves

The question of how much oil is left in the world rests upon which the range of predictions of the date of oil peak. This figure, which Campbell (2005a) calls the 'ultimate' reserve, is an attempt to put a figure on the total amount of oil with which the world was endowed when oil was first laid down. This figure, according to Campbell, is the sum of today's cumulative production, reserves (known oil fields yet to be brought into production), and the amount yet to be found. Calculating this figure is key to predicting oil peak, but is a remarkably difficult task. Oil companies are secretive about these data on reserves. All of the publicly available data is taken from annual surveys conducted by Oil and Gas and World Oil magazines, which has been criticised as being "uncheckable" (Mobbs 2005).

There have been many calls for greater transparency as regards reserves, particularly when Shell was forced to revise its reserves downwards after it became clear that they had overestimated significantly. Further doubts concern the oil reserves claimed by several OPEC countries. Campbell (2005a) highlights how in the late 1980s their stated reserves were increased, between

42% and 197%, with no evidence of any new discoveries (see Figure 1). One possible reason for this is that the larger a country's reserves, the more it is able to pump (under the OPEC quota system), and therefore the more they can earn. As Mobbs (2005:44) puts it "the oil market does not reward conservative estimates".
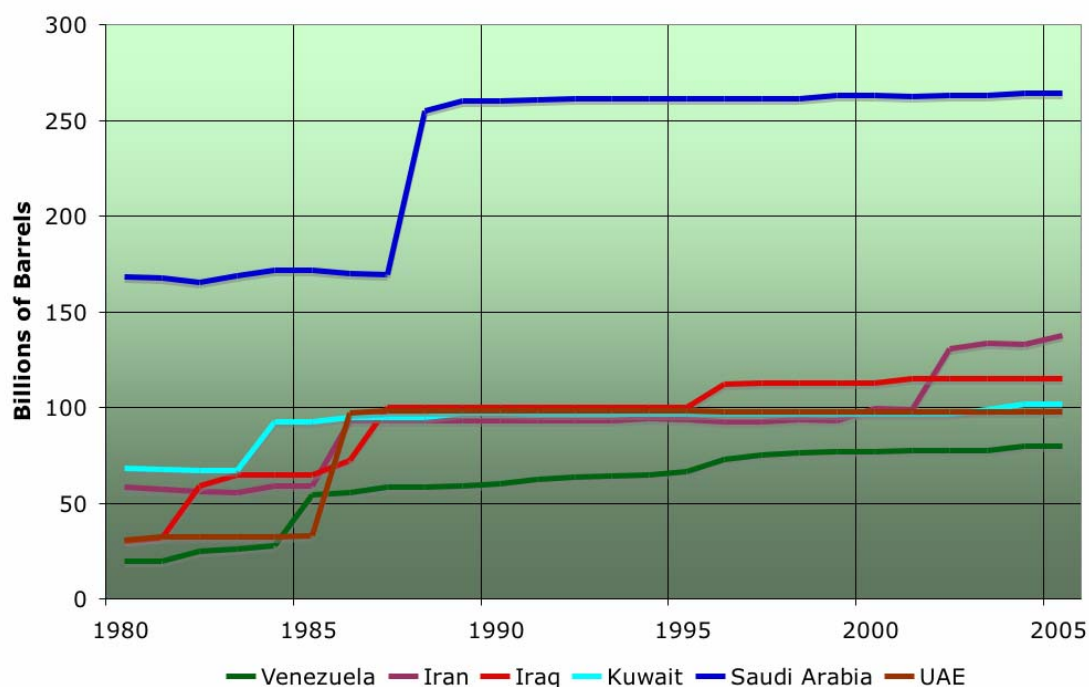
Figure 1. Revisions of stated OPEC oil reserves (Staniford 2006)

The US Geological Survey (USGS) provides much of the data used by other bodies to estimate reserves. Its 2000 World Petroleum Assessment produced a revised figure of the global oil resource of 3,345 bn barrels, far higher than previous estimates. Their calculations were based on a new method of calculating oil reserves which was dependent on unproven or undiscovered oil. The USGS findings have been criticised for being "wildly over optimistic" (Mobbs 2005:44), and for placing too much emphasis on the discovery of unknown oil reserves and industry's ability to develop more efficient extraction technologies. USGS (2000) place world peak between 2020 and 2035.

In 1998 the International Energy Agency for the first time adopted the Hubbert model for estimating peak. By their own admission however, the IEA do not have a database of world reserves, nor do they have the expertise of evaluating data (Bentley 2002). In the IEA's 1998 World Energy Outlook, they calculated a best case scenario of a total global resource of 2,300 trillion barrels, and estimated the year of peak as 2015. However, the upward revisions in the USGS's 2000 Assessment were adopted by the IEA, and the 2001 IEA World Energy Outlook put the date of peak as "beyond 2020". The US Department of Energy also adopted the USGS figures in its calculations.

There has been much scepticism towards the USGS increasing its reserve estimates, particularly in the light of how influential they have been on US Government policy. Heinberg points out a sentence in an EIA report which refers to these increases, "these adjustments to the USGS … estimates are based on non-technical considerations that support domestic supply growth to the levels necessary to meet projected demand levels". "In other words",

concludes Heinberg (2003:115), "supply projections were simply engineered to fit demand projections". Campbell has speculated that political influence on the USGS was the most likely cause for such optimistic estimates (BBC 2002). The thinking behind this, Mobbs (2005) suggests, is that as the world's major importer of oil, the high figure would calm the oil market and keep prices low.

2.7. The Views of the Oil Companies

Bentley (2002:1999) sums up findings from interviews with a number of oil companies for their understanding of peak oil thus; "in terms of the generality of oil company views, it is probably fair to say … that most companies, national as well as commercial, have a strong motivation to put a more optimistic gloss on the resource numbers than the latter actually warrant". His discussions with various companies revealed that oil companies actually do very little modelling, instead relying on other peoples'; Shell for example, take the controversial USGS world reserve figures as their baseline. The oil companies, Bentley (ibid) writes, "simply take public domain proved reserves as (their) starting base".

In a submission by Shell to the UK Department of Trade and Industry in 2000, they state "we believe that oil supply can easily match demand for at least the next 20-30 years" (ibid). Some observers point to the increasing number of mergers in the oil industry as an indicator of an awareness of peak oil. Writing about Chevron Texaco's recent takeover of UnoCal, Lazarus observes that Chevron would only have paid the $16.4 bn asking price if world oil prices will stay high for the foreseeable future, and, he writes, "reading between the lines, that means only one thing, peak oil" (Lazarus 2005:unpaginated).

BP would appear to be doing much to dispel any impression that oil peak may be near. BP CEO Lord Browne (2005:unpaginated) writes "…at minimum current levels of consumption there are sufficient reserves to meet oil demand for some forty years". Campbell (2004) is deeply critical of Browne's approach, "…this goes beyond being economical with the truth, and suggests a deliberate policy of denial and obfuscation, which deserves to be exposed…if its objective is to evade the issue of depletion to impress the stock market with the pretence that finding oil is just a matter of economic incentive and technology, it risks being accused of culpable fraud". For Campbell (2005a) Browne's faith in technology isn't borne out, and increased efficiency in technology merely means that oil reserves are used up faster, hence accelerating depletion.

In July 2005 Chevron began an unprecedented press campaign to launch its website, www.willyoujoinus.com, and to announce to the world that world oil production is nearing the peak. "Energy will be one of the defining issues of this century. One thing is clear: the era of easy oil is over" (Chevron 2005:unpaginated). The advert, in the form of a letter from David O'Reilly, Chevron's CEO, set out many of the points raised by peak oil commentators, and concluded "we call upon scientists, educators, politicians and policy makers, environmentalists, leaders of industry, and each one of you to be part of reshaping the next era of energy" (ibid). Perhaps most startling was the advert's headline, "it took us 125 years to use the first trillion barrels of oil. We'll use the next trillion in 30". This figure of 2 trillion tons of oil is the same estimate of the ultimate reserve as that put forward by Campbell and others.

Longwell (2002:104), ex-Director and Vice-Chairman of ExxonMobil, offers an upbeat assessment of the future facing the industry. "I believe", he writes, "industry has the resources to meet future global energy demand for some considerable time". He puts his faith in advances in technology both for exploration and production, although he concedes that "it is getting harder and harder to find oil and gas". Tellingly, his report uses a graph produced by Campbell and Lahererre which shows world peak discovery occurring in the mid-1960s. In 2005, however, Exxon's tone changed.

According to Cavallo (2005:17), with the publication of 'The Outlook for Energy: A 2030 View', "Exxon Mobil has quietly joined the ranks of those who are predicting an impending peak in non-OPEC oil production". The report looks at Exxon Mobil's production, all of which comes from non-OPEC countries, and concludes that production will peak in 5 years, adding that this is "too short a time-frame for any new developments to have an impact on this result" (ExxonMobil 2005). They conclude that meeting world demand will depend on OPEC 'vastly and rapidly' increasing its production, which some, in particular Simmons (2005), believe is deeply unrealistic. Salameh (2004) has studied the reliability of OPEC's proven oil reserves can be relied upon, and concluded that they have been overstated by 300mn barrels.

One growing school of thought argues that the failure of major oil companies (excepting Chevron and BP) to acknowledge peak oil is irresponsible. Illum (2005:11) writes "the longer the oil industry defers the point of time when production can no longer meet an ever-growing demand, the more unfortunate the situation at that point becomes: the world economy will have become even more addicted to oil when production eventually can no longer meet demand and subsequently begins to decline. Moreover, the decline will be steeper the longer the peak is deferred".

2.8. National Government Perspectives

The UK Government, in its 2003 Energy White Paper uses the IEA's USGS derived figures as the basis for claiming that;

> "*globally, conventional oil reserves are sufficient to meet projected demands for around 30 years, although new discoveries will be needed to renew reserves. Together with non-conventional oil shales and improvements in technology, there is the potential for oil reserves to last twice as long…. That there is no shortage of oil and gas resources globally means that supplies are unlikely to be interrupted for long*" (DTI 2003 p79).

The UK Government has yet to acknowledge peak oil publicly, although there are indications of awareness at high levels. Energy Minister Malcolm Wicks (2006) acknowledges the peak oil concept, but does not see it as a problem. "The Government is aware of the arguments surrounding this issue that global oil (and gas) production will one day peak, which cannot be disputed. However, we believe that such a peak is not imminent and will not be reached until some time after 2030, provided the necessary investments in expanding and replacing production capacity are made". The Government's recently published review of its 2003 White Paper makes no mention of peak oil.

Porritt (2005:63) writes "what is remarkable is the failure of politicians to start planning in any way for this *inevitable* transition, or even to start preparing their electorates for its inevitability". "The principal reason, I suspect" he continues, "is that the end of cheap oil means the end of easy economic growth, high living standards and the kind of 'live for today, live for yourself' lifestyles that have become so destructive" .

Some other national Governments have been more forthcoming. The Venezualan President Chavez, recently said that "the world should forget about cheap oil", and French Prime Minister de Villepin said in July 2005 "the time has come to prepare for the 'post-oil era'….we must all incorporate this change in our behaviour and reduce consumption" (quoted in Tooke 2005). The Swedish Government recently announced its intention to become a fossil-fuel free economy by 2020 (Sahlin 2006).

2.9. Critics of Hubbert

There are those who believe the Peak Oil scenario to be flawed. Most of these writers have backgrounds in economics rather than geology or the oil industry. The base argument for most sceptics is the allocative and dynamic efficiencies of the market, that as oil becomes scarcer, its rising price will encourage innovation and technology to develop alternatives. Economides writes "trusting markets is only way we can assure energy abundance in the future, it's also the only way that we will ever transition to something other than oil and gas" (Bailey 2006). This belief is summed up in the oft-quoted saying "'the Stone Age didn't end for lack of stone, and the oil age will end long before the world runs out of oil'", attributed to former Saudi oil minister Sheik Ahmed Zaki Yamani. One of the main exponents of this school of thought is Lomborg (2001), who believes that humanity always finds substitutes for any resource that begins to grow scarce. One of the first and most vocal critics of the peak oil concept, Adelman (2004:17) writes "it is commonly asked when will the world's supply of oil be exhausted? The best one word answer: never". For him, the root of the oil 'problem' lies with OPEC; "once we dispense with (the myths about an oil gap…), we will begin to see that many of the problems in the world oil market are the result of this short-sighted cartel, as well as the failure of importers to seize opportunities to weaken it" (Adelman 2004:1).

Smil argues that the peak oil argument is nothing new, that people have been predicting oil peak since 1865, and have always been proved wrong. He outlines his belief, common among many peak oil critics, that the market economy will function to develop alternatives in time to facilitate a transition. "There is *no reason*" he writes," to see an eventual decline in oil's share in the global energy supply as a marker of civilisational demise" (Smil 2006:24). Smil (2006:22) is critical of the 'Hubbertians', stating that they "resort to deliberately alarmist arguments as they mix incontestable facts with complex realities and as they ignore anything that does not fit their preconceived conclusions in order to issue their obituaries of Western civilization". For Smil (ibid), humanity has passed through a number of 'energy transitions', each of which "has stimulated technical advances and driven our inventiveness". "Unless we believe, preposterously", he continues, "that human inventiveness and adaptability will cease the year the world reaches the peak annual output of conventional crude oil, we should see that milestone (whenever it comes) as a challenging opportunity, rather than a reason for cult-like worries and paralyzing concerns" (Smil 2006:24).

2.10. Assessing the Various Perspectives – a contested consensus?

Porritt (2005:160) sums up the debate between the two main schools of thought;

> "…*geologists involved in the debate tend to incline towards an earlier date (perhaps as soon as 2008), principally on the basis that overall discoveries of oil peaked in the 1960s, with just one new barrel of oil being discovered today for every four that is consumed; economists incline towards a later date (2015/2020) given that there has always been more in the ground than the experts have historically predicted and that extraction techniques just go on getting better and better*"

Some criticize the statistical approaches taken by Campbell and Laherrere in formulating their estimates (Lynch 2003). They argue that the fact that Campbell's database is not in the public domain means that no-one else is able to check his claims. However, others have checked their findings and found them to be rigorous and accurate (Bentley 2002), and it is interesting that Skrebowski takes a completely different approach to calculating peak, and reaches roughly the same estimate (2007-2010) (Bentley 2002).

Heinberg (2003) having assessed the debates as to when the peak may arrive, believes it will be sometime between 2006 and 2015. He identifies the three most likely scenarios that will influence the exact date of peak.

> 1. *Robust economy, high demand: in this case, the extraction rates for all fossil-fuel liquids could peak as soon as 2006.*
> 2. *Global recession: if the global economy limps along at its 2001 rate, with no increase in activity or demand, the peak would be delayed, perhaps until 2010 or 2012.*
> 3. *Global depression: if the global economy were to nose dive, demand for oil would recede sharply. The extraction peak would then be delayed substantially, perhaps to 2015 or beyond*"

Tooke summarises the current position thus, "the total amount of oil available is largely known, even if reserves are falsely reported. Technology will make a higher percentage of conventional and non-conventional oil viable by financial, energy economic and environmentally acceptable measures. However, even taking these factors into consideration it is highly likely that production will peak in the next few years" (Tooke 2005:unpaginated).

2.11. Conclusion

We have seen above how the peak oil concept offers a logical and well-researched theory for how world oil production functions, and how its decline might affect humanity. Although much of the literature on the subject originates in the US, an increasing amount is emerging from the UK (Leggett 2005; Mobbs 2005; Bentley 2002), as the scale of the challenge peak oil presents to the UK becomes clearer.

The deeper one studies the question of peak oil, the more one becomes aware of the confused nature of the picture, as much data is withheld or uncertain, and many predictions change as new information becomes available. For example, in January 2006, Petroleum Intelligence Weekly reported on leaked documents from the Kuwaiti Oil Company which showed that rather than the previously stated reserves of 99 billion barrels, the remaining reserves are closer to 48 billion barrels. Overnight the world lost 5% of its total reserves (Reuters 2006).

Monbiot sums up the situation; "our hopes of a soft landing rest on just two propositions: that the oil producers' figures are correct, and that governments act before they have to. I hope that reassures you" (Monbiot 2005:unpaginated). As will be discussed in the following section, the actual date of peak is largely of academic interest. What is equally important is exploration of approaches to mitigate its effects and how much time in advance of peaking is needed to adapt to a new era of contracting supplies of fossil fuels.

Chapter 3. Assessing the Scale of the Challenge

3.1. Introduction

Chapter 2 showed that the peak oil concept offers a powerful perspective on humanity's energy prospects in the near future. If humanity is at or near the peak in world oil production, how might this impact on our civilisation, economy and way of life? Chapter 3 explores the literature which relates to this. The term 'energy descent' is increasingly used in relation to the downward half of the Hubbert peak; this is defined and its origins within the literature explored. A wide spectrum of post-peak scenarios have been generated. These are explored and used to generate a model of post-peak possibilities to analyse common and divergent trends.

3.2. Mitigation and Risk Management – beyond the peak

What might be the implications of peak oil for Western economies? The most authoritative analysis so far is *'Peaking of World Oil Production – Impacts, Mitigation and Risk Management'* by Hirsch et.al. (2005), commissioned by the US Department of Energy. The study does not look at when peak oil might occur, rather at its risk management implications, and also how much time will be needed to prepare for it.

Peak oil, they conclude, represents "an unprecedented risk management problem" (Hirsch et.al. 2005:4). They analyse three scenarios, the first where action is not initiated until peaking occurs, the second which assumes that action is initiated 10 years before peaking, and the third where action is initiated 20 years before peaking. They conclude that "the problems associated with world oil production 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" (Hirsch et.al 2005:5). Regarding the amount of time

required for adequate mitigation, the authors write that any response will "need to be initiated more than a decade in advance of peaking" (Hirsch et.al. 2005:4).

The most recently published national study is *'A Baseline Assessment of Ireland's Oil Dependence – key policy considerations'* produced for the Irish Government. Identifying peak oil as particularly affecting the availability and cost of liquid fuels, and therefore transport, the study highlights how oil dependent the Irish economy has become, and how damaging large reductions in transportation would be. The report concludes, "while it is often difficult for policymakers and businesses to take a long-term view of the issues that they face, that is the requirement in regard to the peak oil challenge" (Forfas 2006:27). The UK Government has yet to commission a study on the subject.

3.3. The Scale of the Challenge

Hirsch et.al. (2005:7) argue that peak oil represents a problem which is "unlike any yet faced by modern industrial society". Milbrath (1989:5) writes, "we cannot escape our planetary predicament by relying on past theories". Glendinning (1994:x) identifies what she calls "two of the most important social issues of our times: the psychological/spiritual challenge each of us is facing, and the ecological crisis besieging our planet". She states that her aim in exploring the interconnections between these two realms is "to encourage a conscious coalescing of the social forces that are addressing them: today's psychological movements (which include the addiction/recovery field, humanistic/transpersonal psychologies, and the burgeoning interest in spirituality in all its earthly forms) and the environmental movement (with its varied devotion to protest, clean-up, conservation, and sustainability)" (ibid).

Canty (2005:9) asks the question central to this dissertation, "how do people of Western civilization, particularly those addressing the environmental crisis, shift from a scarcity paradigm to one that spawns abundance in the context of our environmental realities?"

Brown (2006a:206), writes of the need for a 'wartime mobilisation'. Taking as an historical example the restructuring of the US economy at the beginning of WW2, he writes, "this mobilisation of resources within a matter of months demonstrates that a country and, indeed, the world, can restructure its economy quickly if it is convinced of the need to do so. The issue is not whether most people will eventually be won over, but whether they will be convinced before the bubble economy collapses". In a later article he characterises this shift as being "from a fossil-fuel-based, automobile-centered, throwaway economy to a renewable-energy-based, diversified-transport, reuse/recycle economy" (Brown 2006b). The concept of a 'war-time mobilisation' is echoed by Hirsch et.al. (2005:4) in their call for a 'crash program' and by Heinberg (2004:88), who calls it "a species-wide effort towards self-limitation".

3.4. The Concept of 'Energy Descent'

Much has been written about the geological and economic aspects of the Age of Cheap Oil, or what we might call 'energy ascent', as well as the peak oil concept, but very little which looks beyond the peak, into the period of 'energy descent' (i.e. Jarman 2006; Henderson 2006; Heinberg 2006; Hopkins 2005,

2006; Fenderson 2004, 2006).   The concept of energy descent was put forward by ecologists Odum and Odum (2001:4):

> *"That the way down can be prosperous is the exciting viewpoint whose time has come. Descent is a new frontier to approach with zeal … if everyone understands the necessity of the whole society adapting to less, then society can pull together with a common mission to select what is essential. Presidents, governors, and local leaders can explain the problem and lead society in a shared mission. Millions of people the world over, if they see the opportunity, can be united in the common quest for a prosperous way down. The alternative is a world of selfish battles for whatever resources remain".*

The term was further developed by Holmgren (2003b:unpaginated); "I use the term 'descent' as the least loaded word that honestly conveys the inevitable, radical reduction of material consumption and/or human numbers that will characterise the declining decades and centuries of fossil fuel abundance and availability".

For the purpose of this paper I shall define energy descent as ***"the continual decline in net energy supporting humanity, a decline which mirrors the ascent in net energy that has taken place since the Industrial Revolution. It also refers to a future scenario in which humanity has successfully adapted to the declining net fossil fuel energy availability and has become more localised and self-reliant. It is a term favoured by people looking towards energy peak as an opportunity for positive change rather than an inevitable disaster"***.

3.5. Future Scenarios

While some authors have used fiction to explore how the post-peak world might unfold (Callenbach 1975; Slonczewski 1987; Starhawk 1994; Poyourow 2005;), it is from scenario planning that the most practical models have emerged. This offers a useful tool for assessing general post peak oil trends. Gallopin (2002:365) writes "unlike projections and forecasts, which tend to be more quantitative and more limited in their assumptions, scenarios are logical narratives dealing with possibly far-reaching changes". He continues, "the scenario approach can provide a common framework for diverse stakeholders to map and address critical concerns and identify alternatives as a forum for discussion and debate" (ibid). None of the authors below argue that their scenarios will unfold as described, they are storylines rather than predictions, offering tools to encourage creative thinking.

Holmgren (2005) identifies four possible scenarios (see Figure 2). The first two, the 'techno-explosion' (holidays on the moon, unlimited nuclear cold fusion etc.) and 'Atlantis', (a sudden and catastrophic societal collapse) he sees as unlikely or eminently undesirable. More realistic are the third and fourth, 'green-tech stability' and 'Earth Stewardship'. 'Green-tech stability' outlines the idea that business-as-usual can continue indefinitely, with renewable energy replacing conventional energy, hydrogen cars replacing existing cars. 'Earth Stewardship' Holmgren defines thus, "human society *creatively* descends the energy demand slope essentially as a 'mirror image' of the creative energy ascent that occurred between the onset of the industrial revolution and the

present day" (Holmgren 2005:7). It is this fourth scenario which Holmgren believes to "represent the only truly sustainable future" (ibid).
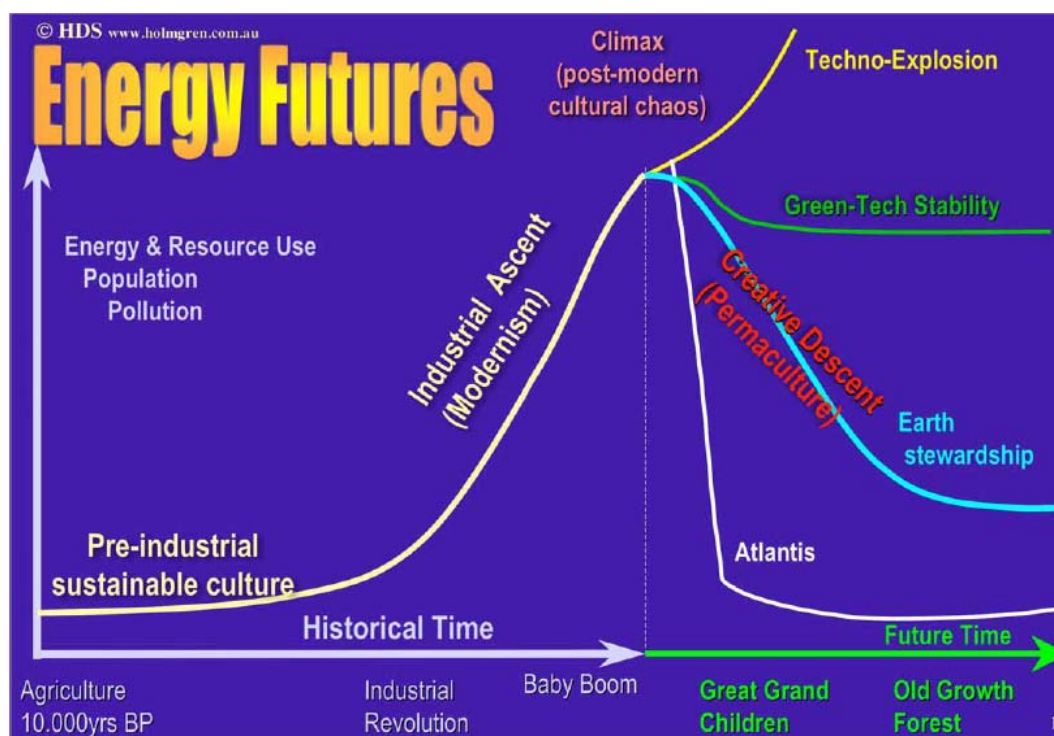
Figure 2. Holmgren's Energy Futures Scenarios (Holmgren 2005).

The first of Heinberg's (2004) four scenarios, "Last One Standing", describes a scenario where military force is used to secure remaining world hydrocarbon reserves. In his second, "Waiting for the Magic Elixir", a new energy source as abundant and versatile as oil is developed, such as cold fusion or the mythological 'free energy'. The third scenario, "Powerdown", is seen as "the path of cooperation, conservation and sharing" (Heinberg 2004:14), a Government-led strategy utilising all the resources at its disposal to reduce per-capita consumption and build the post-fossil fuel economy and infrastructure. Finally, "Building Lifeboats", which, Heinberg (2004:15) writes, "begins with the assumption that industrial civilisation cannot be salvaged in anything like its present form" and is a process of building community solidarity, creating a localised infrastructure and preserving and enhancing the essentials of life". Heinberg suggests that "the most fruitful response is likely to be a combination of Powerdown (in its most vigorous form) and Lifeboat Building" (ibid).

The Foundation for the Economics of Sustainability (FEASTA) in Dublin developed four scenarios for Ireland's energy future. The first, 'Business as Usual', puts oil peak at 2030, with the Government doing nothing to pre-empt its arrival. The second, 'Enlightened Transition' assumes that the Government decides "to use energy which is much cheaper now than it will ever be again to develop Irish energy sources and to reduce the amount of energy required to maintain and run the Irish economy" (FEASTA 2006b). This results in an economy much more prepared for the peak when it does eventually arrive.

The third, 'Enforced Localisation', assumes oil peak in 2007 leading to a drastic economic downturn. The economy contracts and then collapses, resulting in a very localised future, which over time becomes increasingly sophisticated, but

only within much reduced energy limitations. The final one is 'Fair Shares', which assumes peak oil in 2007, but a rapid Government response including the introduction of carbon rationing alongside a concerted effort to reduce energy use in all areas, and the relocalisation of most aspects of daily life. This descent is far gentler than in the 'Enforced Localisation' scenario.

A study by Foresight (Curry et.al. 2005) examines 4 scenarios for the future of transport in the UK. These were developed to investigate how science and technology might be applied to infrastructure over the next 50 years. The scenarios it proposes are as follows;

1. **Perpetual Motion.** A zero-emissions hydrogen economy, assumes that globalisation is still in place, with strong demand for travel.
2. **Urban Colonies.** A future of compact sustainable cities, with energy efficient public transport systems, more isolated rural areas and reduced consumption.
3. **Tribal Trading.** A world that has been through a 'sharp and savage energy shock'. A global recession has left millions unemployed, and for most people, 'the world has shrunk to their own community'. Transport is typically by horse and bicycle.
4. **Good Intentions.** A world in which a system of rigorous carbon rationing has been introduced, leading to reduced traffic volumes and more mass transportation.

The authors acknowledge that the exact year of oil peak will have a considerable effect on the timeframe of this scenario. Within 'Tribal Trading' the authors acknowledge that there is considerable room for a range of outcomes. Curry et.al. cite the work of Gallopin, whose 'Panarchy' model has many similarities to 'Tribal Trading'. Gallopin (2002:383) presents three pairs of scenarios;

1. **Conventional Worlds** – basically business as usual, the scenarios don't deviate sharply from the present.
2. **Barbarisation Worlds** –like Holmgren's 'Atlantis' scenario, these model a deterioration in civilisation as problems overwhelm the coping capacity of both markets and policies.
3. **Great Transition** – these scenarios "incorporate visionary solutions to the sustainability challenge, including fundamental changes in the prevailing values as well as novel socio-economic arrangements"

Gallopin sees the Great Transition scenario as having two possible outcomes. The first he calls 'ecocommunalism', a relocalised future, with local autonomy and a dominant value of voluntary simplicity. Population contracts and cities devolve into towns and villages. The second variation on the Great Transitions scenario is the 'New Sustainability Paradigm'. This is an almost Utopian vision wherein the global economy continues, but the culture underpinning it changes to prioritise the local, in terms of energy, production and governance. This echoes Heinberg's 'Powerdown' scenario, a collective, ambitious and inclusive drive to live within the Earth's limits.

The final relevant scenarios come from outside the peak oil literature. Johnston (1991) explores paradigms for the future and identifies 3 possibilities. Canty (2005) observes that while Johnston does not directly address the ecological crisis, his categories are helpful. The first, 'onward and upward', if translated to

the environmental scenarios, is that of believing Governments and scientists will "come up with something". This echoes Holmgren's 'techno-fantasy' and Heinberg's 'Waiting for the Magic Elixir'. Johnston's (1991) second scenario he terms the 'polar view', which essentially believes that our problems will lead to "Armageddon: nuclear, environmental or economic collapse, akin to Holmgren's 'Atlantis'.

His final paradigm he calls the Evolutionary scenario, which "includes elements of each while stepping beyond either". This echoes Holmgren's 'Earth Stewardship' scenario, and partly Heinberg's 'Lifeboats' and 'Powerdown' scenarios. He writes that most of the environmental movement operates from the polar view, arguing that we have to wake up collectively to the scale of the crisis before it is too late. This leads to solutions that promote conservation, environmental law and so on. The Evolutionary paradigm requires our evolution as a species, rather than just allowing technological solutions to 'fix' the problem.

3.6. The Post Peak Scenarios Model

The model in Figure 3 was created to place the scenarios discussed in 3.5 along a spectrum. Its form became circular rather than linear, as both extremes led to what Holmgren terms 'Atlantis'. Johnston's paradigms underpin the model, offering a useful template. Those scenarios between Green Tech Stability and Localisation fall within the Evolutionary Scenario, suggesting that for these to be successful, they will require our collective cognitive and behavioural evolution or adaptation as a species.
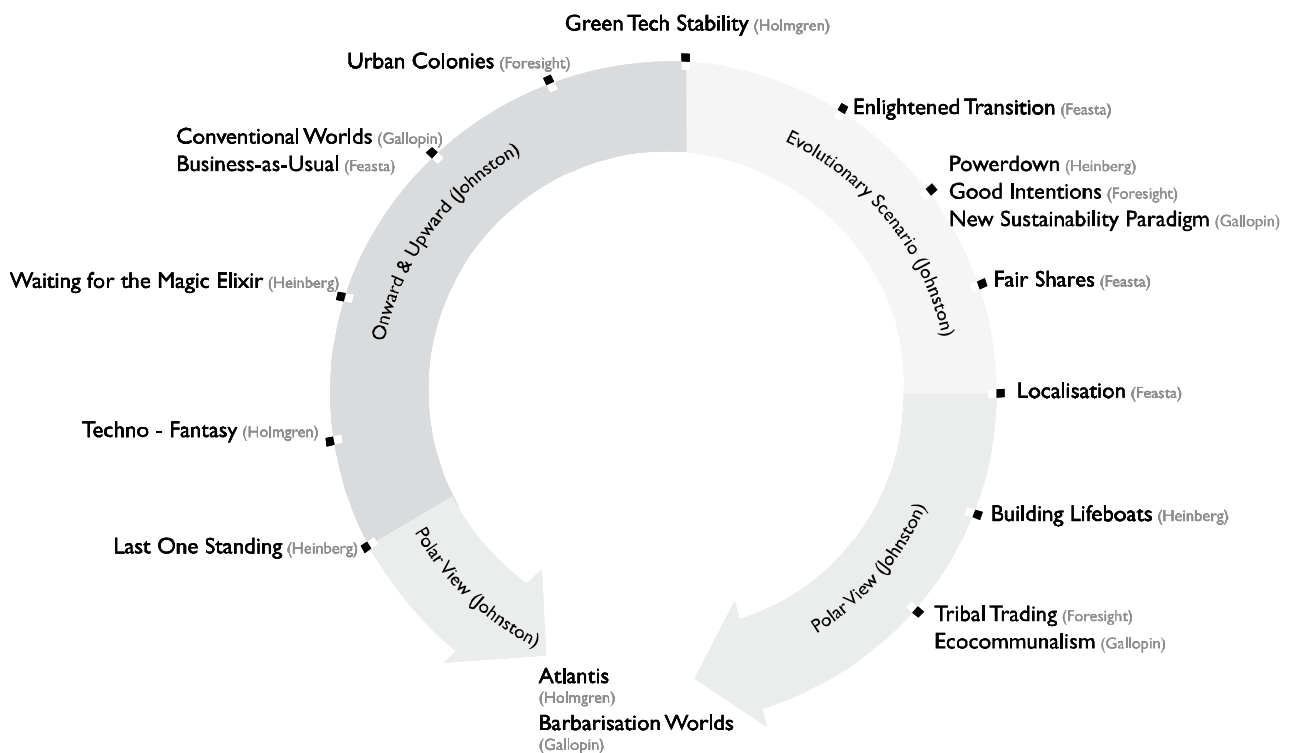
Figure 3. Spectrum of post-peak scenarios (Hopkins 2006; after Johnston 1991; Gallopin 2002; Holmgren 2003a; Heinberg 2004; Curry et.al. 2005; FEASTA 2006b).

One might argue that the scenarios in the 'Onward and Upward' realm require what scenario planner Pierre Wack called the "Three Miracles", namely a technological miracle (i.e. extraordinary new exploration and production levels or free/hydrogen energy), a socio-political miracle (that Government policies and cultural values will allow social exclusion to be eradicated) and thirdly a fiscal miracle, namely that the public sector will fund the implementation of that scenario (Kleiner 1996). It is the unlikeliness of all three miracles occurring that leads this dissertation to believe that the Evolutionary scenario is perhaps the most likely.

3.7. The UK's Most Recent Powerdown – World War Two

Can any lessons be learnt from the UK's most recent national 'Powerdown', World War Two? While there are clearly many differences with energy descent, there are also relevant similarities. As Simms (2005:156) observes, "recent history demonstrates that whole economies can be re-geared in short periods of time, which is exactly the demand global warming makes of us". "Could it be", he continues, "that the experience of social and military mobilisation in wartime might answer the biggest question to do with global warming: are we capable of changing our lifestyles and economies *enough* and *in time* to stop it?".

Despite popular images of wartime austerity, there is much that can be learnt from both the run-up to the war and the 1939-45 period itself. Simms (2005:157) notes "the pall of austerity that held wartime and post-war Britain is not as miserably straightforward as it can at times be seen". In April 1936, an Act of Parliament set up two committees, one commissioned to design and prepare a scheme of food rationing, the other to propose the commodities to be given priority in a programme of storing food (Wilt 2001). This led to the creation of the Food (Defence Plans) Department in the Board of Trade, which became the driving force in preparing the food sector for war. Even so, Wilt (2001) argues, it was not until 1940 that the Government produced a long term policy. Committees were set up in 476 districts nationwide to co-ordinate the reorientation of agriculture. As well as attempting to increase levels of stored food, increasing home production became a major concern. In 1936, two-thirds of Britain's food was imported and much of the nation's productive land was under pasture (Gardiner 2005).

By 1944 the amount of land under cultivation had increased from 12.9 million acres in 1939 to 19.8 million, food production had risen 91% and in effect Britain was able to feed itself for approximately 160 days a year rather than the 120 days it had been in 1939 (Gardiner 2005). Food imports to the UK halved between 1939 and 1944 (ibid). Local authorities set up horticultural committees to advise people on growing food, complemented by a huge programme of promoting virtues of thrift and economy, as well as teaching practical skills. In 1942 Bristol, for example, had 150,000 allotments, and over half the nation's manual workers had an allotment or garden, producing around 10% of the nation's food (ibid).

One of the successes of rationing was that it rebalanced inequalities in diet. While the wealthy saw their diet restrained, for the poor, particularly in industrial centres, diet improved significantly from the pre-war years. Total food consumption fell 11% by 1944 as did meat consumption (Simms 2005). Infant mortality rates also fell, and arguably the UK's general state of health was

never better. In terms of car use, petrol rationing, introduced in 1939, was restricted to 1,800 miles per year for non-essential users, then gradually reduced until 1942 when individual allocations were abolished. Between 1938 and 1944 there was a 95% drop in the use of cars in the UK (ibid).

Much can be learnt from the experience of World War Two regarding how Governments prepare for such a transition. The Government was able, between 1936 when the Food (Defence Plans) Department was set up within the Board of Trade and 1939 when the war began, to co-ordinate a response which was able (just) to support the nation (Hammond 1954). The most important lesson from the War years, according to Simms, is that "when Governments really want to, they can do almost anything, including good things" (Simms 2005:156).

Clearly peak oil and climate change have yet to engender in the population or within Government a sense of urgency anywhere near that of Nazi invasion. However, as Hirsch et.al. (2005) state, by the time a Government considers it politically expedient to promote the concept of a contracting economy, it is too late. In terms of the model in Figure 3, the response in World War Two was arguably closest to Heinberg's 'Powerdown', although the Government's emphasis on local action and reskilling places it further round towards FEASTA's Fair Shares. The challenge presented by peak oil will rely more on grassroots responses than national Government, at least in the initial stages, a pattern that can be observed in the US, where State authorities, frustrated by Governmental inaction on climate change, have begun passing their own, far more stringent, policies (Stiffler 2006).

3.8. Conclusion

This chapter has provided an overview of possible scenarios within the peak oil literature. In particular the Hirsch Report (Hirsch et.al. 2005) sets out an uncompromising picture of the scale of the challenge, with its call for a 'crash programme' initiated at least 10 years ahead of the peak. Given the number of writers who argue that peak oil will occur within the next 5 years, this is a stark assessment.

Emergent from the scenarios explored and the model generated (Figure 3), are 3 core possibilities. Firstly that peak oil triggers a catastrophe so profound that current civilisation collapses. This has many advocates, most commonly within the US (Hanson 2001; Savinar 2004). The second is that rapid improvements in technology enable business-as-usual to continue. The third is that the challenge of peak oil necessitates a profound restructuring of society, in every aspect, not just energy. While scenarios can only ever be storylines not predictions, it is clear that, when combined with Hirsch et.al.'s call for a 'crash programme', there is an urgent need to explore more deeply how this restructuring might be facilitated.

I propose that the vulnerability of the transportation sector and centralised distribution systems to shortages and high prices of liquid fuels, as identified in the Hirsch report means that the most likely scenario lies somewhere between Heinberg's (2004) 'Building Lifeboats' scenario, and his 'Powerdown' scenario, probably best described in Holmgren's (2005) 'Earth Stewardship' scenario. In other words, a combination of local communities self-organising to increase self-reliance and parallel infrastructure, and national governments moving

towards responses to a contracting energy supply, possibly though implementation of some kind of carbon rationing system (Fleming 2005; FEASTA 2006a). Given the UK Government's apparent reluctance to acknowledge the subject (Wicks 2006) the primary impetus will need to come from the community level.

Chapter 4. Rethinking the World Beyond Oil

4.1. Introduction

One of the central debates within peak oil literature focuses on whether peak oil is seen as a crisis or an opportunity. An emergent body of opinion sees it as key to the transition to a sustainable society, using terms such as 'The Great Turning' (Macy & Brown 1998; Korten 2006) to portray a period of profound, but ultimately beneficial, transition.

A number of writers explore the possibility that peak oil will lead to a largely relocalised economy as the centralised distribution systems made possible by cheap oil become unfeasible. Calls for localisation are not exclusive to the peak oil literature; a broad spectrum of writers, principally from the anti-globalisation movement, have been arguing for this long before peak oil emerged.

4.2. Peak Oil – a Crisis or an Opportunity?

Chapter 2 showed that the potential impacts of peak oil are complex and contain many unknowns and uncertainties. The literature reflects a wide range of opinions as to the impacts of Peak Oil on society. First to suggest that peak oil might represent an opportunity as well as a crisis was Hartmann (1999:302), who wrote that peak oil could result in "a brighter, more meaningful and more joyous future".

Winter and Kroger (2004:18) believe that focusing on potential disaster reduces our ability to respond. They continue;

> "Healthy functioning requires that we have faith that our needs will be met in the future; without this confidence, our trust in the world is damaged. Damaged trust can lead to four neurotic reactions that are likely to impact environmental behaviour: narcissism, depression, paranoia and compulsion".

This focus on the negative is seen by some (Canty 2005) as dangerous, leading to psychological problems. Oskamp (2000:383) sees a basic difficulty in promoting environmentally responsible behaviour being that the problems we seek to address "stimulate fear, and … essentially people don't like to think about fearful topics, … they frequently repress or deny such information". There is an argument, however, that fear can be a trigger for change. Oskamp (ibid) continues; "research studies on appeals to fear have shown that they are most likely to change people's behaviour under two conditions: (1) if people are aware of clear steps they can take to protect themselves, and (2) if these steps are conveniently available".

Macy and Brown (1998:17) describe this transition to a sustainable society, they describe the scale of change required as 'epochal', and continue "while the agricultural revolution took centuries, and the industrial revolution took generations, this ecological revolution has to happen within a matter of a few years. It also has to be more comprehensive – involving not only the political economy, but the habits and values that foster it". The concept of The Great Turning has subsequently been used by other authors, most notably Korten (2006). He writes, "some critics will surely complain that 'Korten wants to change everything'. They miss the point. Everything is going to change. The question is whether we let the changes play out in increasingly destructive ways or embrace the deepening crisis as our time of opportunity … it is the greatest creative challenge the species has ever faced" (Korten 2006:22).

For Capra (2006:unpaginated), this transition is seen in terms of systems thinking and ecology; "the new conception of life that is now emerging in science has some interesting lessons to teach us here, because what we have learnt from complexity theory and systems theory is that the crisis that we are experiencing is an integral aspect of dramatic transformation. Every emergence of novelty has an instability preceding it or a crisis preceding it. So, the crisis may lead to a breakdown, but it can also lead to a breakthrough, and we can achieve a new state of affairs, a new way of life, that can be a much higher quality of life, and it's up to us to shape that transformation".

4.3. Relocalisation as a Possible Response to Peak Oil

For many writers, a radical relocalisation of the economy and every aspect of life is an inevitable outcome of Peak Oil. The future, Kunstler (2005:239) believes, will be "increasingly and intensely local and smaller in scale". Indeed, Fleming (2006:109) states that "localisation stands, at best, at the limits of practical possibility, but it has the decisive argument in its favour that there will be no alternative". Localisation is not a concept exclusive to peak oil theorists. As will be seen in 4.3.1., a range of arguments for more small scale, self-reliant and localised economies have been around for some time.

Peak oil has added new momentum to these calls. Fleming (2006b:118) elucidates this argument thus;

> "The transition to localisation from the global interdependence of today will be hard to achieve successfully, although it will be enforced by the breakdown of the world's energy systems and food supply. Achieving it successfully will mean establishing local political economies with an intelligence and cultural existence well in advance of the incoherent, growth-dependent and locally-atrophied market economy of our day. Doing so unsuccessfully would mean failing to build local competence of any kind, so that neither the place nor the people survive the breakdown of the global market economy which the serial traumas of energy, food, climate and social deconstruction will bring".

Ultimately, Heinberg (2004:140) writes, "personal survival will depend on community survival", that is, individual self-sufficiency will not be a viable response to a problem of this magnitude. The first place to start in exploring the re-prioritisation of the local is with the concept of localisation.

4.3.1. Localisation

Norberg-Hodge (2003:24), defines localisation thus;

> "the essence of localisation is to enable communities around the world to diversify their economies so as to provide for as many of their needs as possible from relatively close to home… this does not mean eliminating trade altogether, as some critics like to suggest. It is about finding a more secure and sustainable balance between trade and local production".

Woodin and Lucas (2004:69) trace arguments for economic localisation back to Keynes, who said in 1933;

> "I sympathise, therefore, with those who would minimise, rather than those who would maximise, economic entanglement between nations. Ideas, knowledge, art, hospitality, travel – these are the things that should of their nature be international. But let goods be homespun whenever it is reasonable and conveniently possible, and above all, let finance be primarily local".

Kohr's (2001:1) *theory of size*, suggests "that there seems only one cause behind all forms of social misery: bigness". Schumacher argues in favour of a higher degree of self-reliance and self-sufficiency (Vergunst 2002), not, as is sometimes misrepresented, for keeping everything as small as possible, but rather that "for every activity there is a certain appropriate scale, and the more active and intimate the activity, the smaller the number of people that can take part, the greater is the number of such relationship arrangements that need to be established" (Schumacher 1973:54). Hines (2000a:4) writes "localisation is not a return to overpowering state control, merely governments' provision of a policy and economic framework which allows people, community groups and businesses to rediversify their own local economies".

Shuman (2000:46) favours the term 'community self-reliance'. He writes that "it suggests personal responsibility, respect for others, and harmony with nature…addition of the word 'community' to self reliance underscores that the ultimate objective is a social and caring one". The term self-reliance was previously utilised by Ekins (1989:101) who argued that it offers a key to creating sustainability. "By producing what we consume and consuming what we produce, rather than doing either through exchange, by definition we keep the externalities, positive and negative, for ourselves. The justification for so doing is clear: we will enjoy the positive externalities, rather than giving them away, and at the same time will be responsible ourselves for the negative externalities".

None of the above argues for isolationism, or for total self-*sufficiency*. Shuman (2000:48) writes "it's easy to dismiss the principle of self-reliance by pointing to many complex products that communities cannot manufacture on their own. The goal of a self-reliant community, however, is not to create a Robinson Crusoe economy in which no resources, people or goods enter or leave. A self-reliant community simply should seek to increase control over its own economy as far as is practicable". Hines (2006b) echoes this, arguing that everything that can be produced within a nation or region should be.

Voices in favour of localisation emerge from disparate perspectives. Critics of globalisation point out that it is environmentally destructive (Retallack 2003), has disastrous effects on indigenous farmers in the developing world (Shiva 1993, 2001), promotes cultural homogeneity (Barnet & Cavanagh 2003), contributes to climate change (Sobhani & Retallack 2001), erodes biodiversity (Shiva 1993), creates inequitable trade models (Shiva 2005) and that it promotes a colonial model of development (Goldsmith 2001). Scruton (2003) argues that in the face of radical Islamic fundamentalism it is necessary to reverse the process of globalisation, and that its replacement with smaller-scale, locally based economies would facilitate the rebuilding of national security and social cohesion.

4.4. Critics of Localisation

Some are critical of the concept of localisation, believing it completely unnecessary (Beckerman 1995) or having a disastrous effect on the economies of developing countries (Monbiot 2005). Monbiot argues that localisation is "coercive, destructive and injust" (Monbiot 2003:unpaginated), and that "the money the poor world needs has to come from somewhere, and if our movement rejects trade as the answer, it is surely duty bound to find another" (ibid). He proposes that poorer nations be allowed to trade under fairer terms, because the localisation approach "damages precisely those interests (it) seeks to protect" (ibid).

Woodin and Lucas (2004:82) respond "to prevent this injustice arising, localisation must demonstrate that trade is not the only means of transferring resources from rich to poor countries ... the developed world must radically reorient its approach to development aid and debt so that sufficient resources are transferred to the South to give it the opportunity to create the resilient, self-reliant local economies that will lift its people out of poverty".

Hinrichs (2003) argues that what she calls 'defensive localisation' can lead to the emergence of undesirable separatist politics. In this event, she argues, "localisation becomes elitist and reactionary, appealing to narrow nativist sentiments" (Hinrichs 2003:37). Monbiot adds that localisation can never be effective because "local solutions will always be undermined by communities of interest which do not share our vision" (Monbiot 2003:12). He argues that rather than relocalising the economy, we should instead rethink and revitalise global politics, in order to "establish the political space in which our local alternatives can flourish" (ibid). None of those arguing against localisation discuss the impacts peak oil may have on international trade, fair or otherwise.

4.5. Conclusion

Until recently, the concept of localisation has been promoted as a conscious choice, as being preferable to globalisation. However, an increasing number of people are coming to see it as the inevitable result of energy descent.

An emerging voice within the literature argues that peak oil contains the potential to be a great opportunity as well as, or rather than, a crisis. While some argue that it could lead to the long-overdue transition to a sustainable society, there is a major gap in the literature as regards how this transition might actually be achieved. Both within what we might call the 'localisation by choice' school of thought (Shuman 2000; Hines 2000; Norberg-Hodge 2003;)

and the 'localisation enforced by energy contraction' school (Heinberg 2004; Kunstler 2005; Fleming 2006), little consideration is given to how communities might become engaged in formulating and driving this process, on the scale of the 'wartime mobilisation' advocated by Brown (2006a), as well as how it might be designed and managed, and what the end result might look like.

Chapter 5. – Lessons from Behavioural Studies.

5.1. Introduction

The scale of the challenge of peak oil has been clearly defined in Chapters 2 and 3. The questions now arise how do communities change and how can that be facilitated and, accelerated? Jackson (2005) observes that behavioural change is fast becoming a kind of 'Holy Grail' in the area of developing sustainable consumption policies. This section will examine the literature on motivating sustainable consumption and studies that have explored why people alter their behaviour in order to live more sustainably as well as how that behaviour might be influenced.

Much research has been done into how individuals can be encouraged towards more sustainable behaviour, providing useful insights into what prompts people to change. Despite the fact that most of it relates to individuals, useful observations can be drawn of relevance on a larger scale. Also examined is an approach from Holland called "Transition Management", a process for facilitating behaviour change on a community and societal level.

5.2.   Insights from Behavioural Studies 1: why people don't change

Most of the research on behavioural change and sustainable consumption focuses on individuals, as understanding mainstream consumer behaviour is seen as a pre-requisite for understanding how to motivate pro-environmental consumer behaviour (Jackson 2005). Most studies reach the conclusion that change is possible but not easy. Jackson (2005:134) for example, warns against "simplistic prescriptions for change".

The starting place when looking at this is the 'rational choice model' (also known as the 'information deficit' model) which guides much existing policy. This model is described by Jackson (2005:29) thus; "the basic tenet of the model is that we behave in such a way as to maximise the expected benefits to ourselves (as individuals) from our actions". Barr (2003:227) writes "the process of engagement is commonly seen in governmental circles as a problem of awareness: individual people simply do not appreciate environmental problems for what they are. The solution to this problem is often seen to lie in the provision of information and knowledge dissemination".

This approach has been called A-I-D-A (Awareness-Information-Decision-Action) (Jackson 2005) and assumes that the more information people have, the more likely they are to act. It is, write MacNaghten and Urry (1998:212)

"predicated on the assumption that inaction is determined by people's ignorance of the facts". Owens (2000:1142) writes "there could hardly be a clearer demonstration of the flaws in the information deficit model than the persistent refusal of the public to have their allegedly irrational conceptions of risk 'corrected' by providing them with more information". Indeed some (i.e. Thompson & Rayner 1998; Blake 1999; Smith et.al. 1999) suggest that not only is this approach unlikely to produce the desired effects, but that it could also lead to alienation and apathy.

Holdsworth (2003) examined consumer attitudes to sustainable consumption in the UK using qualitative and quantitative approaches. She observed that the two approaches yielded significantly different results. The quantitative research showed people across all social groupings to be very supportive of the principle of more sustainable modes of consumption. However, qualitative research showed that the factors influencing peoples' choices were far more complex than would first appear. The report concluded that policies promoting more sustainable consumption "need to pay greater attention to implementation and delivery so as to fit in with the demands of consumers' lives" (Holdsworth 2003:10). Among the findings in the qualitative research, those of relevance to this paper include;

- "People feel more motivated to act where they perceive a problem that affects them, but do not tend to associate what they think of as sustainable consumption with any positive personal benefit, or tangible improvement in their quality of life".

- "Time spent on sustainable actions is seen as requiring a sacrifice of some other activity – notably leisure or family time"

- "…they are most positive about policy measures that do not disrupt their daily routine, and where they can see tangible benefits for their household or local environment".

The key finding is that "consumers are generally happy to act sustainably where it does not impinge on their key priorities and cause them inconvenience" (Holdsworth 2003:6).

There appears to be a paralysing mismatch of views, individuals believe that Governments should initiate change, while Governments see their role as providing information so that individuals will adapt their behaviour. This mutually re-enforcing cycle stifles the kind of response this dissertation is exploring. Other obstacles to behavioural change identified by Jackson are "overcoming problems of consumer lock-in, unfreezing old habits and forming new ones and understanding the complexity of the social logic in which individual behaviours are embedded – all are pre-requisites for behavioural change (Jackson 2005). By 'lock-in' Jackson is referring to the phenomenon of people being unable to change specific behavioural patterns due to institutional factors beyond their control.

5.3. Insights from Behavioural Studies 2: Why People Do Change

The above might suggest that changes in individual behaviour are an impossibility. However other literature argues that although not easy, behavioural change is possible. Jackson (2005) writes that consumer behaviours are socially negotiated, and consumer goods are observed to be a key factor in 'social conversations' contributing key aspects of our identity, social cohesion and cultural meaning. Therefore, he argues, pro-environmental behaviour change has to be a social process, substituting the important social functions these products and behaviours perform in other ways. He writes "in this context, motivating sustainable consumption has to be as much about building supportive communities, promoting inclusive societies, providing meaningful work and encouraging purposeful lives, as it is about awareness raising, fiscal policy and persuasion" (Jackson 2005:134).

Despite arguing that community-based processes "could offer affective arenas for exploring pro-environmental and pro-social behaviour change", Jackson (2005:2) concludes that, at this point, "there is no unequivocal proof that this community-based approach will be effective and that there is an urgent need for pilot community-based schemes using participatory tools". This is an area that will be explored more depth in 7.11.

5.4. Transition Management.

Transition Management (TM) is an approach to understanding the dynamics of transition on a societal scale that originated in the Netherlands from biology and population dynamics and is now well accepted in Dutch society. Rotmans et.al. (2001:2) define a transition as "a gradual, continuous process of structural change within a society or culture", and proceed to describe it in more depth as "a set of connected changes, which reinforce each other but take place in several different areas, such as technology, the economy, institutions, behaviour, culture, ecology and belief systems". They note that transition usually takes place over one generation (25 years), however, they observe that "this can be accelerated by unexpected or one-off events: for example, war, large accidents (eg. Chernobyl) or an *oil crisis*" (emphasis added) (Rotmans et. al. 2001:3).

They identify four stages common to any process of transition.

- The first is the predevelopment phase of dynamic equilibrium where the status quo does not visibly change.
- A take-off phase where the process of change gets under way because the state of the system begins to shift.
- An acceleration phase where visible structural changes take place through an accumulation of socio-cultural, economic and institutional changes that react to each other. During the acceleration phase, there are collective learning processes, diffusion and embedding processes.
- A stabilisation phase where the speed of social change decreases and a new dynamic equilibrium is reached.

(Rotmans et.al. 2001)
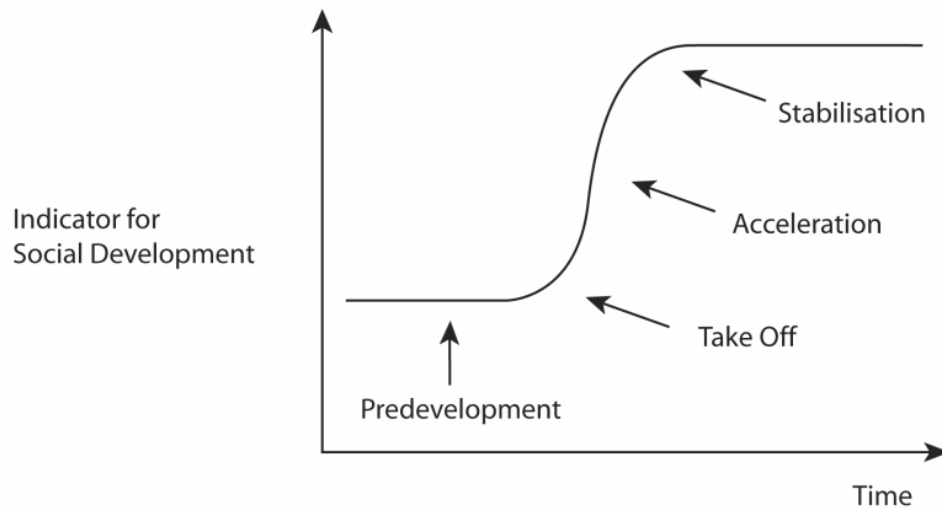
Figure 4. The Process of Transition (adapted from Rotmans et.al. 2001)

Historical examples of transition include the transition from sail to steam or from coal to gas. It can be argued that the transition to a sustainable society is the greatest challenge of our times, and TM has been applied to a number of aspects of the sustainability challenge, such as biodiversity, sustainable agriculture and sustainable transport.

TM is proposed as a new steering concept which explores different trajectories for managing the transition period. Rather than defining end states, TM is an iterative process of decision making in which the Government acts as a process manager. "The aim of transition management is not so much the realisation of a specific transition … the goals as well as the instruments of change need to be regularly re-evaluated" (ibid).

Kemp et.al (2005:2) argue that TM "constitutes "the third way" political scientists have long been looking for, overcoming limitations of disjointed incrementalism (partisan mutual adjustment) and planning. TM is a promising but not unproblematic model for sustainable development, allowing societies to explore alternative social trajectories in an adaptive forward-looking manner.

In practice, TM views social change as arising from the interaction between "all relevant actors on different societal levels within the context of a changing social landscape" (Kemp et.al. 2005:9). It aims to establish a "basis for coherence and consistency in public policy" (Rotmans et.al. 2001) and to co-ordinate, through the involvement of as many stakeholders as possible, a long term vision. It makes use of tools such as visioning and backcasting, the exploration of multiple options and seeks to co-ordinate all relevant stakeholders in developing a society-wide transition.

5.5. Conclusions.

The literature on sustainable consumption and how change is brought about, both individually (sustainable consumption) and collectively (Transition Management) is complex and sometimes contradictory. It offers a range of models and alternative interpretations of what actually leads to people making the changes necessary to make their lives more sustainable.

It emerges that choices in terms of consumption and behaviour are affected by more than just the information given. Indeed, studies have shown that too much or the wrong kind of information, can make people less likely to engage. What emerges consistently is the need for more creative approaches, focusing on solutions, visioning, and participatory engagement. Holdsworth's study indicates that in a world where people lead busy, cash-strapped lives, it is important that as well as developing creative ways of engaging communities in responding to energy descent, a second strand is identified wherein a new infrastructure is 'built around' people, with their support but not necessarily their involvement. This approach, known as parallel public infrastructure, is outlined in 7.5.

Chapter 6. The Metaphor of Addiction.

6.1. Introduction.

The metaphor of addiction in relation to Western consumerism and dependence on cheap hydrocarbons was used long before President Bush's statement that the US is "addicted to oil". Although most references linking addiction and oil dependency offer a fairly superficial comparison, some have taken the comparison deeper, producing fascinating insights. However, the key question explored here is not 'is the West's relationship with oil an addiction/dependency?', rather how it might inform our approach. Any effort to engage communities in the process of relocalisation or any other adaptive stategies to cope with peak oil may draw useful insights from some of the more innovative approaches to addiction. Might a deeper understanding of the nature of addiction and strategies for managing it offer a useful contribution to community responses to energy descent?

6.2. Acknowledging Society's Oil Addiction

Traditional definitions of addiction, such as that of the American Psychological Association, limit the term, and the companion label of addict, "to individuals with a *physiological* dependence on one or more *illegal* drugs" (DiClemente 2003 – original emphasis). Over the last 20 years however, the scope of the term addiction has expanded. Booth (2004:2) identifies a spectrum of definitions, "at one end of the spectrum, addiction is treated as a strictly biochemical phenomenon induced by a drug. Addiction is chemically induced and likely has a strong genetic component, according to this view. At the other end of the spectrum, the object of addiction can be 'any potent experience' and involves compulsive and destructive behaviours of all kinds … addiction does not have to be chemical or physical but can extend to experiences, that are strictly psychological".

While not referring directly to oil, Booth (2004:3) argues that society is addicted to the growth economy, as without it "people would lose their livelihoods as opposed to merely forgoing the pleasure of more consumer goods or having to experience the discomfort of unrealised consumption expectations". Berman (1981) writes "addiction, in one form or another, characterises every aspect of industrial society … dependence on alcohol (food, drugs, tobacco…) is not formally different from dependence on prestige, career achievement, world

influence, wealth, the need to build more ingenious bombs, or the need to exercise control over everything".

Schaef (1987) argues that human beings operate in addictive ways because the society that we are part of functions as an addict.   For LaChance (1991:1), more conventional addictions such as drugs and alcohol, are merely the first and most obvious signs of a deeper illness, a "deep cultural pathology", which he defines as; "Western culture is addicted to consuming" (LaChance 1991:2). For LaChance what matters is that we "move into recovery as cultures", and he has developed an approach based on Alcoholics Anonymous' 12 Steps Programme, which he calls the "Twelve Steps of Ecological Spirituality" (LaChance 1991:1). LaChance's assertion that collective addictions can only be dealt with collectively is echoed by Naess, who calls for what he terms "community therapy" (Naess 1988:29), and 'green' theologian Thomas Berry's assertion that we need "a deep cultural therapy" (Vittachi 1989:54). Some writers have suggested new versions of the 12-step approach, devising their own steps in relation to weaning communities off oil (i.e. Dauncey 2005; Brune 2006).

An increasing number of writers and commentators explicitly link the concept of addiction to dependence on cheap fossil fuels (Campbell 2005; Kingsnorth 2006; Leggett 2006; Kraemer 2006). In 1976, Miles referred to energy dependence as an "unhealthy addiction", and Rifkin (1981:99) wrote, "Addiction! There is simply no other way to accurately describe America's energy habit". The metaphor of addiction is used increasingly in media articles on the subject (i.e. Lazarus 2004; Cochet 2004; Stewart 2004). Chomat (2004:6) uses addiction as the central metaphor in his book *'Oil Addiction'*, writing "we are oil addicts, human beings who have created an industrial empire that can exist only so long as it can continue to guzzle vast amounts of energy. It is time we face up to the truth and its consequences". Alongside the use of the addiction metaphor, the concept of recovery or a weaning off is widely used. Cochet, for example, states the need for "a prompt weaning from our addiction to black gold" (Cochet 2004). So, is the addiction metaphor relevant to oil dependency? It is argued here that rather than an addiction to oil *per se,* the issue is an addiction to energy services, that is the work that energy, specifically non-renewable energy, makes possible.

6.3. The WHO's Diagnostic Criteria – is dependency a better metaphor?

Given that no universally agreed definition of addiction exists, could the term dependency offer a more accurate and clearly definable description?   The World Health Organisation's (WHO undated), identify 6 criteria that constitute a dependency.   Using this as our reference, the comparison with individual dependency and societal dependency to non-renewable energy services becomes clear. In the WHO definition, for a behaviour to be defined as dependency, "three or more of the following manifestations should have occurred together for at least 1 month or, if persisting for periods of less than 1 month, should have occurred together repeatedly within a 12-month period:

(1) *"a strong desire or sense of compulsion to take the substance".*

Western society's *'strong compulsion to take the substance'* can be seen in its deeming it necessary to wage military campaigns to sustain access to oil

supplies (Klare 2002; Ruppert 2004) and the degree to which energy issues underpin much of international geopolitics (Heinberg 2006). The cost of militarily sustaining this supply, principally from the Middle East, has been put at $10 billion a year for the European countries and $120 billion for the US (Plesch, et. al. 2005). For many people, daily life has become utterly dependent on access to cheap energy, for example, for commuting to work or relying on supermarket supply chains (Jones 2001; Smith et.al. 2005).

(2) *"impaired capacity to control substance-taking behaviour in terms of its onset, termination, or levels of use, as evidenced by: the substance being often taken in larger amounts or over a longer period than intended or by a persistent desire or unsuccessful efforts to reduce or control substance use"*.

Repeated efforts by successive Governments to restrain fossil fuel consumption have been largely unsuccessful. There is a high degree of caution about 'interfering' with the market. Mechanisms such as the Oil Depletion Protocol (an international agreement to regulate the trading of oil as a depleting resource) (Heinberg 2005) and Tradable Energy Quotas (a national carbon-rationing scheme (Fleming 2005, FEASTA 2006) which would both bring fossil fuel consumption under some kind of control, have yet to garner much support.

(3) *"a physiological withdrawal state when substance use is reduced or ceased, as evidenced by the characteristic withdrawal syndrome for the substance, or by use of the same (or closely related) substance with the intention of relieving or avoiding withdrawal symptoms"*.

The potential for serious societal withdrawal symptoms from oil came sharply into focus with the 2000 fuel protests in the UK (Chrisafis 2000), where food rationing was imposed in a number of towns; within 3 days of the beginning of the blockages of fuel depots, supermarket shelves were dangerously empty (ibid). It became clear that the 'just-in-time' food supply system resulted in a dangerously high degree of vulnerability. This can also be seen in the dramatic and rapid transformation undergone by Cuba when its oil supplies were cut off by the former Soviet Union in 1989 (Murphy & Morgan 2004).

(4) *"evidence of tolerance to the effects of the substance, such that there is a need for significantly increased amounts of the substance to achieve intoxication or the desired effect, or a markedly diminished effect with continued use of the same amount of the substance"*.

Providing an example of this criteria is potentially problematic, as per capita consumption of oil and gas in the UK has actually fallen slightly in recent years (Poten & Partners 2001), which, it could be argued, negates the point that in order to be considered a dependency, increased consumption is required to maintain the desired effect. However, this need not always be the case. A smoker who has cut down from 40 a day to 30 is still dependent on nicotine.

According to an expert in the addictions field;

"It is common in my addictions work to see clients who have recently reduced their intake of alcohol or drugs but who are still dependent. The important question is "what would happen if they stopped?". If withdrawal symptoms would follow, that is one marker of dependence. If they found it difficult to stick

to a decision to stop, that is another. And if they went back to using even when they knew it was harmful, that is a third. These three are enough to bring a diagnosis of dependence syndrome" (personal communication with Johnstone 31st May 2006). Asked for his thoughts on how this relates to oil dependency, he replied, "Western society is so dependent (on oil) that even though it has managed a slight decline in per capita use, it would not be able to tolerate a sudden further un-planned reduction without massive disturbance in function" (personal communication with Johnstone 31st May 2006).

This reduced per capita consumption has been accompanied by a decline in manufacturing; and this 'outsourcing' makes the reduction in consumption spurious, as it neglects what would be required were the UK to rebuild a national manufacturing base or imported energy requirements.

(5) "*preoccupation with substance use, as manifested by important alternative pleasures or interests being given up or reduced because of substance use; or a great deal of time being spent in activities necessary to obtain, take, or recover from the effects of the substance*".

It has been argued that in order to sustain the lifestyle cheap oil and gas make possible, people in developed nations work longer hours than any previous generation (Durning 1992). A 2002 survey found that one in six of those surveyed said they were working more than 60 hours a week compared to one in eight two years ago (BBC News 2002). Also the decline of communal social activities (Putnam 2000), and the increased amounts of time spent watching television, which has risen 63% since 1999 (BBC News 2004) point to the effects of the growth economy on our collective *'important alternative pleasures or interests'* .

(6) *"persistent substance use despite clear evidence of harmful consequences, as evidenced by continued use when the individual is actually aware, or may be expected to be aware, of the nature and extent of harm"*.

The harmful side effects of fossil fuel consumption are increasingly clear to see, particularly in terms of climate change, a phenomenon confirmed by a consensus of international scientists, yet consumption and demand for fossil fuels continue to rise sharply (Hillman 2004) .   The heatwave of August 2003, the hottest on record, directly caused 35,000 deaths in Europe (EPI), 14,802 in France alone. Professor Andy Haines, Dean of the London School of Hygiene and Tropical Medicine (ENDS 2003:unpaginated) estimates that "climate change may already be causing in the region of 160,000 deaths a year … this could double by 2020". The World Health Organisation estimates that 150,000 deaths in 2000 were directly attributable to climate change. Globally cars are responsible for 1.2 million deaths per year (Peden et.al. 2004:3), and air pollution caused by vehicles is responsible for 310,000 deaths per year, 32,000 in the UK (BBC 2005).

Hillman (2004:74) argues that while Government, though campaigns such as 'Are You Doing Your Bit?', urge people to reduce their climate impact and energy use, "in reality substantial direct and indirect policies and practices continue to be made in supporting car users". This includes £30 billion to be spent in the UK on new roads over the next 10 years, and the fact that the planning system, while requiring environmental impact assessments, sustainability appraisals and so on, has no requirement for major new

developments to assess their energy implications. It has been argued that climate change will lead to the deaths of billions of people, and is the biggest challenge to the stability of the human race yet known (Lovelock 2006). Even so, the Kyoto Protocol has struggled for ratification on the international stage.

Some, reading the above, might argue with the above criteria, stating that oil is as much a core need as say food or oxygen. Society needs energy as a key requirement for life, so at what point does a healthy need become an unhealthy dependency? Rust (2006, personal communication with Rust, M.J. 9th June 2006) writes "we are dependent on everything we eat, breathe and co-exist with, to stay alive. But in our urbanized and more culturally complex lives, it is often hard to tell the difference between essential dependencies and more recently created dependencies … we have existed for thousands of years without oil, so it is not an essential dependency. Yet if we were to remove oil tomorrow without changing the structure of our society, we would experience total breakdown".

6.4. The Transtheoretical Change Model (TTM)

For DiClemente (2003:4), the process of addiction and how change occurs go hand in hand. "In my view", he writes, "change is the antithesis of addiction". One of the most widely known frameworks for conceptualising change and recovery from addiction is the Transtheoretical Change Model (TTM), also known as the Stage of Change model, developed by Prochaska & DiClemente (1982). TTM attempts to bring together a range of perspectives from psychology by focusing on how individuals modify a problem behaviour or acquire a positive behaviour, as well as by identifying key change dimensions involved in this process (DiClemente 2003).
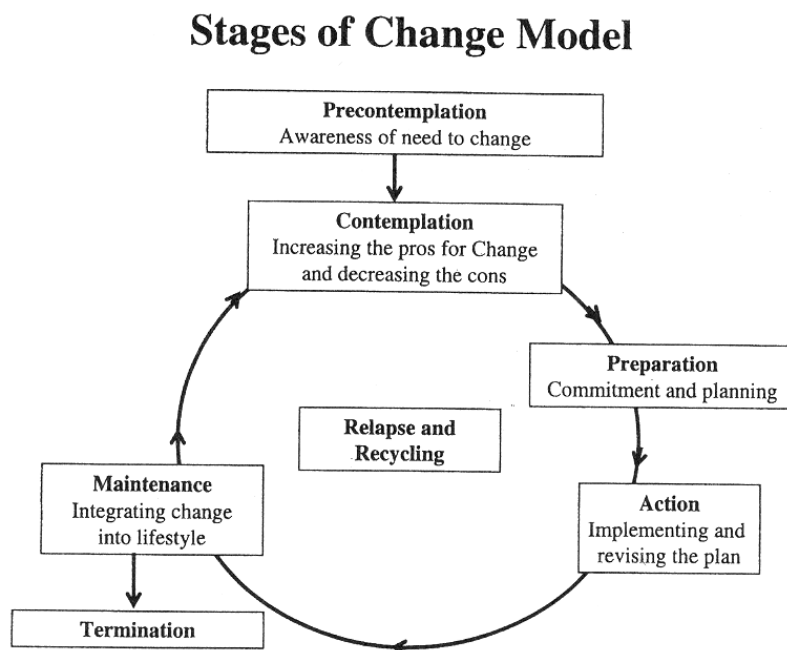
Figure 2. The Stage of Change Model (DiClemente 2003).

It offers, according to DiClemente and Velasquez (2002:201), "an integrative framework for understanding the process of behaviour change whether that change involves the initiation, the modification, or the cessation of a particular behaviour". Since its inception, the TTM model has been applied in facilitating change across a wide range of areas, from those in the health field (Levesque et.al. 2001; CPRC 2006) to all aspects of the addictions field. It is based on key constructs from other theories, as well as longitudinal studies which found that people move through a series of five stages, either when modifying their behaviour on their own or with the help of formal intervention (Levesque et.al 2001).

The five stages of the TTM Model are

1. **Precontemplation**. Here people are not intending to take action within the next 6 months. They tend to avoid reading, talking or thinking about their behaviour. Other theories classify these people as resistant or unmotivated, whereas according to TTM programmes are often not matched to their needs.
2. **Contemplation**. This refers to people intending to change within the next 6 months. They are aware of both the pros and cons of change, resulting in an ambivalence which can lead to people getting 'stuck' and not undertaking change.
3. **Preparation**. Here, people are intending to undertake change within the next month. These people are ready for more action-based approaches.
4. **Action**. These people have made specific overt modifications to their lifestyles within the last 6 months (CPRC 2006). This is the stage at which relapse is common.
5. **Maintenance**. The stage wherein the new behaviour pattern is sustained for an extended period of time and is consolidated into the lifestyle of the individual.

Research has shown that activation of the appropriate processes results in acceleration through the stages of change (Prochaska 2000). Knowing which stage people are at allows the therapist to tailor education and intervention approaches to the level of readiness for change (ibid). While the Stage of Change approach has proved highly successful in working with individual addictions, is it also relevant on an organisational scale and thence on a community scale?

6.5. Applying TTM to communities and organisations

For Winum et.al. (1997) most attempts to implement organisational change fail because principles and knowledge about the psychology of change are violated or ignored. Pendlebury (1996) recognises the TTM as the most influential approach to the integration of behaviour change theories and practices.

In organisations, the TTM begins with a scientific assessment of an organisation's readiness to change (Paskett et.al. 1992). This is done with the use of quantitative surveys which allow strategies to be targeted to each stage's requirements, i.e. for those at pre-contemplation stage, the most appropriate responses are consciousness-raising, education and feedback (Prochaska 2000), while for those at the Contemplation stage, the principal challenge is dealing with ambivalence.

A quantitative study by Prochaska (2000) looks at facilitating change in family service agencies in the US, providing strong support for "the application of the TTM to assess readiness for organisational change". Similar findings were reached in a study by Levesque et.al. (2001). So if TTM offers a valuable tool for facilitating change within organisations (Prochaska 2000), is it also relevant on the community scale?

Little has yet been written about the potential of TTM on a community scale. No studies exist and what writing does exist is entirely speculative. One could argue that many approaches by environmental organisations fail because they take an action-oriented, one-size-fits-all approach (Levesque et.al. 2001), assuming an entire community to be at the preparation stage, only requiring information in order stimulate action.

CPRC write that TTM offers the potential for the "recruitment of an entire population" (CPRC 2006:unpaginated). "Traditional interventions", they write, "often assume that individuals are ready for an immediate and permanent behaviour change. The recruitment strategies reflect that assumption, and, as a result, only a very small proportion of the population participates". Applying the TTM to communities necessitates recognition that different individuals are at different stages and hence require different interventions.

How might TTM inform the engaging of a community in an energy descent planning process? We might envisage a process wherein a short questionnaire is used with representative samples of the community to obtain a snapshot of the percentages of the population at each stage of change. This would help to target actions and activities that are most effective. In terms of estimating which stage the UK might be at now, some indicators, such as the level of support for the 2001 fuel protests and opposition to wind farms, indicate that it is largely in the precontemplation stage. Other trends, such as people like David Attenborough and the Queen speaking strongly about climate change, as well as the more mainstream portrayal of green issues in the media, might suggest more people are being encouraged to move into contemplation or even preparation.

6.6. Motivational Interviewing

Motivational Interviewing (MI) is a counselling approach for facilitating behavioural change. First described by Miller (1983) as a method for the treatment of problem drinking and expanded upon by Miller and Rollnick (2002), it is closely aligned to the TTM model with which it shares many foundations. Miller and Rollnick define MI as "a client-centred, directive method for enhancing intrinsic motivation to change by exploring and resolving ambivalence" (Miller & Rollnick 2002:25). This recognition of client ambivalence is at the heart of MI, and this makes it especially useful at the Contemplation stage of the TTM model. MI assumes people entering the process are torn between conflicting possibilities and emotions. This 'decisional conflict' results in the client becoming stuck, and unable to change, despite clear incentives to do so.

Recognising that attempting to persuade a client to change is ineffective and possibly counterproductive, it entails taking one side of the conflict that the client is already struggling with. Markland et.al. (2005:813) write "the client may

adopt the opposite stance, arguing against the need for change, thereby resulting in increased resistance and a reduction in the likelihood of change". They define the aim of MI as being "to guide the client towards a resolution of ambivalence and inconsistencies in their behaviours in order to build motivation for change" (ibid).

Rollnick and Miller (1995:327) state that it is not appropriate to see MI as a technique applied to or 'used on' people, rather it is an interpersonal style, which, is "not at all restricted to formal counseling settings". MI has been mostly used in relation to individuals, although some work has been done applying it at an organizational level.

6.7. Conclusions

It has been argued here that while there is room for debate around the extent to which societal dependence on oil could be classed as an addiction or a dependency, there are grounds, especially using the WHO's ICD10 model, to conclude that there are instructive parallels. The core point is that both are terms applied when people use a substance at levels or in ways that lead to harm, and have difficulty in changing from this. This offers an interesting though not unproblematic description of Western society's relationship with oil.

If society experiences dependency, what exactly is it dependent upon? Is it cheap oil itself, energy in general, the services that energy performs, consumerism, or the convenience and comfort of modern life? I would argue that it is not a dependence on cheap oil itself, rather on the services it provides and the lifestyle it makes possible.   However, both energy services and modern lifestyles are only possible because of the availability of cheap oil, so one could argue that while not being the sole dependency itself, dependence on cheap oil is a facilitator of other dependencies. It is, if society denies a proven risk of peak oil, a dysfunctional relationship whose withdrawal symptoms would be severe. Kingsnorth (2006:10) writes "the reality of the situation is that we are hooked. Oil has become an addiction – one which sustains and destroys at the same time. Like any junkie we think we're in control – but we're not. If we don't break the cycle, the cycle will break us – and much of the rest of the planet too".

It is, however, important not to become too focused on this point. Addictions studies offer useful insights into the process of change and resistance to change. TTM offers interesting observations into why previous attempts to facilitate sustainable behaviour have been largely unsuccessful. By offering a quantitative way of ascertaining a community's 'readiness to change', it allows efforts to engage communities to be more skillfully targeted and allows longitudinal studies to observe changes in preparedness and action over time.

Motivational Interviewing offers one promising method for engaging communities in a skillful dialogue around issues of change, and of addressing the ambivalence many feel about energy and environmental issues. In conclusion Chapter 7 now explores how insights from these fields could inform an approach to engage a community in a positive process of moving away from reliance on cheap oil.

Chapter 7 – Concluding Remarks & Some Speculative Thinking.

7.1. Introduction.

Chapters 5 and 6 explored behavioural studies and the field of addiction for insights into the patterns underlying the process of transition, both individual and societal. This chapter looks at a number of areas which, it will speculate, have useful contributions to the process of enabling communities to plan for energy descent. These include tools for public participation, education and awareness raising, a sense of collective engagement, the concept of parallel public infrastructure as well as visioning and backcasting. The literature on these are explored for their relevant insights, which will then be drawn together using the FRAMES model, as a framework for addressing Oskamp's question (2000:383) about how individual societies can become motivated to make vitally needed changes?" This then leads to the setting out of a speculative approach for a community energy descent planning process, and concludes with some thoughts on areas for further research.

7.2. Pieces of the Puzzle?

A number of diverse elements may have important contributions to make to the process of enabling communities to plan for energy descent. The first is the area of ensuring public participation. In recent years there has been a trend towards increased public involvement in decision-making and policy formulation (Rowe & Frewer 2005). The UK Government's Sustainable Development Strategy sees public involvement as "essential". Owens (2000:1145) writes "for many commentators, the need for engagement points inexorably in the direction of new fora, such as focus groups, citizens juries or panels, round tables, 'visioning', and new consensus conferences, in which, with no technocratic monopoly of information, the necessary deliberation can take place". This arises from a growing realisation that environmental values are not preformed, rather that they "emerge out of debate, discussion and challenge, as [people] encounter new facts, insights and judgements contributed by others" (RCEP 1998:unpaginated).

Atlee's (2003) concept of 'co-intelligence' offers a tool for harnessing the power of communities to implement change. He defines its aim as being "to increase the capacity of a society as a whole to act in a co-intelligent manner" (Atlee 2003:45) and recommends the use of a wide range of facilitation and empowerment tools to enable this. "Our goal…" he writes, "can become the creation of ways in which people can collaboratively arrive at solutions to their (and our) collective problems" (Atlee 2003:45). Some of the mechanisms cited by Rowe and Frewer, most notably Open Space Technology (Owen 1993) and World Café (World Café Community 2002, Brown et.al. 2005), are also advocated by Atlee, and are increasingly being used around the world by groups working to initiate relocalisation projects (i.e. Hopkins 2006c).

Education is clearly a central part of any energy descent process. The key question is how, given the potential imminence of peak oil, to maximise its impact and effectiveness. One insight from Clayfield and Skye (1992) highlights how teaching styles affect the amount that is retained. Rather than conventional methods which allow very poor information retention (see below),

more creative approaches to teaching, involving play, involvement, drawing, brainstorming and so on, as well as enabling students to teach each other and share skills, has a greater chance of being remembered and, therefore, utilised. Their approach, 'Teaching Permaculture Creatively', synthesises much of this into an approach to teaching, containing many techniques, tools and insights relevant to energy descent education.
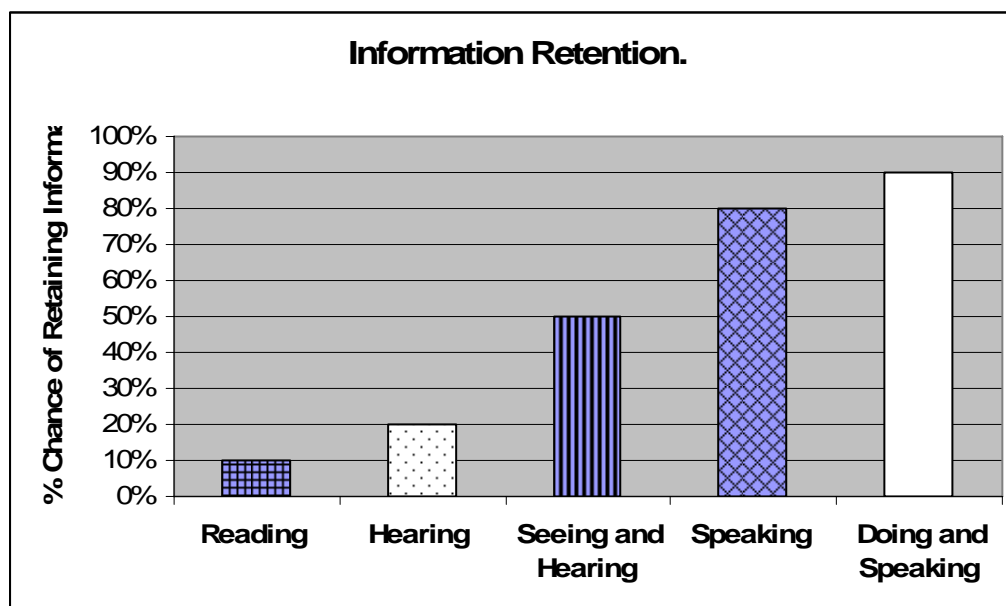
Figure 6. Information Retention based on teaching approach (based on Clayfield & Skye 1992).

It is essential that the process be engaging, positive and inspirational. Studies (ie. Levin 1993) have found that while exposure to more information led to greater concern, it also led to a greater sense of helplessness. The concept of "Despair and Empowerment work" (Macy & Brown 1998) explores the pain and sense of despair that awareness of environmental issues can bring, in order to assist people not to become immobilised by it (Canty 2005). Canty sees energy descent as being achievable only if people are able to explore the grief of the transition as well as its positive aspects, "the ecological crisis is real and pending. We cannot overlook its seriousness, nor minimise the importance of grieving as a point of transformation" (Macy & Brown 1998:28). Johnstone (2006a:257) writes about this sense of despair, "if (people) listen to the shock rather than blot it out, this stirs up the will to change. This becomes their call to adventure".

The idea of building a new infrastructure to replace the non-sustainable one has been current in environmentalism for many years, but has gained a new momentum via the energy descent challenge. Ehrenfield (1999:71), writes "our first task is to create a shadow economic, social and even technological structure that will be ready to take over as the existing system fails". The term 'Parallel Public Infrastructure' has been coined by Darley et.al. (2006:unpaginated). They write;

"Parallel public infrastructure aims to provide necessary systems that individuals can't provide themselves. In addition to locally produced products, services should include energy storage, public transport, local money, seed storage, grains, reforestation, general municipal services, information sharing,

and other structures that support relocalization and shorten supply chains".
The concept implies that the role of an energy descent process might be to
create a new infrastructure, i.e. energy, food, economy and so on, in such a
way as to not interfere with existing infrastructure.

Finally, many approaches to social change use the tools of visioning and
backcasting. Cook (2004:39) defines backcasting as "placing ourselves in the
future and imagining that we have achieved success. Then we look back and
ask the question: "how did we achieve this?" James and Lahti (2004:193)
differentiate between forecasting and backcasting; "'forecasting' the traditional
methodology, takes present trends and projects these into the future. Then,
steps are designed to accommodate a future that people don't want in the first
place. Backcasting from sustainability principles is different than backcasting
from future scenarios, where problems can arise when people don't agree in
the first place about the future scenarios".

7.3. Weaving the Strands Together – The FRAMES model.

Those working to facilitate this transition have a distinct role from what one
might think of as a classic environmental activist. Korten (2000) identifies its
characteristics as "a dual role, hospice and midwife". For Abdullah (1999:87)
"our role is to compassionately assist in its death process, trying to ease the
burden and pain of its passing. This includes restraining the impulse for
revenge among those who see their foundations undermined by the new. For
the emerging … society, our role is to compassionately assist in the birth of a
new way of acting in the world. As with any birthing process, there will be some
pain and trauma associated with the … birth. Our role is to minimise the pain
and nurse the new society to full health".

Chapter 6 identified a number of tools and approaches from the
addictions/dependency field that could be of use in dealing with society's
dependence on cheap oil. One useful tool from the drug and alcohol field is the
FRAMES model (Miller & Sanchez 1993) which offers a template for pulling
together the many threads of this dissertation. It comprises 6 elements
commonly included in brief interventions that have shown to be particularly
effective. These are summarised using the acronym FRAMES. FRAMES
stands for Feedback, Responsibility, Advice, Menu of Options, Empathy and
Self-Efficacy (they do not run in any kind of chronological order).

Feedback of personal risk or impairment

In the drug and alcohol field, this relates to offering the client an honest
assessment of the problem and its potential consequences to raise awareness
of the problem. In relation to peak oil, many groups begin by showing the film
"The End of Suburbia", a frank assessment of the peak oil challenge. An
essential element of initiating productive responses is making the level of the
problem clear in stark terms. There is clearly a balance to be struck in the
potential sense of disempowerment and trauma that this may generate, which
may be surmountable if combined with a positive solutions-focused
programme.

Emphasis on personal responsibility for change

For Miller and Sanchez, this relates to making an alcoholic/addict aware of the degree of personal responsibility that breaking the addiction will require. In the energy descent field, this relates to emphasising that the creation of the problems of peak oil and climate change are the results of many individual actions, and that the solution requires taking responsibility for their actions. Clearly, a 'wartime mobilisation' (see 2.3) will require the large majority of people taking on some responsibility for these. The British experience in World War Two (see 3.7.) and the more recent experience of Cuba shows that this is possible. The emphasis here is on individual choice, rather than telling people what they should do.

Clear Advice to Change

Clear advice needs to be offered to break an addictive pattern. Advice has been shown to be effective but it needs to be given as a recommendation not as a prescription. It can come in two forms. Firstly advice to individuals relating to modifying their own lifestyles, and secondly community scale strategies for energy descent. The first such model is the Kinsale Energy Descent Action Plan developed in Ireland (Hopkins 2005, 2006a), which aimed to create a timetabled path from the peak. Other such approaches are now emerging around the world as community initiated processes towards relocalisation.

A Menu of alternative change options

Offering more than one alternative is a key element. As one of the initial stages, a range of scenarios can be explored with groups representing different sections of society. The Foresight and FEASTA scenarios are used as tools in workshops to assess the acceptability or otherwise of the various scenarios. Also the use of visioning followed by backcasting (Cook 2004; James & Lahti 2004; Hopkins 2006), allows people to generate their own scenarios and explore their implications. This can lead to people developing their own change options. People, in order to feel ownership and a sense of responsibility for an Energy Descent Action Plan, need to feel that they have explored the alternatives.

Therapeutic empathy as a counseling style

Miller and Sanchez (1993) write, "no reports of effective brief counselling have resembled the directive, aggressive, authoritarian, or coercive elements that are sometimes associated with alcohol/drug abuse counselling". Similarly any approach that seeks to engage a significant proportion of a population has to skilfully engage with people and instil a sense of optimism regarding the possibility of change. This creation of a sense of embarking on a collective journey (Johnstone 2006a) may well be key to this.

This principle also implies that the dialogue is a two way process, that the person imparting the information is open to receiving information as well as giving it. Rather than telling people what they should be thinking and/or doing, an empathic approach seeks to engage as well as educate.

Enhancement of client self-efficacy or optimism

This is key to the success of this process. It has been argued here that whether communities see the transition from a high fossil fuel society to a lower one as a positive step or a negative one is crucial. We have seen how presenting information on environmental issues such as peak oil can compound peoples' sense of helplessness (Levin 1993). The challenge of peak oil necessitates a collective involvement on an enormous scale, and cannot afford to make this mistake. There is a strong need for such a process to argue that its outcome will revolve around an improved quality of life. Therefore the use of sustainability indicators such as those developed by Redefining Progress, or perhaps the community itself may aid the process. This would enable regular checks to be made to assess whether quality of life is improving or not. It is essential that any such process sustains an atmosphere of optimism, so this balance requires some skilful management.

This positive solutions-based approach, and the practical application of giving people the experience of making change, can be found, for example, in the Natural Step approach (James & Lahti 2004) and in the permaculture movement (Holmgren 2003a). Holmgren (2003b:11) writes, "permaculture is the wholehearted and positive acceptance of energy descent, as not only inevitable but as a desired reality". One might argue that the recent success of the TV series 'Jamie's School Dinners' in changing national policy on school meals was partly due to the charismatic and affable character of its presenter which contributed to its engaging of members of the public in pre-contemplation and contemplation stages, rather than most environmental work, which works only with those at the preparation stage.

7.4. A Speculative Approach.

We can therefore postulate an approach which draws the lessons from the range of fields covered above, to engage a community on the scale set out earlier in the dissertation. This dissertation has proposed that the most likely scenario may fall between Heinberg's Powerdown and Building Lifeboats scenarios (Figure 3). In other words communities begin to plan and implement the parallel public infrastructure and other elements needed under this scenario, and that at some point this is supported by national Government.

We can perhaps begin to see a process unfolding with the following steps;

1. A **Questionnaire** designed around that used in TTM with alcoholics to assess the 'readiness of change' of different sectors of the community is carried out. This offers a typology of people which would identify the proportion of people in the different categories, and different programmes could be designed for each one. For example;

For the Precontemplators – the key questions that arise are whether they are aware of the issue, if so, what impedes action, and what would be the starting points for their enquiry.

For the Contemplators – the key questions are what is it that they are contemplating? What influences this, what are their arguments for and against change, and why have they, as yet, taken no steps? It has often been said that

Motivational Interviewing is particularly relevant for those at the contemplation stage, however when I discussed this point with Rollnick (Rollnick et.al. 2006), he argued that this is an oversimplification of the subject, that although in general this can be observed, there are dangers in rigidly labelling individuals as being inherently at one stage or another (Rollnick et.al. 2006).

For the Preparation Stage – this stage is more about consolidating existing motivation that is already there. How can we build on existing motivation?

Oral Histories. A number of Oral History interviews carried out with old people, looking back to life before cheap oil and gas, to the arrival of electrification, peoples' skills for everyday life, how society has changed, and what social structures were in place in a more localised economy.

Education and Awareness Raising. Evening classes, talks, film screenings, made available to as broad a spectrum of people and sectors, using a range of creative teaching methods to encourage people to share their skills and to actively participate in the learning process.

Audits and Indicators. Baseline information and sustainability indicators to assess the initiative's effectiveness. One might adopt an existing approach, or the community might develop its own indicators against which to measure its quality of life.

Visioning and the Use of Scenarios – Backcasting. The use of visioning, backcasting (see 7.2.) and scenarios make people thinking practically about the future. The FEASTA and Foresight scenarios are tried and tested in this context. This will help to stimulate creative thinking about practical steps.

An Energy Descent Action Plan. This would set out a timetabled pathway by which the settlement could descent smoothly from the peak. It would fulfil the FRAMES criteria of offering clear advice for change. While it is unlikely that the Plan would be carried out precisely, it offers a path down from the peak, rather than necessarily the path, but its power lies in offering a compelling vision that life beyond oil could be superior to the present, and is achievable in practical steps.

Regular Longitudinal Surveys – these would allow the organisers to monitor the impact of the work on the community. This could be a repeat of the TTM questionnaire, to allow a constitent updates of the community's evolving readiness to change (or not).

Optimism – The process should seek to engage as many people as possible in a process which creates a sense of excitement, inspiration, and a collective adventure towards worthwhile outcomes.

Mechanisms for PPI. Various relocalisation initiatives explore organisational structures to enable their implementation. These include the use of ESCOs (Energy Service Companies) as commercial relocalisation agencies (Hopkins 2006).

Public Participation Mechanisms. Tools such as World Café (Brown et.al. 2005, World Café Community 2002) and Open Space Technology (Owen 1993) offer tools for facilitating community involvement. Rowe and Frewer (2005)

recognise their value as public participation mechanisms alongside the more accepted tools such as Focus Groups.

7.5. Areas for Future Research.

This dissertation has formulated a set of principles for the engagement of a community in a conscious energy descent transition which will form the basis of my proposed PhD research 2006-2009. These principles resonate with other approaches used around the world by community relocalisation groups. One useful area for future research is the study of such projects and what can be learnt from their practical experience.

What is also needed is further research on how to apply the approach sketched out in 7.4. to an actual community. The Kinsale Energy Descent Action Plan (Hopkins 2005b) was a pilot of this approach, and for my PhD research I will apply lessons learnt from that process and this dissertation, to design an approach for a town integrating awareness raising and education, innovative community dialogue tools and web based tools, quantitative surveys using the TTM questionnaire to assess community levels of 'readiness to change', oral history interviews, and the compilation of an Energy Descent Action Plan for the town. Focus groups will be used to gauge community reactions to it. The aim will be to develop a model and a set of principles that can be applied anywhere. While clearly every settlement has unique challenges, certain principles and approaches will, it is hoped, emerge as being universal.

7.6. Conclusion.

The question of when peak oil might occur and how it unfolds are areas of massive debate and uncertainty. However, if peak oil predictions are accurate or even close, it is clear that the scale of the challenge is unprecedented. Much of the information needed to enable a full assessment is not in the public arena. However, an increasing number of writers believe that we are either at or very close to the peak. As well as debating when this might occur, many writers are looking towards mitigation, and how society might manage this transition. Hirsch et.al. (2005) identify the real challenge as the amount of lead-in time required to make this transition, in their opinion at least a decade.

Chapter 3 explored a number of scenarios relating to possible directions after the peak. It concluded that the most likely is somewhere between Heinberg's (2004) 'Building Lifeboats' and 'Powerdown' scenarios, between a grassroots initiated process of relocalisation and a national Government-led programme of economic contraction. This led to the question, how communities can become engaged on a scale of a 'wartime mobilisation'?

The field of addictions and dependency was explored, and parallels were drawn between the two. It was argued that the processes by which individuals enter and leave addiction are similar to those of any change processes, and that important lessons can be learnt. The Transtheoretical Change Model and Motivational Interviewing were explored and found to be potentially useful tools for engaging communities and providing useful insights into why more conventional environmental approaches have failed thus far to mobilise people on a significant scale.

Also explored was the field of sustainable consumption and what motivates people to alter their behaviour. This concluded that any approach seeking to engage a community needs to be "as much about building supportive communities, promoting inclusive societies, providing meaningful work and encouraging purposeful lives, as it is about awareness raising, fiscal policy and persuasion" (Jackson 2005:134).

A number of other elements were then touched upon, all of which contribute to this approach. Using the FRAMES model for identifying the key aspects required to inform a community energy descent approach, six key principles were sketched out. This then led into an exploration of the principles in a speculative outline of the key elements of such an approach. The emphasis was on practical activities that would be key to the success of the process. Finally the some areas for further research were identified.

In conclusion, it is clear that energy descent and community responses to it is an emerging field in the literature. Much of the discussion and thinking around this topic has yet to really find a voice within the academic literature, which there is a clear need to redress. However, it is hoped that this dissertation has managed to strike a balance between a dispassionate exploration of the literature and a motivational indication of a potentially radical new way of engaging communities with energy sustainability. Peak oil offers a stark vision of the near future, yet one which, if humanity manage mobilises and engages with creativity and imagination, may yet turn out to have been the trigger for a future of abundance with a higher quality of life.

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Energy Descent Pathways:
evaluating potential responses to Peak Oil.

Energy Descent Pathways is an MSc dissertation prepared at the University of Plymouth which explores the implications of peak oil and strategies for its mitigation. The core of it is a review of the literature relating to peak oil, identifying different opinions as to how it will affect society, and how the concept of relocalisation is central to some views of the outcome of peak oil. Many writers argue that the challenge it presents is of such a scale that its mitigation will necessitate a 'wartime mobilisation' or a 'crash programme' scale of response. The question central to **Energy Descent Pathways** is how that might be brought about.

It explores new ground in a number of areas. It examines society's relationship with oil, and whether it could be said to be an addiction. The term 'addicted to oil' is widely used, but does it have any truth to it? If so, what can be learnt from innovative approaches to treating addiction, such as Motivational Interviewing and the Transtheoretical Change Model, that might help to engage communities in a response of this scale. Also, what can be learnt from studies into what makes individuals behave more sustainably? It is argued here that a solution to peak oil will require a unique synthesis of approaches, drawn from a diverse range, including creative educational approaches, innovative public participation tools, assessment of communities' 'readiness-to-change', and many others. What this approach might look like is explored. Peak oil, it is argued, could be the opportunity to finally build a truly sustainable society.

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