Achieving Wisdom:

Making rational decisions

In a previous essay (issue 74: *Achieving wisdom: how to seek out truth*) I described three characteristics of wisdom: first, the ability to determine the truth of situations, second, the ability to make the right decisions and third, benevolence. The right decisions are those which confer the greatest benefit and cause the least harm. On a societal scale, I defined the right decisions as those which lead to the greatest amount of good for the greatest number of people on a long term basis. Some may argue that what constitutes the "greater good" is open to debate, due to the different value systems of different parties. Such people invariably turn out to be arguing for minority special interest groups. I would argue that we *can* obtain consensus as to what constitutes the "greater good" based on universal human ethics as acknowledged by the majority, however this may require we resolutely oppose powerful well funded minority lobby groups who use disinformation and obfuscation to ruthlessly advance their own self interest. One good example of such a lobby group is the tobacco industry. Another example are the global warming deniers.

In this section I ask how we may make the right decisions. Again I advocate we borrow from the principles and practice of medicine.

What factors commonly influence our decision making processes?

One major factor may be our emotional state at the time: whether in a generous mood, in a fit of rage or the feeling of being harassed and swamped by excessive demands (hence hastily choosing the first thing that comes to mind, the easiest way out). Often the choice is made in the pursuit of instant gratification without regard for long term consequences. Continuously repeated, such self-indulgent impulsivity results in aimless drifting in life with no concrete achievements and mounting debt &/or addiction. Perhaps we may use our "instinct" or "intuition" or "gut feeling" which may be useful if based on extensive practical experience and a successful track record, but more likely will be detrimental if based on prejudices or preconceived false paradigms.

Pavlovian psychological processes such as partial reinforcement and recency (outlined in Stuart Sutherland's book "*Irrationality: the enemy within*") also play a role.

Then there is the role of religion and superstition. I place both of these in one category as they share the same characteristics, with no clear-cut dividing line between them. Both are based on unverifiable beliefs (or "faith") rather than provable assertions. Thus we might follow a certain path because a stern old cleric with a beard and holy book said we would burn in hell if we disobeyed him. Or we may accept the advice of a gypsy woman with tarot cards, or a self styled clairvoyant because they claim expertise in prophecy. "Divine inspiration" is no different from "gut feeling" with a spiritual spin.

I advocate a **better strategy to make rational decisons:**

Step 1: Assess the situation

This is none other than the method of determining truth (or method of skeptical enquiry) which I outlined in my previous essay. Proper assessment of a situation (AOS) requires gathering as much accurate information as we can to obtain detailed knowledge of the particular circumstance in question. It requires knowledge of other parties involved and, very importantly, self knowledge (realistic appraisal of one's own abilities and limitations). Not only is factual knowledge important, but also a feel for the emotional tone of a situation and also second guessing what the motives of others may be. To paraphrase Sun Tzu: "know yourself, know your enemy, and in a hundred battles, win a hundred victories".

Step 2: List our options

What options do we have to address the situation? We should comprehensively list all possible options available to us. This requires exhaustive brainstorming and often lateral thinking. Critical appraisal of each option is important.

Step 3: Consider the consequences of each option, both short term and long term
(perform "risk-benefit" or "probability-outcome" analysis)

We must weigh the advantages and disadvantages of each option. In a straightforward situation, we would choose the option with the greatest advantages and the least disadvantages. Unfortunately life is seldom that simple. We must look at the big picture and anticipate long term consequences. The option which at first sight appears to offer us the greatest personal benefit with the least personal drawbacks may not necessarily be the best choice in the long run, especially if it results in disadvantage to others ("collateral damage") which could result in resentful backlashes in the future. Opting for the solution which confers less than maximal personal short term gain (or which even causes some personal detriment), but which confers advantage to others may well be the best choice for long term personal and group success (remember the "*prisoner's dilemma*" scenario). This then, is one rational explanation for the existence of altruism. Risk-benefit analysis is a particular matter which I will expand on further.

Step 4: Choose the best option and ACT

Actively pursuing the optimal option often requires the courage to sacrifice short term gains for the sake of long term benefit, the willingness to take calculated risks, and the application of fortitude and discipline. Often the option of best advantage is the most difficult, even unpleasant option, at least initially. Success also requires bloody minded persistence - the willingness to try and fail 99 times before succeeding the 100th time. The ability to learn from one's mistakes is essential. Also important is the ability to recognise a window of opportunity and to act in a timely fashion. "Timely" means acting swiftly and decisively if necessary, or conversely being patient and biding one's time until more favourable circumstances arise.

Step 5: Change course in mid stream if circumstances also change eg. if new information comes to light requiring reevaluation of the situation

Changing tack mid stream requires continual monitoring of the situation and repetition of steps 1 to 4, and to embark on a new course if necessary. In a word: *Adaptability*. We are all fallible human beings and we all make mistakes. The difference between the wise man and the fool is that the wise man quickly spots and corrects his mistakes, whereas the fool continues to dig himself deeper into the hole he has made for himself rather than climb out of it.

In summary:

1. assess situation
2. list options
3. perform risk-benefit analysis of each option
4. choose the best option and ACT with determination and persistence
5. monitor the situation and be flexible, even backtrack if necessary.

How many of us actually follow the above process, consciously or unconsciously? Precious few I suspect.

General principles are well and good, but principles are best understood and appreciated with the use of concrete illustrations.

There are few fields of human endeavour where making the correct decisions are more crucial to life and limb, than in the fields of medicine and aviation, and I can claim some experience in both. Failure to properly assess the reality of a situation and failure to take the correct action in either field can result in death or disability. Conversely, correct AOS and correct action in both fields can save and enhance lives.

Here is a true case report (with minor alterations to hide the patient's identity):
Some years ago, a lady in her 60s was referred to me for cardiology review. She had progressive breathlessness (which was by then significantly compromising her daily activities) and a heart murmur. After clinical assessment and investigation, I determined she had a severe narrowing of her aortic valve or *aortic stenosis* (which was obstructing the flow of blood out of her heart). She

had no other medical issues. I advised her that medications were unhelpful for this condition and the only viable treatment was surgical replacement of her valve, with a >95% probability of excellent outcome, restoring her to a normal lifestyle and lifespan, but with a perhaps 2% risk of operative death. In the absence of surgery, in the natural course of the disease, she would face about a 50% risk of sudden death over the next 2 years. As there was no way of predicting when she might drop dead suddenly, once the diagnosis and decision to operate were made, it was prudent to arrange surgery with minimal delay and I referred her to cardiac surgeon "M" who accepted her for operation within a few days. Aortic valve replacement is a "bread and butter" operation performed by all cardiac surgeons with little difference in outcomes between experienced surgeons.

Unfortunately her daughter (who lived in a southern state) persuaded the patient to delay her surgery, as the daughter wished to travel to Brisbane to provide social support and wanted her to be operated on by another preferred surgeon "S". Doctors are always obliged to follow the preferences of their patients, once they have informed their patients of the risks and benefits of all their options, hence I had to comply. Without surgery, her two year risk of death was very high (50%) but her very short term risk of death was probably low.

Some weeks later the daughter flew up to Brisbane, however on that very day, the patient suddenly developed heart failure (profound breathlessness due to flooding of the lungs because the heart could no longer cope with the obstructive valve). She was admitted as an emergency to hospital where medical stabilisation was aggressively attempted and she was operated on "in-extremis" by their preferred surgeon "S", but unfortunately she died in the early postoperative period.

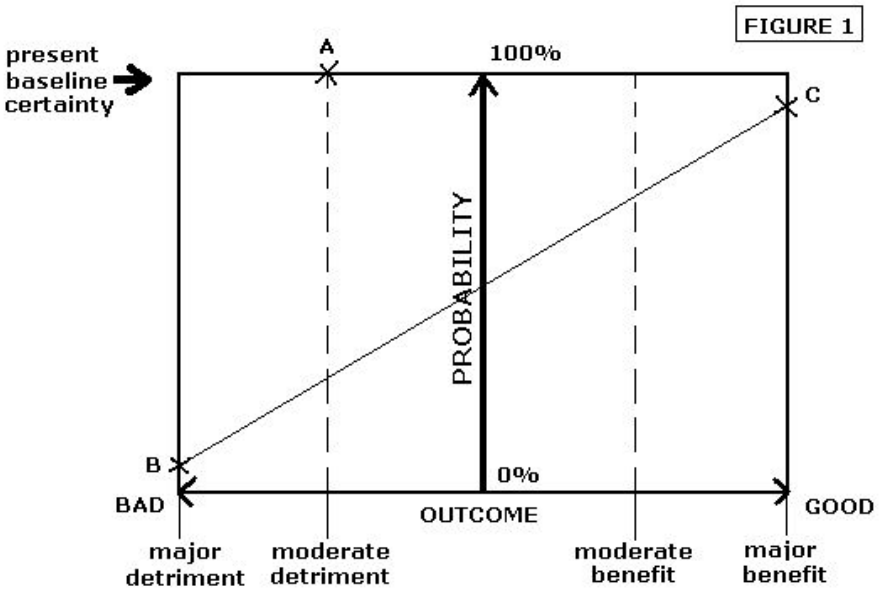
Important lessons can be learned from this unfortunate situation. There is no doubt the patient's daughter wanted the very best for her and was motivated by the best of intentions. More likely than not, "statistically speaking", waiting a few weeks would not have hugely increased the risk of death to the patient, however in this particular case we saw the advent of a low probability but catastrophic event.

First lesson: when faced with a potentially catastrophic outcome, even if the probability of this seems low, we cannot assume everything will be fine. We are obliged to act. The stakes are just too high to be nonchalant about such a potentially disastrous consequence, even if it appears unlikely in the short term.

Second lesson: If we act in good time to alleviate a problem, we give ourselves the greatest chance of achieving the best outcome. If we procrastinate and allow a situation to deteriorate past the "tipping point", we may well face an unsalvagable disaster. This raises the old dictum "an ounce of prevention is worth a pound of cure". Cardiac surgical registries show that elective aortic valve replacement in otherwise well patients have a very high rate of excellent outcome. Unfortunately if left too late and the patient decompensates, the results are dire.

The "tipping point" is the point where compensatory mechanisms fail and the system suddenly collapses due to positive feedback loops forcing a downward spiral to destruction. It is the point where the proverbial straw breaks the camel's back. This "tipping point" is applicable to many biological, ecological and environmental systems which are normally held in dynamic equilibrium by well balanced mechanisms.

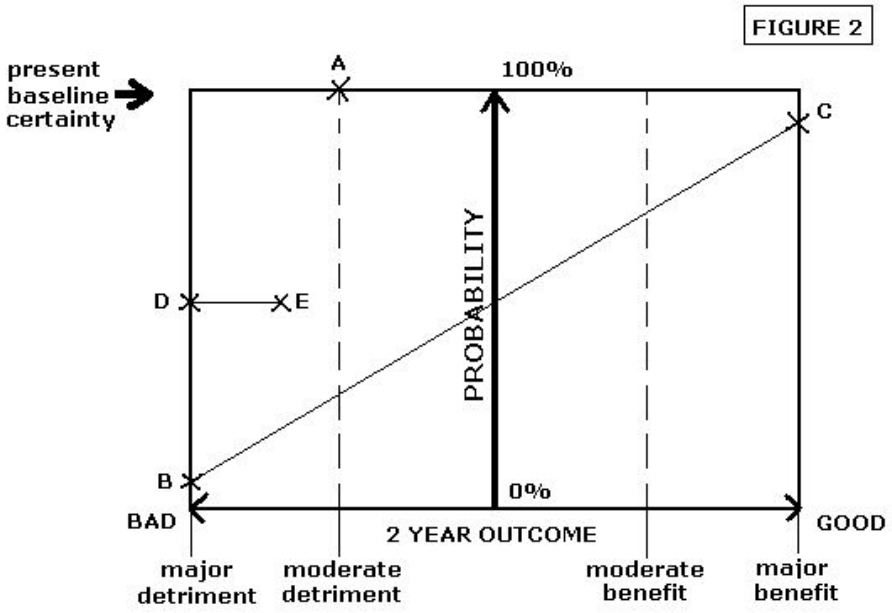
Assessing "risks" versus "benefits": probability-outcome analysis



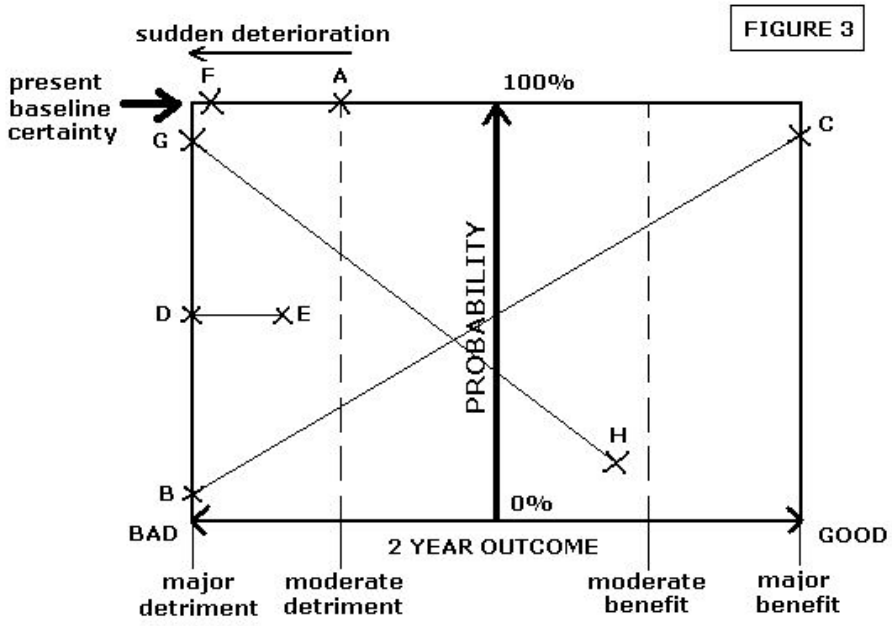
I would like to introduce a visual tool to help with our decision making process. I find visual/graphical models very useful. The term "risk-benefit ratio" is often bandied about in decision analysis theory, however the phrase is so vague and imprecise as to be almost meaningless. Nevertheless I confess I often use that term myself through convention. What do we mean by "risk"? If I describe kayaking across the Tasman Sea as "risky" do I refer to the potentially severe consequence (ie drowning, death) or do I refer to the high probability of the adverse outcome, or do I refer to both? What about bungee jumping? Is that risky? Some would say that although the potential consequence is severe (death if the bungee fails), it is not risky because the likelihood of such an event is miniscule. I think we need to be more precise in our language and we need to separate the considerations of likelihood and consequence using a technique I call "probability-outcome analysis". Consider *figure 1* where the y axis shows increasing probability of a particular outcome and the x axis shows greater harm on the left hand side and greater benefit on the right hand side:

Using the previous example of the patient with severe aortic stenosis: At initial review, the patient was at point A (a 100% situation of moderate disability ie. exertional breathlessness affecting daily activities). If the patient underwent timely surgery, the worst case scenario would be death, however the likelihood of perioperative death is only 2% (low probability) and this outcome is represented by point B. The best case scenario would be restoration to a normal symptom status and a normal lifespan, a 95% likely outcome, which is represented by point C. Hence line BC represents the option line of "timely surgery" – a good choice.

Let us now consider the natural history of unoperated aortic stenosis in *figure 2*. There is a 50% chance the patient will be dead by 2 years (point D) and a 50% chance the patient with be alive at 2 years but will certainly have worse symptoms then (point E) due to the inevitable progression of the disease. Thus the line DE represents the "non surgical option line" – a poor choice. Let me now also add that **for each of these probability-outcome diagrams we must explicitly indicate what time frame we are looking at**: in this case, a two year outcome.



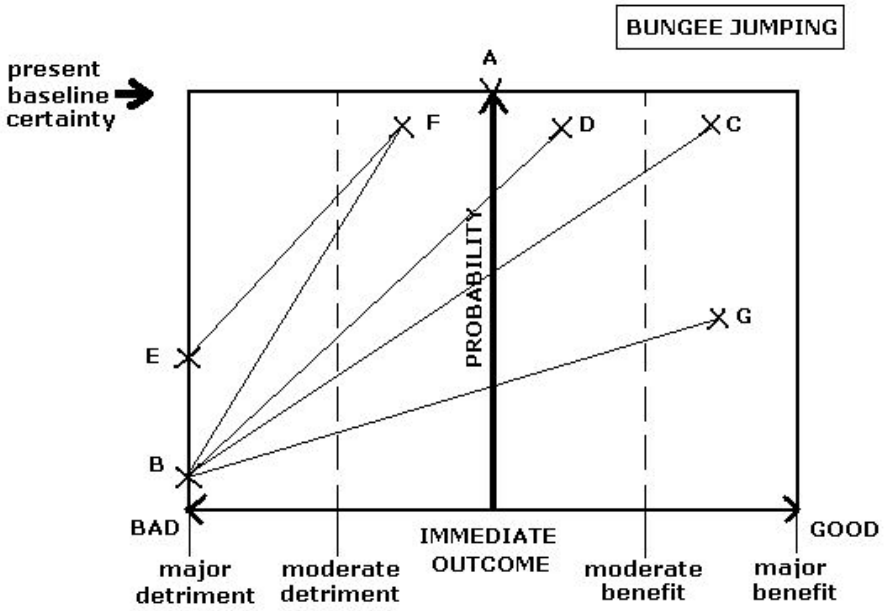
If however, the patient abruptly deteriorates past the "tipping point", the patient's situation suddenly jumps to the left, to point F (100% situation of being near death) as shown in figure 3. Our old option BC based on previous baseline A is no longer applicable and our new option of surgery based on baseline F is represented by the line GH – a high likelihood of perioperative death and a low probability of good outcome. Nevertheless this option must be taken because the patient would otherwise face certain death without surgery.



I would like to emphasize that these diagrams are not precise mathematical graphs (unlike the specificity/sensitivity graphs I have previously devised which are precisely numerical) but are *qualitative visual representations of options* which enable us to better appreciate the consequences of our decisions and to weigh each option.

It is up to the individual to tailor their graph for their own value systems and decide for

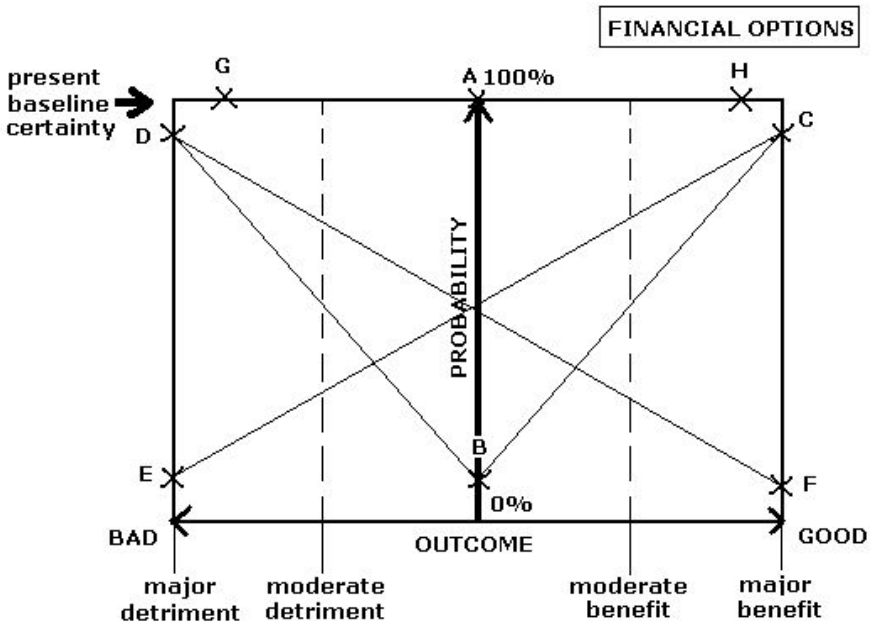
themselves what constitutes great reward or poor outcome. For instance, given the option of bungee jumping, we may see a variety of perceptions of "risk versus benefit":



Point A is the neutral "baseline" starting point for the individual. The thrill seeker may percieve the probability of death to be low and the "payoff" (of a great adrenaline rush) to be high and will rate the option of bungee jumping with the line BC, hence he will go for it. Another may view the probability of death to be low but the "payoff" to be only modest and rate the option with line BD, hence will not bother with bungee jumping. Another person who perceives the probability of death to be low but is terrified by the whole prospect and sees no payoff at all from the jump will rate it as BF. Another still who may perceive the likelihood of death to be higher and sees no payoff at all will rate it as EF. Note that of all of these option lines, only one, option BC, results in the individual "going for it".

Yet another may see the the risk of bungee jumping as low and is doubtful about the payoff. She is however open to the possibility that, contrary to her expectation, she may find the experience very rewarding (medium probability of high payoff). Her view is represented by option BG and she is initially reluctant to take up the option. Such a person may however be persuaded to go bungee jumping if egged on by friends who testify that despite their initial reservations, when they had done it, it was the "best thrill" in their lives. Her perception then shifts to BC and she goes for it.

We can now see patterns emerging of what constitute good and bad options. Let us use some financial examples now (refer to "financial options" diagram).



Let's take point A as the starting point: a person in a neutral situation with an average wage who has no debts but also no assets. Such a person is advised to attend the reading of a will where he stands to inherit, no strings attached, ten million dollars from a deceased relative. We can describe this option as low (or no) probability of even minor detriment and high probability of high payoff and is represented by line BC. This is a no brainer option to choose. Conversely, if someone has been framed for embezzlement to the tune of 10 million dollars with an airtight legal case against them, this scenario represents a high probability of major detriment and low (or no) probability of any benefit and is represented by line DB and can be rightly described as "between a rock and a hard place". The best case scenario is they fight and win the legal case against all odds and have expenses awarded to them, arriving back again at neutral position A (not taking into consideration time lost and mental anguish). Let's take another example of a person who receives a "guaranteed" confidential tip regarding a particular share which is about to skyrocket. With hastily borrowed funds invested, they stand to gain a net profit of 10 million dollars and feel they have little chance of being arrested for insider trading. This option may be perceived by them as a "low probability of major detriment but high probability of high payoff" option, represented by line EC. Conversely, if a person is enticed to smuggle heroin to Bali and stands to gain 10 million dollars by doing so, but has a high chance of being caught and executed, this would be a "high probability of major detriment and low probability of major benefit" option represented by line DF. Thus surely no one in their right mind would take up option DF, would they? Well, it all depends on how desperate they are. Someone at starting position A would be crazy to chose option DF, however if a person is at starting position G (perhaps financially destitute and needs to pay off loan sharks under threat of death), then DF may not seem like a crazy option to them. This is analogous to the patient with aortic stenosis who deteriorated suddenly and had no option but to undergo risky emergency surgery. Finally, let us look at another extreme situation. I previously mentioned that option BC was a no brainer to choose, however that may not always be the case. If you possessed wealth similar in magnitude to Bill Gates and already had $40 billion in assets, you would be at starting position H (indeed, to the right of H). As such, you may not consider it worth your while to get out of bed to accept your paltry $10 million inheritance, and may just instruct the lawyer to give it to charity, thus declining option BC.

Thus I advocate a more precise way of describing an option. Rather than saying vaguely that an option has a "favourable" or "unfavourable" risk-benefit ratio, I suggest we specify in greater detail that an option has a low/medium/high **probability of** minor/moderate/major **detriment**, with a low/medium/high **probability of** minor/moderate/major **benefit**. While this descriptive method may sound cumbersome at first, repeated use will enable familiarity and utility. Used in conjuction with my "probability-outcome" diagrams, one can instantly develop a mental picture that, say, a "*low probability of major detriment with high probability of major benefit*" option is represented by the line EC, and this visualisation can facilitate one's decision whether or not to take up that option.

Here are some general observations about the probability-outcome diagram:

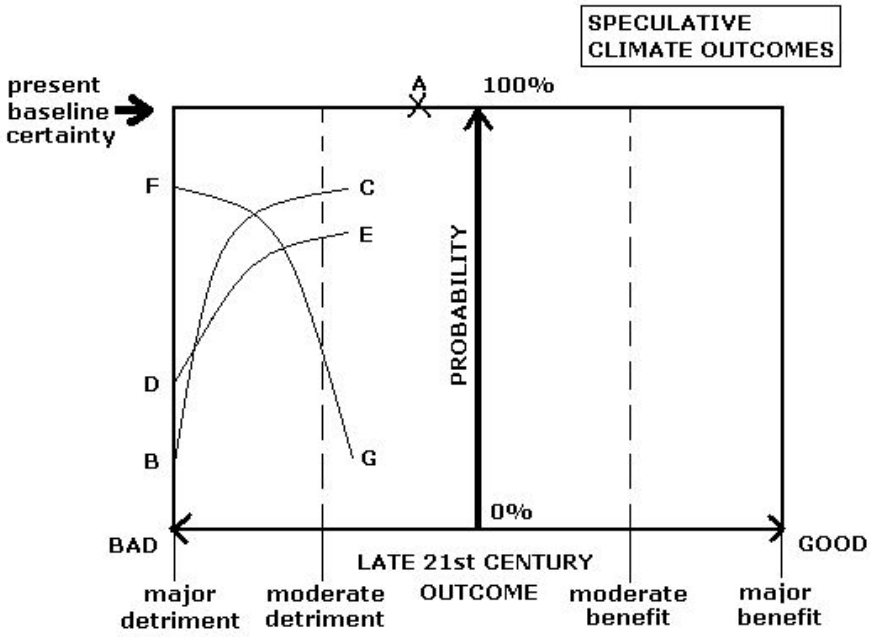
1. Left hand points represent worst case scenarios, right hand points represent best case scenarios
2. The line joining the left and right hand points, the option line, is a qualitative (not quantitative) representation only and the length of the line is not proportional to anything in particular nor should the line necessarily be straight (it is just drawn straight for convenience). All points along the line do however represent various states of well being between the worst and best case scenarios.
3. The steeper the option line *sloping up to the top right hand corner* of the diagram, the *better* the option.
4. The greater the proportion of the option line residing within the right hand side of the diagram, the better the option
5. The steeper the option line *sloping up to the top left hand corner* of the diagram, the *worse* the option.
6. The greater the proportion of the option line residing within the left hand side of the diagram, the worse the option.
7. The further to the right of centre the baseline starting position is, the less likely the person is to take up even low risk high gain options
8. The further to the left of centre the baseline starting position is, the more likely the person is to take up even high risk low gain options

The non-linear probability-outcome curve: global warming

We can also conceive of non linear probability-outcome curves.

Few people seem to appreciate how potentially catastrophic the consequences of anthropogenic global warming may be. We know that global climate has fluctuated hot and cold in natural cycles over millenia in the past. Fully modern humans have been around for well over 100,000 years. The human of 100,000 years ago was no less intelligent than the man on the street today, but for more than 90% of our history we have lived a hunter-gatherer lifestyle. Humans have only been able to utilise agriculture and thus establish settled communities from around 10,000 years ago. Agriculture sprung up independently then in six different locations around the world, all about same time. It is no coincidence that the last ice age ended and our present stable interglacial period commenced at around 11,000 years ago.

Without a stable climate we cannot have agriculture and without agriculture we cannot have civilisation. In the last ice age, average global temperature was only about 5 degrees Centigrade cooler than present average global temperature. In March 2007, the IPPC report projected that by 2080, average global temperatures could reach as much as 6-7 degrees Centigrade higher than today. This represents a nightmare scenario too horrific to contemplate, but contemplate it we must.



Change is inevitable and is not necessarily bad if gradual. Humans and ecosystems can adapt to gradual change, however sudden dramatic change in global climate systems will undoubtedly cause major disruptions and displacements of human populations. Collapse has occurred in many focal communities in human history due to local environmental changes, but this time the collapse of civilisation could be worldwide as a result of sudden global climate change.

We do not know for sure how things will be 100 years from now, but we do know it will be mostly bad news and we do know the magnitude of global harm will be related to the degree of temperature rise. The best we can do is to mitigate harm and in itself this is an essential task.

We do not know exactly how scenarios may pan out, but non-linear models seem likely. One model may be the curves in the diagram "*speculative climate outcomes*".

At our present position A, we already see the early signs of environmental disruption in the form of melting glaciers and worsening hurricanes, droughts and floods. **Line BC** may represent the situation of **60% global reduction of greenhouse gas emissions** (compared to 2000 levels) **by mid century** as advocated by the IPCC which many Europeans are aiming for. In this scenario, global catastrophe may still occur by the end of the century but is very unlikely, indeed all outcomes at the worse end of the spectrum are less likely and all outcomes at the better end of the spectrum are more likely, resulting in a steep left hand portion of the curve and relatively flat right hand portion of the curve.

Curve DE may represent a **30% global reduction in greenhouse gas emissions. Curve FG** may represent **business as usual**, where no effective greenhouse gas reduction occurs and where global catastrophe is overwhelmingly the most likely outcome.

Note that *all* best case scenarios at the end of this century lie to the left (detrimental side) of our present day position. No matter what we do, circumstances will inevitably be worse than today due to the ongoing effect of greenhouse gases in the atmosphere persisting from decades before. Circumstances will not improve till perhaps 150 years from now, assuming major emissions cuts are made now. This does *not* excuse the fatalist who says "things will be worse anyway, so why bother?" The big question is how *much* worse things may be. As stated before: the name of the game is to mitigate harm.

I emphasize again this is a speculative graph (but not unreasonable speculation) based on advice from scientists and is used to demonstrate how we may visualise possibilities.

CONCLUSION: I have intentionally avoided discussing more complex analytical methods, algorithms and diagrams which are the province of decision analysis specialists and computer modelling experts, and which are difficult if not impossible for the average person to utilise in a rough and ready way. I have devised a simple graphical method of probability-outcome visualisation which can be scribbled on the back of a napkin and yet, I believe, has high utility.

If it serves no other purpose, I am hopeful that my probability-outcome diagram will enable thoughtful people to more precisely envision the consequences of their choices. It should help us realise that:

a) every option has a worst case scenario and a best case scenario with a continuum of possibilities in between and

b) each scenario must be specified in terms of probability and magnitude of detriment, and probability and magnitude of benefit.

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