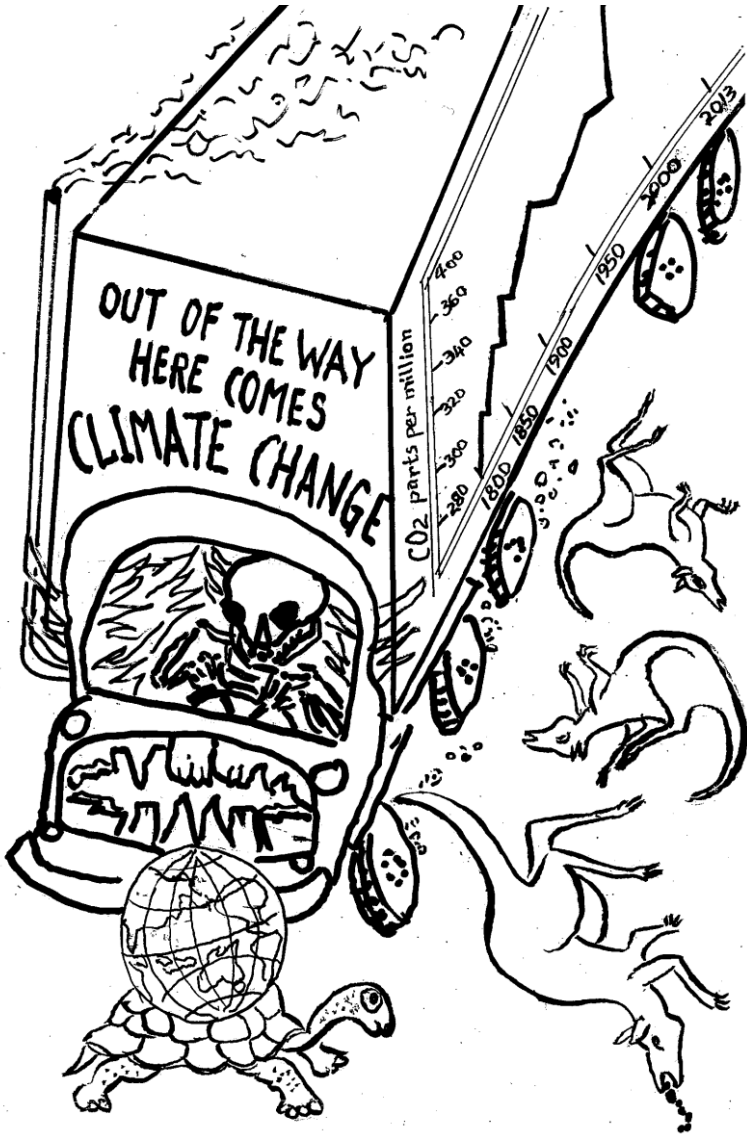


# Spaceship Earth in Trouble





The entire population, faced by the threat of climate change,  
has been flung into a state of complete panic

## Spaceship Earth in Trouble

*In 2003:*

"[Critics of the pact] often say, half-jokingly and half-seriously, that Russia is a northern country and if temperatures get warmer by two or three degrees Celsius it's not that bad - we could spend less on warm coats and agricultural experts say that grain harvests would increase further," he told the conference.

Vladimir Putin, President of Russia [25 (a)]

*In 2010:*

At a meeting of international sporting officials in Moscow on July 30, Russian President Dmitri Medvedev announced that in 14 regions of the country, "practically everything is burning. The weather is anomalously hot." Then, as TV cameras zoomed in on the perspiration shining on his forehead, Medvedev announced, "What's happening with the planet's climate right now needs to be a wake-up call to all of us, meaning all heads of state, all heads of social organizations, in order to take a more energetic approach to countering the global changes to the climate."

Dimitri Medvedev, President of Russia [25 (b)]

*After hurricane Sandy 2013:*

So the question is not whether we need to act. The overwhelming judgment of science – of chemistry and physics and millions of measurements – has put all that to rest. Ninety-seven percent of scientists, including, by the way, some who originally disputed the data, have now put that to rest. They've acknowledged the planet is warming and human activity is contributing to it.

Barack Obama, President of USA [16]

*September 27, 2013:*

We're 95% confident that human emissions are causing global warming.

Intergovernmental Panel on Climate Change (IPCC)

*June 16, 2011:*

"We're going to become extinct," the eminent scientist says. "Whatever we do now is too late. We'll undergo the same fate as the people on Easter Island," he says. "Climate change is just at the very beginning. But we're seeing remarkable changes in the weather already. It's an irreversible situation. I think it's too late. I try not to express that because people are trying to do something, but they keep putting it off."

E/Prof Frank Fenner, ANU microbiologist [25(c)]

*May 10, 1940:*

The historian John Lukacs recounts the conversation between Churchill and his bodyguard, W. H. Thompson as they are driven back to Admiralty House from Buckingham Palace where Churchill has just been made PM. France is about to fall, the British army about to be surrounded at Calais and Dunkirk. What Churchill had warned against throughout the 1930's – but had been ignored, even ridiculed – is now coming to pass; and Britain is unprepared. Thompson congratulates Churchill on his appointment but laments the magnitude of the task ahead. Churchill, with tears in his eyes, says: "God alone knows how great it is. I hope it is not too late. I am very much afraid it is. We can only do our best."

John Lukacs, "Five Days in London, May 1940" [25(d)]

*September 27, 2013:*

We still have a future. But only if we get on with it!

Johnathan Porritt, ABC Science Show [17]

## **1. Introduction**

You're driving along when you notice the thermometer pointing into the red. You call in at your mechanic and with the car idling and the radiator cap off he says: "See those bubbles – combustion gas is escaping into your water circulation system and raising the temperature; it's possible you've got a crack in your cylinder block and the engine may need replacing." You say, "Damn!" But you go ahead and put in a new engine and everything's fine again. No dramas!

What if combustion gases – carbon dioxide etc. – were escaping into the circulation system of planet Earth, passing a critical level, and taking average global temperature towards the red ...?

## 2. Spaceship Earth at a Pit Stop

Suppose you're orbiting along in Spaceship Earth. For the last 250 orbits – or years – you've been on cruise control powering your on-board domestic, industrial, and transport activity by burning coal and oil, with a big spurt of activity in recent orbits. So when your CO<sub>2</sub> gauge shows that during the same period on-board carbon dioxide has risen steadily to 400 ppm (parts per million) – about 30 - 40% above where your logs say it was 250 orbits ago (280 ppm) – you're not surprised. Nor alarmed: CO<sub>2</sub> is essential for your food systems, “plant food” as they say, so a rise seems like grist to the mill. But when your temperature gauge starts rising slightly above the average of about 15 deg. C – for the planet as a whole – and when, at the same time, you experience a lot of freakish weather events, you start to wonder. The rise is only 0.8 deg. C for Earth as a whole. Surely insignificant. But those weather events: firestorms, floods, droughts – both their frequency and severity increasing. And the greater than normal melting in the Arctic deck. Not to mention big tides and coastal erosion.

So you decide to dock with your planetary mechanic. He has a look at the logs and then says:

*Your mechanic:* “You've got a problem. It's no coincidence that the two gauges are rising together. You've been allowing your combustion gases to escape into your on-board atmospheric system assuming it's OK to do so. And, up to a point, it is: CO<sub>2</sub> is good for your food system. But problematic for cabin temperature. For some time now – in fact at least 150 orbits ago in your time – planetary technicians have been thinking about the role gases like CO<sub>2</sub>, methane, water vapor etc. play in the on-board environment. It turns out these gases – as in a greenhouse – trap heat, so causing average temperature to rise; even in tiny proportions. You're familiar with this in the case of water vapor: when a winter night is overcast you'll probably need less blankets. But the technicians have realised it's similarly the case for CO<sub>2</sub>, methane, etc. (see Box 1). On the one hand, without these so-called greenhouse gases your average temperature would plummet to -20 deg. C; so they're essential for

passenger comfort. But you can have too much of a good thing. Your on-board environment is so finely balanced that the 0.8 deg. C rise, due to the big rise in CO<sub>2</sub> etc., is enough to upset your climate system – circulation patterns etc. – and hence the weather. The trouble is that, whereas your humidity comes and goes on a daily basis, CO<sub>2</sub> hangs around for many orbits, centuries in your time. So the temperature rise caused by the CO<sub>2</sub> rise is long term.”

*You:* “Damn! I was thinking there might be a problem. What can I do?”

*Mechanic:* “You've got to stop emitting CO<sub>2</sub>, methane, etc.”

*You:* “But how can I do that? I've got all these passengers on board and I'm dependent on burning fossil fuels to keep them in the standard of comfort they're used to. Some of them not only enjoy the fruits of industrial activity but also have shares in it. And some of them have jobs in the fuel industry. If I have to announce that the party's over they'll revolt!”

*Mechanic:* “You're in a difficult situation. If you try to change it you fear a disruption, even a revolt. But if you just let it go on then not only do on-board conditions deteriorate – and your passengers get restive – but you may reach a point, which some of the technicians are talking about, where it becomes impossible to reverse out of the situation. How will your passengers cope then?”

“You didn't do this with the ozone problem [22, p28]. You docked in here, I put in a fix, and you moved on. No dramas. Why not the same this time?”

*You:* “Yeah, that was pretty straightforward. So what are the options?”

*Mechanic:* “There are four. You stay with your current fuel system but attach a CCS (carbon capture and storage) filter to capture the CO<sub>2</sub> and store it. Or you can do geo-engineering: blocking some of the incoming solar energy by mounting reflectors or by injecting aerosols into your on-board atmospheric system, simulating volcanic emissions. Or you can build more nuclear power stations. Or, finally, you can switch to renewables.”

*You:* “What are the pros and cons?”

*Mechanic:* “CCS is so far experimental, at best: you could say unproven and costly. Geo-engineering is also unproven and has side effects: sulfate aerosols contribute to acid rain [25(j)]; continuing emissions to ocean acidification due to CO<sub>2</sub> washed down by rain. With neither of these options do you get at the root of the problem: you remain hooked on fossil fuels, in geo-engineering

*Box 1. Greenhouse Effect (Fourier, 1820; Tyndall, 1859; Arrhenius, 1896)*

Did you know that a cup and an electric radiator both radiate energy? It's deceptive in the case of the cup because, with the light turned off at night, you can't see the cup whereas you can still see the element of the radiator: it's glowing red because it's much hotter than the cup. But if you put on infrared goggles you can also see the cup. What we have here is the basic radiation law of physics that says that all bodies radiate away their energy – at a rate that increases rapidly with temperature – and with a wavelength that decreases as temperature increases. You can't see the cup because, at room temperature, it's radiating long wavelength light in the infrared, undetectable by your eye. But, in the radiator case, the higher temperature gives you a shorter, now detectable, wavelength: it is *red* hot. And even more so with the Sun which is *white* hot.

You might wonder why, if the cup is radiating away its energy, it doesn't cool right down. The reason is that all the other objects in the room are doing the same and so the cup absorbs just as much radiant energy as it emits: i.e. there's a *balance* between incoming and outgoing energy, the heat energy in the cup is constant, and hence its temperature.

The Earth is more like the cup, the Sun – with an internal source of energy – more like the radiator. To see the effect of greenhouse gases (CO<sub>2</sub>, methane, etc.) imagine, firstly, introducing Earth *without* an atmosphere. Then the Sun would warm it to a temperature, at balance, of about -20 deg. C. Then give Earth its normal atmosphere including the normal level of greenhouse gases (280 ppm CO<sub>2</sub>, etc.). Instantly you would lose balance. The same amount of sunlight would hit the ground as before because the atmosphere – the air – is *transparent* to sunlight (short wavelength). But it turns out that water vapor, CO<sub>2</sub>, etc. are *opaque* to infrared light (long wavelength) so part of the heat energy being radiated by the Earth's surface can't get out (Tyndall, 1859). So instantly, outgoing energy is less than incoming. To restore balance, radiation from the Earth's surface must increase so that the part of this energy that does get out again equals incoming (which is fixed). By the radiation law this implies that the Earth's surface temperature must rise – to about 15 deg. C. When we, from *our* emissions, add more CO<sub>2</sub> (to 400 ppm now) we upset the balance, leading to a further rise – about 0.8 deg. C, so far.

like a smoker taking chemo as an offset; better to give up smoking. Nuclear you know: proven but costly; and you've got to store the waste on board for thousands of orbits. Renewables: proven, costly, but no side effects."

*You:* "Hobson's choice! By the way, I thought renewables were unproven in that they couldn't meet base-load demand."

*Mechanic:* "Not any longer, apparently. One of the technicians has done a feasibility study (see Box 3) which I'll include in my quote, if you like, showing renewable sources – wind turbines, solar thermal, solar voltaic, hydro, tidal, etc. – can meet real demand, hour by hour. He based it on real demand data and on real weather data: wind and sun conditions for the same period."

*You:* "What would *you* do; I get the impression you favour renewables?"

*Mechanic:* "Yes. To me it's a no-brainer. Look out there at that beautiful Sun. There you've got a fusion plant giving you millions of years of energy as you orbit around it. Gratis! Why squander your irreplaceable fossil fuels? You'll burn them up in a few hundred orbits anyway, oil for sure. You'll have to switch eventually. Why not now? Leaving some of that stuff for your kids, their kids ..."

*You:* "Yeah, but try telling that to the various interests: the passengers who don't want any disruptions, the power and fuel companies who cater to their needs, etc. It's such a big change for just a 0.8 deg. C temperature rise. The whole on-board economic system is geared to the present power-fuel system. The cost of replacing it would wreck the economy."

*Mechanic:* "Don't be deceived by 0.8 deg. C. This is an average rise for the planet as a whole and masks the bigger rises in some regions: e.g. several degrees in high latitudes including the Arctic deck. This is the reason the ice is melting there. Your planetary system is so finely balanced that it's like your body: just as a small rise in your body temperature from its steady 36.8 deg. C tells your doctor there's a problem so too does the 0.8 deg. C rise tell *me* there's a problem."

*You:* "What if I do nothing?"



*Mechanic:* “Then the problem will get worse: planetary temperature will continue to rise, the weather will get worse and other things as well. In fact, even if I install renewables today, your past emissions commit you to another half degree rise in average temperature. The good news is your rising CO2 gauge will ease off; but the bad news is your temperature gauge will keep on rising over the next 20 orbits or so. Unfortunately, I can't do anything about that. So you're going to hit 1.3 deg. C whatever you do. But if your emissions continue – say you see about 550 ppm on the CO2 gauge – then expect to see your average-temperature gauge moving up by between 2 and 4 deg. C.”

“It's not just the *lag* there is in temperature catching up to CO2 – i.e. *thermal inertia* due to the slow heating up of the ocean. You've also got positive feedback coming into play: such as the melting of sea ice on the Arctic deck. This exposes 'dark' ocean, meaning that sunlight, which would have otherwise been reflected, gets absorbed. Thus raising your surface temperature. Leading to more melting. Leading to more absorption, to more temperature ... Or to CO2 being evaporated from the ocean (like soft drink left out in the sun) leading to more warming, leading to more evaporation, ...”

*You:* “You mentioned 'other things as well'. What are *they*?”

*Mechanic:* “In the ice ages, mentioned in the logs, the gauge would have shown only a 5-6 deg. C *drop* from where it is now. But some of your decks, including some in business class – such as the North American deck – would have had to be closed: they were mostly covered by glaciers! Basically a different planet; you would have had a hard time attracting passengers. Your worry now is that, with a 2-4 deg. C *rise*, you face 'a different planet' in the opposite sense. For example, the projected rise on the Arctic deck, which will be much higher than 2-4 deg. C, will cause the Greenland ice-sheets to melt, raising sea levels by many meters. Your island and coastal decks will have to be closed. Likewise you face the permafrost in Alaska melting, exposing organic matter stored beneath it and releasing large amounts of methane, another problem gas. Although these kinds of feedbacks are slower than the ones I mentioned before they will, if they ever get going, cause your greenhouse gas gauges to shoot through the roof. A different ball game. Then your carbon emissions will have been the trigger for the planet itself to get into the emissions game. You can forget about your own emissions then; they'll be dwarfed by what the planet's doing! You've passed the point of no

return. You'll be closing most of your decks, if you can operate at all. For many, many orbits. And no use calling in here: I can't fix a problem like that.”

*Box 2. Quote for fixing spaceship Earth. Part 1 – diagnosis*

*Observations.* From inspection of logs and gauges:

1. *Emissions are rising.* From logs of coal exports etc. Burning coal produces CO<sub>2</sub> (basic chemistry).
2. *Atmospheric CO<sub>2</sub> is rising.* About half of emitted CO<sub>2</sub> goes into the atmosphere, the rest into the ocean [22, p18]. Measurements at observation stations in Hawaii and Antarctica show a steady increase in the amount of atmospheric CO<sub>2</sub> from about 315 parts (i.e. molecules) per million particles (ppm) in 1958, when measurements started, to about 400 now; ice cores show pre-industrial CO<sub>2</sub> at 280 ppm.
3. *CO<sub>2</sub> and other greenhouse gases trap heat.* Basic physics, proven in the lab (Box 1).
4. *Global average surface air temperature is rising.* Observations at weather stations around the world (now 39,000 of them) show average temperature steadily rising from about 1950 (the base of 0) to 0.8. There are years that stick out as being higher than subsequent years (eg 1998) but the last 10 years are the hottest on record and the trend is unmistakable.

*Analysis. The cause of your rising temperature: your rising emissions.*

Firstly, 1) implies 2) : i.e. rising emissions implies rising CO<sub>2</sub> (and rising CO<sub>2</sub> is actually observed)

Secondly, by theory and experiment, 3) is true : i.e. there *is* a greenhouse effect

Thirdly, 2) and 3) implies 4) i.e. rising CO<sub>2</sub> and the greenhouse effect implies rising temperature (and rising temperature is actually observed)

Conclusion: 1) implies 4) : i.e. rising emissions implies rising temperatures

PS My friend says your gauges are OK; he's no longer a skeptic [3, p104]

*You:* “But isn't the planet already in the 'emissions game' in that, from season to season, there are big swings in the CO<sub>2</sub> level: I see it on the instantaneous-

CO2 gauge – as leaves take up CO2 in spring only to give it out later when they fall and decompose?”

*Mechanic:* “Yes. About 100 gigatonnes carbon flows annually between ground level and atmosphere [11, p58]. Out of a total atmospheric content of about 800 gigatonnes. Compared with this your fossil fuel emissions, currently at about 10 gigatonnes per orbit, might seem small: only about 1% of the total. But the cumulative effect of 250 orbits of emitting, and now at an accelerating rate, is that you've raised atmospheric carbon from the pre-industrial level of about 600 gigatonnes to 800 gigatonnes currently. So even though your *instantaneous*-CO2 gauge shows it going up and down on a seasonal basis, your *average*-CO2 gauge shows it 30 to 40 % higher than what it used to be. That is not fluctuating: it's showing a steady rise. Your impact's of planetary proportions! Well beyond the manufacturer's recommended level. Not surprising your gauge is showing a rise in average temperature, along with the CO2 rise.”

*You:* “OK, OK, OK. Damn it! What you're telling me sounds incredible. Can it be true that my emissions are having an impact of such proportions? That's unprecedented!”

*Mechanic:* “Not entirely, remember ozone.”

*You:* “Well yes, as you said, you helped me that time. It was pretty cheap – I hardly noticed it. But this time I fear it's a much bigger problem, isn't it? I dread asking you the cost to fix it. I want to be absolutely sure there's a problem before I fork out a lot of money. I don't want to be railroaded into a big expense if it's not absolutely necessary. So help me understand why the CO2 is such a problem. It's such a small part of the atmosphere. How can it cause so much trouble?”

*Mechanic:* “As I said before: CO2 traps heat, like water vapour or cloud cover at night. The effect's observable in the lab and the physics is well understood. Here's a brochure (see Box 1). Have a read of it. Talk it over with your wife. Your friends. In the meantime I'll prepare a quote (see Box 2). If you like I'll also check the gauges. In fact I'll give the job to a mechanic mate who's a bit of a skeptic – but honest. He'll try to prove your gauge is faulty, that that's the problem [3, p104].”

“Yes, it will be expensive, but I can assure you, as with the ozone problem, it will be much cheaper fixing it now than leaving it to later. I'll get an expert to help with the costing (see Stern, Box 3). It mightn't be as bad as you think. If we phase it in over many orbits you'll see the demand we create bringing the price down. Also there may be ways for you to fund it. Those passengers you mentioned with super funds: they could get their fund managers to invest some of the money in renewables (see Hewson, Box 3)?”

“Get a second opinion, if you like. But beware of misinformation [13, 15]. I'm sure it's no coincidence both your CO2 and average temperature gauges are rising together [3, p59]. But someone might say: 'No! It's just a cycle!' ”

*You:* “But isn't that possible – that it *is* a cycle? The logs say there's a cycle about every 100,000 orbits, when we orbit closer to the Sun, and both temperature and CO2 goes up. Couldn't that be happening now?”

*Mechanic:* “Not on the timescale we're seeing it, in just tens of orbits. Effects due to the cycles you're talking about come on very much more slowly [1, p107]. But yes, it's not impossible it could be *both* – emissions *and* cycles – rather than *either / or* [3, p132]. Though, in my opinion, *you* are the cause, through your emissions, of your temperature rising. However, if you're concerned, I'll get the mechanics' institute to vet my quote.”

“By the way, don't you think it's a good thing that it *is* your emissions that's the cause? If the problem really was due to a cycle – coming from the design of your planet – there wouldn't be much we could do about it. You'd be powerless to stop it. All you could do would be to try to adapt. But, if you're the cause, you can stop being the cause! And we have a fix enabling you to do that. You've just got to make up your mind to install it.”

*You:* “Well thanks for telling me that. I take it I don't have to make up my mind immediately. Could you include something on the pros and cons of acting now? And thanks for your help so far. I'm sorry to have left it so late.”

So home you go. You get a beer and sit down. As you sip you look out the window: a brilliant day. Little puffs of white cloud moving in an easterly direction. A carpet of green running down the hill to the creek flats. Courtesy

of the spring rains. The creeks were running a-banker. “The one hundred year flood!” your neighbor said. You hear a car pulling up outside. It's your wife.

*Wife:* “How did you go with the mechanic?”

*You:* “Not good. He thinks we've got a problem. He thinks we've got to abandon the current power system. Otherwise we'll get to a point where on-board conditions are unviable and we can't operate at all. We won't even be able to pass the business on to the kids.”

*Box 3. Quote. Part 2 – feasibility, cost, funding*

*Feasibility.* Diesendorf's report:

Our research at UNSW finds that we could in fact go to 100% renewable electricity within a few decades if we had the political will. We've been doing hour by hour computer simulations of the electricity system based on real hourly electricity demand measured in 2010 and real measurements of sunshine, solar energy, and wind across the region and we find we can match supply and demand with the same reliability as the existing polluting system based on fossil fuels using 100% renewable sources which are commercially available now [9(b),(c)].

*Cost.* Stern's report:

Sir Nicholas Stern suggests that global warming could shrink the global economy by 20%. But taking action now would cost just 1% of global gross domestic product [25 (e)]. The main conclusion is that the benefits of strong, early, action on climate change far outweigh the costs of not acting. According to the Stern Review, without action, the overall costs of climate change will be equivalent to losing at least 5% of global gross domestic product (GDP) each year, now and forever. Including a wider range of risks and impacts could increase this to 20% of GDP or more, also indefinitely [25 (f)].

*Funding.* Hewson's initiative:

Dr. John Hewson, through his AODP project, is urging that, if superannuation funds invested an additional 2-4% of their funds in renewables (infrastructure), we could see a turn-around [11].

*Wife:* “Well, I don't like the sound of that. Things are fine at the moment, the passengers are happy. Why have we got to make a change?”

*You:* “Because he thinks on-board conditions are going to deteriorate in a big way. Due to our exhausts coming into the cabins. I thought it was OK to do that. But he says it's not.”

*Wife:* “Well he's the expert. Can he do anything about it?”

*You:* “Yes: he has several suggestions. As far as I can see, they all involve major disruptions. Some of his options aren't yet available. So we'd run the business as is until they come on line. The ones that are available now are very expensive. He's preparing a quote but I dread to think about what I'm in for.”

*Wife:* “What does he think you should do?”

*You:* “Well he seems wedded to renewable energy. He thinks if we put this in there'll be no more problems. There's the initial cost of installation – but after that the power is free. With the other one available now – nuclear – we've got to find somewhere on board to store the waste. And we still have a fuel cost. He doesn't like the other options – what he calls CCS or geo-engineering – because they're just a bandaid and delay the inevitable.”

*Wife:* “What do you think?”

*You:* “Well I'm in two minds (see Box 4). Suppose we switch to renewables and it turns out we didn't need to. We have all that needless expense. And it may wreck the economy. Bankrupt the business. But he says not switching to renewables will wreck the planet. What do you think?”

*Wife:* “If I had to choose between the planet and the economy? Well, obviously the planet comes first: without the planet you *can't have* an economy. The economy rides on the back of the planet, doesn't it? Not the other way round. We only have one planet in this solar system – one that we can live on. That comes before the economy.”

*You:* “Yeah, but how do we fund fixing the planet if the business, the economy is wrecked in the process?”

*Box 4. Quote Part 3 – acting now vs delaying (following Dessler [1, p216])*

One can think about our situation re climate change as decision making under uncertainty. If the risk is catastrophic then even if it has low probability it may be necessary to act. Consider, for example, Dick Cheney’s logic:

If there’s 1% chance that Pakistani scientists are helping al-Qaeda build or develop a nuclear weapon, we have to treat it as a certainty in terms of our response. It’s not about our analysis ... It’s about our response.

*The one percent doctrine* Wikipedia.

Apply this to climate change and ask yourself what is worse: a) to switch to renewables at great expense and find out we didn’t need to; or b) to continue “business as usual” and find out that we’re in big trouble?

Dessler reasons that if we do a) it’s not all that bad. As soon as we discover that we didn’t need to switch we can reduce our efforts – it won’t all happen overnight. It’s reversible. And we improve our energy independence if peak oil comes about [19(a)]. Whereas, if we do b) it may not be reversible: the climate scientists are telling us that the CO<sub>2</sub> stays around for centuries, there are tipping points, etc.

*Wife:* “Does it really come down to one or the other?”

*You:* “It looks like it. I’ll know more when I see his quote (see Box 3). I’ll have to raise prices to pay for it. The passengers won’t like that.”

*Wife:* “What about the stewards, what do they say?”

*You:* “Nothing! I think they know there’s a problem but most of them are not letting on. They’d be afraid that if we have to institute a big change – one that they have to oversee, one that the passengers don’t like – then they would cop it at election time. So I’m going to have to persuade them that we’ve got no alternative.”

*Wife:* “But we’ve had crises in the past and had to do unpopular things. The passengers have usually come along with us”.

*You:* “Yes, but that’s been when the crisis was so in your face that no-one could deny it. Look at that magic day out there. Who’s going to believe me, or the mechanic, that the weather will get so bad as to make life on board impossible? They’ll say, or at least think: ‘Are you for real?’ I’ll try to have a talk with them – maybe they’re seeing the problem themselves. But I’d better first wait for the quote.”

*Wife:* “Yes – but don't wait too long! Would you like another beer?”

### **3. To act or not to act?**

If Earth really was a spaceship and NASA had detected a cabin gas going critical then there’d be a RED ALERT: action stations! There *is* a planetary emergency on Earth:

We are in the midst of a global sustainability emergency, evidenced by deteriorating biophysical systems and escalating financial crisis. The challenge is far greater and more urgent than acknowledged officially, and demands nothing less than an emergency response [19(c)]

Ian Dunlop, *chair of Australian Coal Association in 1987-88*

The IPCC is “95% sure global warming is caused by human emissions” (IPCC, Sept 2013); and, according to some of the commentators, it may be too late for action [2]. Yet we have no equivalent to a NASA style response for the Earth as a whole. Although we’ve known about global warming for at least three decades and although there have been actions by local governments and the UN to try to head it off our actions have so far been ineffective and our global emissions are actually increasing, rapidly. Ironically, when NASA climate scientists speak out – raising the prospect of Earth passing tipping points to a point of no return [7] – our politicians, some at least, brand them victims of “group think” or even “frauds” [3(b)].



*Crisis management a “confidence trap”?*

Democracy's a curse  
All of the rest are worse!

Churchill

Because of a record of success at muddling through the various crises, including the two world wars, David Runciman thinks that democracy may have gotten into a state of complacency which he calls the “confidence trap” [6]. This may indeed be a trap if it leads to thinking we can crisis manage our way through climate change. But climate change is what is called an SDCR – a Slowly Developing Catastrophic Risk [18]. For by the time Nature gives us a crisis big enough to shift us it's then too late: we've passed a tipping point and things are irreversible no matter what we do [7]. David Runciman:

Some of the crises we face – particularly if there is, and I think there is (I believe the science) – a serious environmental risk over the next 100 years [then] the time lags of that are so great [that] there's nothing like it in the past. If we wait for the economic threat to get so serious that we wake up, cut through the noise, and take action there has to be a good chance that we've waited too long. And in some way that is a really serious present threat to democracy and I'm not optimistic. What we do need is a wake-up call but environmental wake-up calls are scary because something goes really badly wrong.

So we are called upon to “act now”, as Obama says; to head this off before the crisis arrives.

But this is a hard ask for a democracy: to think long-term, to be *pro-active*. According to Runciman a democracy is good at cleaning up *after* a crisis, often of its own making; less good at acting to head off a future crisis, which is what we're called upon to do in regard to climate change. Whereas autocracies, not subject to checks and balances, fare better in this respect: e.g. China taking *preemptive* action to control their population.

But for us to act preemptively in regard to climate change would mean overcoming the vested interests: not just the companies supplying fossil fuels but also our governments who tax them and you and I as well. Us who depend

on the tax for our welfare; us who through our super funds, invest in these companies – “we have met the enemy and the enemy is us!” (see Box 5).

*Box 5. Gold bars in a desert*

Open cut coal mines are progressing up the Hunter Valley [25 (h)] – turning conservatives to protestors – in parallel with the scale of firestorm severity progressing to “catastrophic” [24]. We're now at the point where Australia's emissions, including what we export, are about 5% of global emissions [21] and so – given our small population – are probably, per capita, *the* highest in the world! At the same time the carbon tax, which might have encouraged us to offset some of this, is to be axed [14]. Compare this with Scotland:

Scotland looks set for its highest ever renewables output, and could produce almost a third of its electricity from renewable sources by the end of 2011. The Scottish government said that ... the country's goal of 100 per cent green energy by 2020 is also on track ... [and] that £750m worth of renewables projects were switched on in 2011, while another £46bn worth are in the pipeline. [25 (g)]

Catching the Virgin train from Glasgow to London you'll see the wind turbines festooned along the hills!

*Mobilisation: from above or below?*

What do we want? Action!  
When do we want it? Now!

How do we get our democracies to move onto a “war footing” in regard to climate change: a crash program that would see the roll-out of climate safe sources of energy? Although our democracies are capable of delivering crash programs, and some workers are now contemplating the need for this on climate change [9 (a)], it usually only occurs during war: e.g. the Manhattan project to build the bomb. Even Kennedy's space program was launched against the backdrop of the Cold War with Sputnik supposedly the crisis that triggered it.

There is little sign at the moment that we can look to democracy for the urgency of response that the climate scientists are calling for. So it looks like it will be left to the community to amplify the voice of the climate scientists to such a level that government is able to hear it, above the voice of the vested interests [25(k)]. As happened with the demand in the USA for action on civil rights for blacks, or with stopping the bombing of Vietnam. Mobilisation from below.

### *Implicatory denial*

But would we not be shooting ourselves in the foot: to protest against inaction on climate change when the cost of action is ultimately going to come back to us? To repeat: are we not ourselves part of the vested interests opposing action? We don't want our lifestyles impacted, our economy wrecked – the Stern report notwithstanding (see Box 3). Hence denial in the community.

Similar to denial in Britain in the 1930's vis-a-vis the possibility of invasion: the prospect of a re-run of what it had just been through a decade or so earlier understandably leading the community to deny the existence of the threat?

In both cases *implicatory denial* ([3], [15]): when the consequences of accepting the facts are unacceptable better to deny the facts.

Interestingly, Britain currently, is *not* now in denial regarding climate change. According to Julian Huppert, House of Commons MP, “the debate is over”: 99% plus of the politicians see climate change as real and the need for action [17].

## **4. Wake-up! Act!**

So the logic has brought us to this point. The climate scientists tell us we're in trouble: according to Hansen [7] the “safe” upper limit of CO<sub>2</sub> is 350 ppm; whereas we're at about 400 ppm with emissions accelerating. The IPCC is 95% confident that global warming is *our* doing. The politicians know there's a problem but won't act until they're forced to. The action needed is mobilisation, similar to war. The community has to demand action of the politicians. But most of the community is in denial and won't awaken unless there's a crisis. But the climate scientists say, by then, it will be too late.

Apart from this everything's OK!

### *Waking up*

No problem is solved by the same  
consciousness that created it  
Einstein

How do we end our paralysis, break out?

The CO<sub>2</sub> clock has passed “one minute to midnight” (350 ppm) but we’ve slept on into overtime (400 ppm) despite the alarm bells – from Nature, from the climate scientists – ringing loudly. Despite knowing about climate change for at least 100 years (Arrhenius, 1896 [20]), and certainly since the 1970’s we’ve slept on. We can’t wait for a crisis to wake us so we must wake ourselves!

If the reason for our torpor is our addiction to fossil fuels and the growth economy [12(d)] then collectively we have a problem similar to the individual addict. The individual addict makes no progress until he gives up denial, acknowledges his addiction, and his powerlessness to act [12 (a)]. This is the AA approach, widely regarded as effective. To break our paralysis we may need to do likewise – “AA for the planet” [12 (c)]. Before we’re capable of deploying a technical fix we may have to engage with a “consciousness fix” [12 (b)]? Not needed for ozone but probably needed for climate change. Then things might start moving.

### *Individual and group action (“Be the change!”)*

Action Reading the books on climate change to convince yourself of the gravity of the situation.

Action Talking it over with your family and friends – are we acting, if not why not?

Action Joining or forming a group. AA style? Seeking support from your friends as you try to make some changes: taking the train rather than driving if possible, ...

*Box 6. A WAKE-UP CALL TO ACTION FOR ALL OF US*

The responsibility for action rests with all of us.

The health of our beautiful planet Earth is in OUR HANDS NOW.

The glorious bounty of fruits, grains, and forests of OUR PLANET must be safeguarded forever.

The amazing beauty of all living forms, of fish, of elephants and even, but especially, of that humble servant the honey bee, must be safeguarded FOREVER.

The time is NOW to let our governments know, in no uncertain terms, that the future is not up for grabs by the vested interests of fossil fuel corporations.

The only vested interests that count for anything are yours, mine, our grandchildren's and the sovereign right of all people, as well as all living entities, to have a future to look forward to.

Because science warns us there is no time to lose ... what must we do?

THE TIME HAS COME TO MARCH DOWN OUR HIGHWAYS AND THE STREETS OF OUR CITIES AND TOWNS AND HAMMER ON ALL DOORS OF POWER IN THIS LAND.

RENEWABLE SAFE ENERGY TECHNOLOGIES ARE PROVEN. WE WANT THESE TECHNOLOGIES ROLLED OUT NOW!

Australia is after all a democracy and we do have that right.

Action Become a climate change activist! Under 30: Australian Youth Climate Coalition <http://aycc.org.au/>; older: e.g. Ian Dunlop, an engineer and former senior international oil, gas and coal industry executive [19 (b)]).

Action Copying this pamphlet and passing it on.

Action Seeing your local member. Going in a rally.

Action Supporting John Hewson's initiative by writing to your fund trustee (see Box 3).

Action Putting up solar panels. Buying a hybrid. Etc.

*Collective action* (“*The situation is hopeless – we must take the next step!*”)

In this pamphlet we're trying to give you basic information on climate change and the real threat it poses to us, to our children, and to future generations including our grandchildren. Also a call to action (see Box 6).

## 5. Conclusion

Whatever you can do or dream you can do, begin it.  
Boldness has genius, power and magic in it!

Goethe

As the extremity of our situation dawns you may be tempted to swing from denial (if that applies to you) to despair. But what about the other possibility: of us all taking action? Why pass over that? What would be wrong with that?

If someone says: “climate change is due to a cycle” then let us say: “no, it’s due to us and that’s good; if it was due to a cycle there’d be nothing we could do about it; but if we’re the cause we can stop being the cause!”

If someone says: “the projections are uncertain so we don’t need to act” then let us say: “while ever it’s not 100% certain that the situation is irreversible it’s still worthwhile acting!”

If someone says: “it’s gone too far, we’re going to be extinct” then let us say: “we’ve never given up before – otherwise we wouldn’t be here! – and so we won’t give up now!”

Recall Churchill (see page 4). Britain, seemingly, is about to lose its army at Dunkirk, about to be invaded, and some in his war cabinet advocate “seeking terms”. Churchill resolves not to. Then comes a report from the chiefs of staff saying Britain might prevail in the air [5, p106]. Then the cracking of the enigma code. Then the entry of Russia and America ...

Until one is committed, there is hesitancy, the chance to draw back. Concerning all acts of initiative (and creation), there is one elementary truth ignorance of which kills countless ideas and splendid plans: that the moment one definitely commits oneself, then Providence moves too. All sorts of things occur to help one that would never otherwise have occurred. A whole stream of events issues from the decision, raising in one's favor all manner of unforeseen incidents and meetings and material assistance, which no man could have dreamed would have come his way. Whatever you can do, or dream you can do, begin it. Boldness has genius, power, and magic in it. Begin it now. [25(i)]

Majesty in acting. We've done it before. We can do it now [23]!

## References

[1] Andrew Dessler (2012), “Introduction to Modern Climate Change”, Cambridge University Press.

[2] Clive Hamilton (2010), “Requiem for a Species – why we resist the truth about climate change”, Allen & Unwin.

[3] (a) Anna Rose (2012), “Madlands – A Journey to Change The Mind Of A Climate Skeptic”, Melbourne University Press; video of the book at <http://annarose.net.au/video/>; (b) <http://www.smh.com.au/federal-politics/political-opinion/balance-in-the-eye-of-the-beholder-in-climate-change-debate-20120425-1xlii.html>

[4] Tim Flannery (2005), “The Weather Makers”, Text Publishing.

[5] John Lukacs (1999), “Five Days in London – May 1940”, New Haven, Yale University Press.

[6] David Runciman (2013), “The Confidence Trap”, ABC Radio National, Late Night Live <http://www.abc.net.au/radionational/programs/latenightlive/the-confidence-trap/4929732>

[7] James Hansen (2008) “Global Warming 20 Years Later – Tipping Points Near”.  
[http://www.columbia.edu/~jeh1/2008/TwentyYearsLater\\_20080623.pdf](http://www.columbia.edu/~jeh1/2008/TwentyYearsLater_20080623.pdf).

[8] Nicholas Stern (2007), Address to the Royal Economic Society,  
<http://www.guardian.co.uk/environment/2007/nov/29/climatechange.carbonemissions>

[9] Mark Diesendorf (2013); (a) ‘Is wartime mobilisation a suitable policy model for rapid national climate mitigation?’ <http://www.ceem.unsw.edu.au>; (b) <http://www.abc.net.au/radionational/programs/bigideas/clean-energy3a-will-we-ever-get-it3f/4799646>; (c) “Sustainable Energy Solutions for Climate Change”, UNSW Press.

[10] John Hewson, <http://aodproject.net/index.php/about/our-board/33-john-hewson-chair>

[11] Raymond Pierrehumbert (2010), “Principles of Planetary Climate”, Cambridge University Press.

[12] (a) Richard Rohr O.F.M. (1989) “Breathing under Water”, St Anthony Messenger Press, 2 CDs, <http://www.FranciscanMedia.org>; (b) Eckhart Tolle (2005), “A New Earth”, Michael Joseph: Penguin Books, <http://archive.org/details/EckhartTolleAndOprahWebcast-2009>; (c) Anne Wilson Schaef (1987), “When Society Becomes an Addict”, Harper Collins; (d) Clive Hamilton (2003), “Growth Fetish”, Allen & Unwin.

[13] Tobacco Institute policy of “sowing doubt”. This document can be found at: <http://legacy.library.ucsf.edu/tid/wjh13f00/pdf;jsessionid=327B30459BA2C657A2B368E944FAA27C.tobacco03> See Appendix.

[14] David Suzuki (2013), “Ditch the carbon tax at your nation’s peril, Mr. Abbott – you’re dooming future generations”, The Sydney Morning Herald, Wed, Sept 18, 2013, p22. For a simple account of how the carbon tax encourages emitters to reduce emissions see [1, p16]. How axing it will *raise* power prices see: <http://www.abc.net.au/radionational/programs/breakfast/axing-carbon-price-will-hit-power-prices/4882394>

[15] Naomi Oreskes et al (2010), “Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming”, Bloomsbury Press, New York.



- [16] Barack Obama (2013), “We need to act”,  
<http://www.bloomberg.com/news/2013-06-25/-we-need-to-act-transcript-of-obama-s-climate-change-speech.html>
- [17] Julian Huppert (2013), ABC Radio National Science Show,  
<http://www.abc.net.au/radionational/programs/scienceshow/challenges-for-the-scientific-politician/4984798>
- [18] Len Fisher (2013), “Can We Plan for Catastrophic Risks?” Occam’s Razor, ABC Radio National  
<http://www.abc.net.au/radionational/programs/ockhamsrazor/4805376>
- [19] (a) Ian Dunlop (2013), “Australia's oil vulnerability”, Big Ideas, ABC Radio National, <http://www.abc.net.au/radionational/programs/bigideas/australia27s-oil-vulnerability/4565726>; (b) <http://www.aspo-australia.org.au/general/ian-dunlop-climate-change-&-peak-oil.html> (c) <http://www.facets.org.au/ian-dunlop/>
- [20] Svante Arrhenius (1896). According to [1, p198] and [11, p60] Arrhenius thought that, at the then rate of emitting, it would take 1000 years to double CO<sub>2</sub>; but we’re almost halfway there after just 100 years!
- [21] Peter Christoff (2012), “Why Australia Must Stop Exporting Coal”, The Conversation. <http://theconversation.com/why-australia-must-stop-exporting-coal-9698>.
- [22] Ian Lowe (2005), “Living in the Hothouse – how global warming affects Australia”, Scribe Publications, Melbourne.
- [23] Stafford Beer (1973), “Designing Freedom”, Massey Lectures, 1973, <http://www.cbc.ca/ideas/massey-archives/1973/11/07/massey-lectures-1973-designing-freedom/>,  
<http://cbcmp3.appspot.com/?q=http%3A%2F%2Fwww.cbc.ca%2Fideas%2Fmassey-archives%2F1973%2F11%2F07%2Fmassey-lectures-1973-designing-freedom>; Graham Moore et al (2011), “Viable Systems Modelling for Climate Change Adaptation in the Gippsland Region”, <http://mssanz.org.au/modsim2011>
- [24] ABC RN PM (2013), “Fire deaths prompt rethink on building near bush”,  
<http://www.abc.net.au/pm/content/2013/s3875465.htm>
- [25] (a) [1, p136] or <http://news.bbc.co.uk/2/hi/science/nature/3147912.stm>; (b) [1, p136] or <http://content.time.com/time/world/article/0,8599,2008081,00.html>; (c) <http://www.theaustralian.com.au/higher-education/frank-fenner-sees-no-hope-for->

[humans/story-e6frgcjx-1225880091722](http://humans/story-e6frgcjx-1225880091722) (d) [5, p6] or <http://www.rlhymersjr.com/Articles/03-19-03GodBlessAmerica.html>; (e) [2, p52], [8], or <http://news.bbc.co.uk/go/pr/fr/-/2/hi/business/6096084.stm>; (f) [http://en.wikipedia.org/wiki/Stern\\_report](http://en.wikipedia.org/wiki/Stern_report); (g) [3, p239] or <http://www.theguardian.com/environment/2011/dec/22/scottish-renewable-electricity-record-year>; (h) <http://www.abc.net.au/radionational/programs/360/king-coal/5029506>; (i) W. H. Murray in *The Scottish Himalaya Expedition*, 1951 or <http://www.goethesociety.org/pages/quotescom.html> (j) <http://rsta.royalsocietypublishing.org/content/366/1882/4007.full> (k) <http://www.abc.net.au/radionational/programs/bigideas/reimagining-national-leadership/5631798>

## Appendix. Tobacco Institute's policy of "sowing doubt"

as the mass public, our product as doubt, our message as truth -- well stated, and our competition as the body of anti-cigarette fact that exists in the public mind.

We have chosen the mass public as our consumer for several reasons:

- This is where the misinformation about smoking and health has been focused.
- The Congress and federal agencies are already being dealt with -- and perhaps as effectively as possible -- by the Tobacco Institute.
- It is a group with little exposure to the positive side of smoking and health.
- It is the prime force in influencing Congress and federal agencies -- without public support little effort would be given to a crusade against cigarettes.

A 010117

Memo to  
R. A. P. H. M. A. H.  
Aug 21 1969

Doubt is our product since it is the best means of competing with the "body of fact" that exists in the mind of the general public. It is also the means of establishing a controversy. Within the business we recognize that a controversy exists. However, with the general public the consensus is that cigarettes are in some way harmful to the health. If we are successful in establishing a controversy at the public level, then there is an opportunity to put across the real facts about smoking and health. Doubt is also the limit of our "product". Unfortunately,

**CONFIDENTIAL**

680559702

<http://legacy.library.ucsf.edu/tid/wjh13f00/pdf>

See:

<http://legacy.library.ucsf.edu/tid/wjh13f00/pdf;jsessionid=327B30459BA2C657A2B368E944FAA27C.tobacco03>

