



Part 2. The Future in Australia: The Next 13 years.

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Introduction

So, is Mad Max a good how-to guide for the decades ahead - am I building a bunker and stocking up on shotgun shells? No. And here is why: If things get so bad that I need to shoot people as part of my day-to-day activities, then my son has no future. That is not a future, it is an end.

I don't believe in ends, I believe in cycles.

It is fair to assume that things will change. It is fair to assume that there may be wars.... because somewhere in the world there is always a war. Resource depletion just exacerbates this situation.

Here in Australia, we may have some tough times, but our children and grandchildren will grow up and emerge from these trials knowing no other world - and full of the usual dreams and hopes of youth. The future that we hand on to our children and grandchildren depends on the changes and preparations that we make now.

The first and most important preparation has been mentioned in Part 1. We need to cut our consumption. Reduce. Reuse. Recycle. Grow food at home. Install water tanks. Attitudes to consumption need to change. We know what we need to do; we just need to do it.

The second part of preparation is personal preparation.

I need to prepare in such a way that I can get through a possible bad time, and then be in a position to help make things better. To do this I need to understand what I am preparing for. This means considering the various phases that each scenario might go through.

Here are some possible phases for some of the scenarios we might go through (world wide):

1. Phase 1. Business As Usual. I am employed and life is good.
2. Phase 2. Business Not-Quite-As Usual. Times are hard. A lot of people can't find employment. Many people have been forced to turn to crime, just to get by. Food security is sometimes a problem. Personal security is a problem. Security for my family is a problem. Utilities sometimes don't work. Unlicensed local markets are starting to appear to peddle food and other common commodities.
3. Phase 3. Partial Collapse. Times are very bad. Unemployment is widespread. Utilities frequently don't work. Law and order is severely impacted. Almost the only place you can get goods and food is in "Grey Markets" - venues that operate with no official accreditation or sanction, questionable hygiene, and where security is provided by ugly-looking characters with baseball bats.
4. Phase 4. Collapse. The old system does not work at all. The "Grey Market" has expanded into almost every area. Organizing and providing security for the markets is virtually the

only process left that works. These markets now deal with scavenging, reusing and recycling machinery and commodities of all sorts. Violence is widespread, with warlords and grey marketers being almost the only sources of security.

5. Phase 5. Rebuilding. Enlarging on the process of scavenging, an industry of rebuilding slowly emerges. This process, of course, can only occur if there are adequate resources for the population.

Those are countless scenarios, which range from the benign (consumption is curbed, population growth gradually comes under control and disaster is averted with only minor social dislocation) to the catastrophic (severe resource constraints cause massive difficulties in South East Asia, Indonesia invades Papua New Guinea in order to secure resources, Australia objects and becomes embroiled in a region-wide war).

The future is unclear, but business has long known how to deal with situations like this:

1. Generate scenarios to identify risks,
2. Use statistical tools to get a feel for the probabilities of the risks.
3. Examine impacts for each risk
4. Generate priorities, based on impact and probability for each risk.
5. Decide on strategies, based on the priorities identified above.

Risk management is very inexact, and extremely subject to personal bias, but I am going to try to put some numbers against the risks that I list below. In risk management, two numbers are important – likelihood and impact. How likely is each risk, and how close to complete disaster do we come if it occurs?

So here goes. I'm going to be lazy and look at Best Case and Worst Case scenarios in the hope that these stimulate thinking about preparations that can cover most things in between:

Best Case Scenario

Our way of life depends on oil, but it does not require the volume that we currently consume. Much of our consumption is devoted to activities that provide little or no real benefit - do I really need a Shrek doll with my MacDonald's meal? Would I miss it, if it wasn't there?

The Hubbert curve suggests that initially we face a gradual decline in oil. Perhaps a decline of 25% across the next 20 years. If our oil supply was gradually cut by 25%, we would be forced to compromise in a lot of areas (more use of public transport, less air travel, less junk food, etc), but we would not starve. Of course, a sudden cut of 25% is a very different story. We are not set up for a sudden drop - but more on that later.

We can expect that two changes will occur as we gradually adapt to lower oil and resource supplies:

1. Substitution (e.g. a move from oil to other fuels)
2. Behavior modification (e.g. a move away from fossil-fueled individual transport to more efficient Mass Transport systems or to walking and biking).

We have some ability to replace oil with alternatives - electric vehicles, compressed natural gas, ethanol, algae biodiesel, etc. In the decades to come, I would expect to see some significant infrastructure projects undertaken in order to produce and distribute substitute fuels. It is easy to envisage some of the other infrastructure projects ahead:

1. Alternate power sources. We are likely to need them all. New Zealand has a bit of an advantage in geothermal, but here in Australia we should be able to utilize our solar power advantage, using both thermal and photovoltaic technologies. As well as natural gas, algae-

to-biodiesel, ethanol, wind, wave, etc, etc.

2. Expansion of mass transport facilities.
3. Salvaging and recycling. Major projects are likely to be needed to demolish the unneeded infrastructures of the consumption-oriented society and recycle salvaged materials.
4. Water. God only knows what will be done about water, but we obviously need a new plan and the infrastructure to go with it.

The infrastructure projects may be complicated by resource shortages, but this is not a disaster – it simply means that choices will have to be made. Do we need a new shopping mall or a new energy generation facility? We may even need to demolish a shopping mall and mine it for resources to build the natural gas facility.

Clearly, there are a lot of jobs here for engineers and construction workers. Other areas are likely to be laying off workers, so retraining is likely to be a key role for TAFEs and other educational facilities.

What will cities look like in a resource-constrained scenario?

Obviously public transport (or more correctly Mass Transport) is more efficient than individual vehicles, so there will be a greater usage of Mass Transport facilities. Expect trains and buses to be overcrowded, as the pace of building new transport infrastructure may struggle to keep up with demand. We can expect this pattern to be repeated everywhere - infrastructure lags demand, causing shortages and overcrowding.

In a resource-constrained society public transport is likely to be used more than private vehicles, but public transport tends to focus on delivering people to the city, so large businesses in cities will have an advantage over large businesses in outer suburbs. Businesses in outer suburbs will need to concentrate mainly on local clientele.

Resource intense transport and consumption will be replaced by infrastructure projects that focus on supporting substitution and behavior change. These infrastructure changes will have massive manpower requirements and could even drive a boom in education and training (particularly in technical areas).

Food is more likely to be sourced locally. In areas without easy rail or water transport, goods are more likely to be fabricated and/or maintained locally. We are likely to re-learn the lessons our grandparents knew about thrifty living and making-do.

Risks in the Best Case Scenario

Our ability to substitute fuels makes the gradual decline scenario relatively benign, but we should not forget that infrastructure growth is unlikely to keep pace with demand. So the big risk here is that the creation of the necessary “Substitution” and “Behavior Change” infrastructure will not keep pace with the velocity of the decline in resources. As an example: We simply cannot build LNG Gas plants and distribution infrastructure in 5-10 years. Likewise we cannot (or perhaps I should say "will not") build new train lines and rolling stock in 5-10 years. The lead time on projects like this is around 5-7 years, just to get the necessary impact statements, designs, permits, etc done. In 10 years this process will probably be streamlined, but 10 years from now is too late.

Risk: Failure of infrastructure construction to keep pace with resource declines.

Likelihood of this risk occurring: Very High.

Impact: Moderate.

The outcome is likely to be: Crowded public transport, possibility of less reliable utilities, reduced productivity, shortages of some goods, etc.

Worst Case Scenario.

Homo Sapiens can adapt to change. It is what we are good at. But there are limits to our adaptability. The limit of our ability to adapt can be triggered by:

1. Sudden Change. If a significant negative change is too sudden, our ability to cope may be exceeded. For example: If, over a period of 10 years, there is a 300% increase in food prices, then people will find a way to adapt, but if this change occurs in 5 weeks we could expect problems.
2. Extreme Change. If negative changes go too deep, then our ability to cope may be exceeded, even if the change occurs slowly. For example: We can adapt to 10% less food, but 90% less food will cause society to break down. It does not matter if this change occurs slowly, eventually people will reach the point where they cannot continue to function within the framework of current society.
3. Multiple Changes. If multiple negative changes occur at once our ability to cope may be exceeded. Jared Diamond commented on this in his book "Collapse". A combination of multiple factors (such as external threats, environmental damage, and climate stresses) can collapse a society, despite the fact that each individual factor is not lethal.

All of these collapse triggers are plausible in our current situation. Scenarios for each of the three triggers (sudden change, extreme change and multiple changes) are considered in more detail below.

Sudden Change

The Best Case Scenario suggests that the change in oil availability will be gradual, in line with the Hubbert curve. However, there are at least three plausible events that could produce a much faster decline in availability:

1. Invasion of supplier nations - "Resource Wars". If an importing nation perceives that it has no future unless it can guarantee future resource supplies, then war is on the cards. If multiple wars break out and many suppliers have supplies disrupted, then world supply would be severely disrupted.
2. Supplier lock in (Resource nationalism). If suppliers decide that their long-term welfare depends on limiting exports so that their own long-term supply is guaranteed, then supply could be drastically curtailed.
3. Large increases in demand. It has been observed many times that if China and India consumed resources at the same rate as the Western World, then world oil (and other resource) production capabilities would be immediately overwhelmed. Yet the Chinese and Indian people clearly have aspirations in this direction, and their economies are ramping up accordingly.

Each of these scenarios is plausible. Each might conceivably cause a significant shock, even in a well-off nation such as Australia.

Extreme Change

There is one obvious trigger for a deep change - The Hubbert curve may start off gradually, but in 20-30 years it gets precipitous. In 30 years we could find our oil supply cut dramatically. If we are still dependant on fossil fuels in 30 years, then we deserve the inevitable consequence.

Multiple Negative Changes

Based on the discussion above, there are many factors that could interact with oil depletion, or even with each other, to form a collapse trigger. Here is a brief discussion of some of them:

1. **War**

Australia could become drawn into regional wars, or our current involvement in Middle Eastern wars could drain us so severely that a crisis is precipitated. The worst-case scenario is that our endowment with resources, in combination with our low population and comparatively small military could make us a target for invasion, and we might be forced to fight a war on Australian soil. War has the capacity to be a sudden change, an extreme change and a change that interacts with others. As a result, war is a well known collapse trigger.

2. **Climate change**

Several prominent scientists have suggested that a “Tipping Point” is near, or has been reached. They further suggest that the Paleolithic evidence suggests that change is rapid once tipping points have been reached. If sea levels were forecast to rise (say) 3 meters in the next 5 decades we would be forced to relocate entire cities. Could we do this at a time of energy-scarcity? Other climate change impacts could further complicate things. Crop failures, water shortages, spreading diseases, and so on. Entire books have been written. There may also be less predictable outcomes. Imagine the impact of hundreds of thousands of climate-change refugees landing on our shores. How could such a thing occur? It is conceivable that a nation could decide that it cannot cope with climate change refugees, and could transfer its refugee problem to Australia. Any country that has the capacity to move troops could move refugees using the same mechanism. Climate Change has the capacity to be a sudden change, an extreme change and a change that interacts with others. Climate change is another well known collapse trigger.

3. **Massive economic downturn** (depression or a similar economic collapse).

In an environment where capital is not available and credit is not being extended, it would be hard to mount major risk-mitigation projects. Unfortunately, the economic “liquidity crisis” that is currently emerging in the US financial markets might have exactly this effect.

4. **Disease.**

At a time when resources are limited, combating disease stops being such a priority. Will hungry people in South-East Asian nations continue destroying all their poultry every time there is an avian flu outbreak? Will screening for multiple drug resistant strains of TB (MDR TB) continue even in a time of economic downturn? Will societies be able to cope with an epidemic of a lethal disease if they are also trying to build new infrastructure for energy substitution? The World Health Organisation advises us that the question of a lethal flu pandemic is "when" not "if".

5. **The emergence of other resource constraints.**

The Canadian Tar Sands are frequently cited as a potential solution to oil scarcity. But processing these sands depends on water and natural gas. Both resources are becoming constrained and severely limiting oil production. Uranium has been proposed as a potential replacement for Natural Gas, but the price of Uranium has skyrocketed recently. Another alternative is to burn some of the bitumen in the tar sand to provide the heat needed to extract the rest. This works, but has obvious CO₂ problems. Other emerging resource constraints world-wide include depletion of platinum, water, copper, hafnium, indium, etc. It is proving difficult to build new energy-producing infrastructure as the price of the necessary resources skyrockets.

Risk

It would take a book to fully explore these risks - a book that I don't have time to write, and I'm sure you don't have time to read - but we have at least hit the high points. Now that we have identified some risk scenarios, we should start to assess them.

Below is a table in which I list the risk, the likelihood, the impact and then a “Notional Damage”.

Notional Damage is calculated by multiplying the risk by the impact (note that I am only interested in the worst case - catastrophe - so my definition of impact differs from the usual definition, I am defining impact as "probability of the risk creating a major dislocation"). You can sum up the "Notional Damage" of all the risks to get a "Total Notional Damage" - representing the notional likelihood of complete failure of your project. Note that this is not statistically accurate. There exists a danger that related risks (which might occur at the same time) can sum to produce artificially large numbers.

As an example, if a risk is 50% likely to happen, and would cause 50% devastation, then the "Notional Damage" caused by this risk is $.5 \times .5 = 0.25$, or 25% notional probability of complete devastation. Two risks of this type will obviously give you 0.50 - notionally (not statistically) a 50% chance of total devastation.

This is very inexact. Summed notional risks are unreliable. For this reason, very few risk managers are willing to sum risks, choosing instead to count types of risks. In addition to statistical flaws, the summing method does not take interactions into account, nor does it consider unexpected good luck that might cause outcomes that act against the risks listed below. However this kind of exercise can give you a gut-feel for the risk, and thus the viability of a project. For this reason, I am willing to do it, while treating the numbers generated with extreme caution.

The table below attempts to answer this question:

Assuming that Peak Oil is a fact (and there are now few people left who question the theory), then what risks could precipitate a collapse by impacting in one of these ways:

1. Making Peak Oil more sudden (or)
2. Making Peak Oil more severe (or)
3. Introducing new factors that interact with Peak Oil to create more multiple negative changes than we can cope with

So here are my numbers (feel free to substitute your own best guesses)

Risk Description	Likelihood (Likelihood of this risk occurring before 2020 - Discussion, followed by numeric value)	Impact (Likelihood of this risk causing major dislocation before 2020 - Discussion, followed by numeric value)	Notional Damage
Resource Wars. Invasion of energy-supplier nations by resource-depleted aggressors	Although this seems to be occurring already, the Iraq experience is likely to discourage imitation for a while. (Ultimately, resource depletion is likely to lead to war, but probably not in the timeframe under consideration.) .06	Impact depends on the effectiveness of the invasion and the number of nations affected. It is unlikely that by 2020 a significant number of suppliers could be invaded so ineptly that oil supplies were cut off. 0.3	0.02
Supplier Lock-in (Resource nationalism)	Low. Suppliers would be aware that lock-in could lead to action against them. 0.2	Low. Impact would depend on the degree of lock-in and the number of suppliers who attempted it. 0.1	0.02
	Medium. Occurring already in	Low. As long as Australia can outpace emerging nations this will	

Large increases in demand	medium. Occurring already in China and India, but moderated by the market. 0.5	outspend emerging nations, this will impact us, but not be a show-stopper. 0.1	0.05
Australian involvement in a major war (as an aggressor or as an invasion target)	Extremely Low. We are too smart to over-involve ourselves in a foreign war, and too far away to be a viable target at a time of limited logistics. 0.02	Severe. An invasion of Australia would be crippling, and a resource-draining military overextension would be almost as bad. 0.9	0.018
Abrupt Climate Change (rising sea levels, decades-long droughts, etc)	Low within the pre-2020 timeframe. The Paleolithic evidence supports the concept of abrupt climate change. But the probability that it will hit before 2020 seems low? 0.15.	High-Severe. Even a 0.2 meter increase in sea level by 2020 would be sufficient evidence to force us to commence relocating city functions and infrastructure. Venice adapted to rising seas – but it would be a hard thing to do in a time of resource constraints. 0.8	0.12
Massive economic downturn	Low-Medium. High oil prices combined with the sub-prime meltdown and “liquidity crisis” could plausibly have severe economic consequences. However it appears that the "Resource Boom" has largely insulated Australia from the worst effects. 0.3	Low-Medium. A bad economy could place severe constraints on any attempts at mitigating responses to resource constraints. 0.3	0.09
Pandemic Disease	Low-Medium. According to the World Health Organization, a lethal flu pandemic is a matter of “when” not “if”. New diseases and drug-resistant diseases are constantly emerging. Bird Flu and MDR TB are two examples. 0.3	Low-Medium, depending on severity and timing. The emergence of a pandemic disease at a time when society is resource-constrained and attempting to mount projects in response to these constraints could create severe problems as conflicting demands emerge. 0.3	0.09
Other Resource constraints cause a cascading problem	Low-Medium. Moderate constraints are already in evidence. 0.3	Low. Although constraints are in evidence, none have yet created a severe problem in Australia. Constraints will create significant problems, but there is no clear sign that a complete collapse could be triggered in Australia. 0.1	0.03
Total			0.11

Notional Damage			0.44 (approx)
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Low: 0.0 - 0.3
 Medium: 0.3 - 0.6
 High: 0.6 - 0.8
 Severe: 0.8 - 1.0

Note that most of the factors listed here are external to Australia and out of our control. Our resource advantage offers us little protection from many of these risks - in fact it increases some of the risk factors.

Note also that I am not using the standard definition for "Impact".

This table indicates a notional (roughly) 50% chance of a severe setback before my son turns 16. How severe? Possibly not as severe as one might think. For example, one of the risks considered is a pandemic. If it occurred while we were trying to cope with Peak Oil and undertake a serious infrastructure project, then it could set us back. But here in Australia I think we could cope. In the closing phases of WWI, Europe was hit by the Spanish Flu pandemic. Tens of millions of people died, and the fabric of society was strained - but it held together, despite dealing with a war and a pandemic at the same time. I believe that the fabric of our society can survive two simultaneous hits, as long as they are not severe.

We might be set back by a few years, and certainly there would be suffering, but I believe that if Europe can do it, then Australia as a nation could rise to the challenge. This, obviously, depends on the nature of the crisis. I give "Invasion" an impact of 90%. If we get invaded, all bets are off! Likewise a pandemic that caused very high levels of fatalities could be a problem beyond our capacity to cope.

This kind of mathematical game-playing is only intended to provide a gut-level assessment of the magnitude of the accumulated risk. The number produced is usually artificially high. Suppose, for example, that China's next moon probe finds a huge ocean of Helium-3 on the moon, and simultaneously scientists in Europe find a breakthrough technology that can immediately utilize Helium-3 to produce limitless, cheap power. An event like that would make many of the risks above irrelevant. But "positive risks" like these are not assessed in conventional Risk Analysis. Negative risks, on the other hand, can simply be added until you reach any Total Notional Risk number that you desire.

The three risks of particular interest are climate change, pandemic, and massive economic downturn. Although the Total Notional Damage number should be viewed with caution (since it has been generated using a flawed methodology), the Notional Damage numbers are calculated simply by multiplying risk x impact. These numbers have much more validity. I am looking at numbers like 0.12 for climate change, 0.09 for pandemic disease, and 0.09 for massive economic downturn. Numbers this high would normally cause me to either cancel the project or introduce massive risk mitigation. Many of the numbers on this table are so high that I am forced to question my objectivity.

I have been fairly conservative (I believe) with the estimates. When making estimates, I have tried to put the question into concrete terms. For example, in the question about a major war with Australian involvement, the concrete question to ask is "How often will Australia be invaded, or make an all-in commitment to a war that leads to major domestic dislocations?" My answer is "once ever 500+ years" (i.e. an invasion every thousand years and a stupidly aggressive war every thousand years), so the chance of this happening in the next 13 years is a bit over 2%.

The once-in-500 years number seems quite conservative. In fact there are no numbers on that list that I am really uncomfortable with. So there is a credible risk of a severe crisis by 2020. I clearly need to hope for the best, but prepare for the worst.

A Range of Cases and Timeframes.

A best case scenario might push Australian society through to Phase 2 (Business not-quite-as usual), while a worst case could push us to Phase 3 (partial collapse) or even, possibly, into Phase 4 (collapse). So any preparations being contemplated must enable us to move from one phase to the next

A worst case scenario would leave us with a devastated economy and could require years for recovery, so preparations need to provide support for a possible extended period and enable us to contribute to the recovery phase.

It is important to remember that during the recovery phase we would still face the massive task of building infrastructure for alternate fuels, mass transport systems, etc. However we would be starting from a lower industrial base and with a shattered education system (thus complicating the task of retraining people for the challenge).

The recovery process in the worst case scenario would not be pain-free.

At this point it is worth quoting from Dmitry Orlov, who experienced and wrote about the collapse in Russia after the demise of the Soviet Union (<http://energybulletin.net/23259.html>). Dmitry said:

(The)“Soviet Collapse was absolutely horrible for most people. Many of them died.” “In spite of all this, I believe that in every age and circumstance, people can sometimes find not just a means and a reason to survive, but enlightenment, fulfillment, and freedom.”

My point is that hard times are not always unhappy times. With sufficient preparation we can improve the likelihood of happiness for ourselves and our loved ones even in the worst-case scenario.

Summary

In Part 2, I presented these arguments:

- Australia will need significant infrastructure changes in the years to come.
- A move to alternate fuels and mass transport systems will provide many work opportunities, particularly for engineers, artificers and construction workers.
- There is a plausible risk of a serious dislocation that could set this necessary work back. If this occurs, we will need to spend a significant amount of time recovering before we could undertake the necessary infrastructure changes. A setback like this is likely to be accompanied by significant trauma.

We now have a picture of the stresses that Australia might face. Personal preparations will require looking at the scenarios, defining strategies to address the identified risks, then deciding what preparation is required now, so that we can carry out each strategy.

In Part 3, I will talk in more detail about personal strategies and preparations.



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