

**CAN HUMANITY MANAGE THE ANTHROPOCENE:
THE CHALLENGE OF CLIMATE CHANGE**

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Humanity's fabulous journey of ideological, social, economic and scientific innovation over the past two hundred years or so has taken us into the Anthropocene. The journey has carried us into a current reality for much of humanity, and an imminent opportunity for the rest, of an abundance of goods and comforts and information and experience and knowledge and health and longevity that were beyond the reach of the elites of the several thousand earlier generations of humanity.

The journey into the Anthropocene has also taken us into a place where our next steps have fateful consequences for our own civilisation and for other life on earth. One of several areas in which what we do next has fateful consequences is climate change. Management of climate change requires in high degree capacities for decisions in the national public interest within each substantial sovereign entity, and in the international public interest in relations among sovereign entities. The climate change challenge is probably the most complex of the challenges, if no more fateful than some others.

I want to introduce in the beginning a cautionary word about the place of the Anthropocene in the history of life on earth. We are not the first species with the capacity to change the earth and the possibilities for life on it. A form of life with a single cell and no brain changed the physical characteristics of the earth including its climate, and the possibilities for life on earth, more than we have yet changed them and almost certainly more than we ever will. Algae converted a carbon-rich into an oxygen-rich atmosphere. The mindless and unconstrained human emission of greenhouse gases would only partially reverse that change, fateful though that partial reversal may be for our own civilisation and for the survival of many species.

I start with this caution because I want to concede at the beginning a favourite proposition of some who contest the significance of anthropogenic climate change. There have been times on earth when the air has had much higher concentrations of carbon dioxide with much higher average temperatures than the Anthropocene seems likely to bring. But those were times long before homo sapiens emerged in the savannahs of Africa. Those were times long, long before these last dozen millennia, since the invention of agriculture set us upon our remarkable if eventually pyrrhic conquest over our natural environment.

The Anthropocene's effect on global temperature does not threaten the survival of our own species.

Anthropogenic climate change does, however, threaten the foundations of the civilisation that humans have built over these last twelve thousand and especially these past two hundred years.

The Anthropocene is unknown country. But the unknown is familiar for our curious, restless, energetic, adventurous species. The trek out of Africa around seven or so tens of millennia ago was into a great unknown. So were the steps that took us swiftly across the width and depth of habitable Eurasia and across the adjacent waters into what is now Indonesia and Australia and Papua New Guinea.

Humans had no idea of the consequences when they began to plant seeds from the best grain near settled residences a dozen millennia ago (Smith, 1995). The ultimate consequences were far from mind when some began to represent objects and ideas by symbols. They were far from mind when some humans began to feel the power that they could exert over large numbers of their fellows when they worked together for a common goal, guided by beliefs, fear, ambition, altruism and the habit of continuing things that had worked for a while. The ultimate consequences were far from mind when others, later, began to explore the natural laws joining the earth and the skies and the sea and living things.

Human history and the emergence and change of our civilisation have been a rapid and accelerating journey through the unknown.

Algae took hundreds of millions if not billions of years to work its change in the seas, the atmosphere and the earth's crust. Not so the restless big brain, the dextrous hands, the flexible vocal cords of homo sapiens. The earlier history of life on earth saw nothing like the speed of change wrought by humans in these past seventy thousand years.

The relentless change came to be shaped by the unusual co-existence within the same creature of two powerful and opposite tendencies: the tendency to altruism and the tendency to selfishness; the capacity to subjugate personal goals to those shared by a wider society, and the ambition to advance one's self above one's fellows.

Edward Wilson has recently distilled into a reflective book the wisdom from a long lifetime's work at the frontiers of biology (Wilson, 2012). His theme is that the tension between ambition and its containment by social constraints has been the mainspring of human success. Selfish ambition has driven evolution for most life on earth: the origin of species through natural selection in the struggle for life. In the whole context of life on earth, it is not humanity's selfish ambition, but our capacity to contain ambition for social purposes that is distinctive. Our acceptance of social constraints is causally important to the success of our species in building modern civilisation. Societies that had in high degree a capacity to contain private ambition for public purposes excelled in competition with others and expanded at their expense.

Wilson's conclusions are drawn from the biological sciences. There have been similarly ambitious recent attempts to discover general explanations in political science and sociology for the emergence of political order in large societies. These have drawn conclusions that have much in common with Wilson's narrative from biology (Fukuyama, 2011 is one of several attempts to tell this grand story).

The general narratives on the origin of a state that is capable of governing a large community refer to the role of religion in building ethical systems that assist in imposition of constraints on private ambition. That the constraints related mainly to people who shared the faith was of small importance when most human interaction occurred within the tribe. But in the Anthropocene, productive interactions across the whole of humanity are essential for success.

Whether they derive from religious or secular sources, the only ethical systems that will prove to be helpful will be those that are built upon conceptions of a common humanity.

Ethical systems reinforce the power of the state. In some cases, they reduce the costs of enforcing the law. In some cases they make it possible to enforce the law. To take an example from contemporary events, the recent discussion of the Greek financial problems has referred to an exceptional tendency to tax evasion. That is unlikely to be removed by state coercion alone. Compliance with the law has ethical value of its own, and the fact that an action is illegal changes citizen's perceptions of its ethical value.

Yes, Brutus said that Caesar was ambitious. But when the poor cried, Caesar wept. Ambition should be made of sterner stuff.

Thoughtful economists have grappled with these basic relationships since they began to explore systematically the reasons why the citizens of some nations were poor and of others comfortably supplied with goods and services. The basic truths were of central importance in the foundational texts of economics. Adam Smith's classic exposition on the positive role of private profit depended on explicit ethical and institutional foundations that secured the public interest (Smith, 1759 and 1776). Smith's *Wealth of Nations* told us that it is to the self interest and not the altruism of the butcher, the brewer and the baker to which we owe our daily dinner. But self interest alone will not be enough to underpin a prosperous and successful society. Smith also tells us that "people of the same trade seldom meet together, even for merriment and diversion, but the conversation ends in a conspiracy against the public interest". Imagine if they met together in a Mining Industry Council to advance their shared interests!! Smith focussed strongly on the importance of an equitable distribution of income as well as on the adequate provision of a wide range of public goods in a successful society.

As modern economists have searched for explanations for why some societies succeed economically and others fail, they have kept coming back to the importance of the balance between the ethical and institutional constraints on private ambition, and incentives for people to pursue private interests. Hirsch found explanations for deteriorating economic performance in the rich countries in the weakening of internal ethical inhibitions on pursuit of private interests (Hirsch, 1976). Jones' thought that modern economic growth emerged in Western Europe, and not in China where the technological and some other building blocks had been available much earlier, because they were living within an "optimality zone", in which the State's role in the economy is neither too large nor too small (Jones, 1988).

The outstanding feature of the changes that have emerged from the individual and collective minds of humans has been their speed, and even more, the acceleration over time of the pace of change.

We can tell the story of accelerating change in many ways.

Wilson asserts that scientific knowledge and technology double every one to two decades (Wilson, 2012, p. 27). Different measures yield different answers about the rate of growth of scientific knowledge, but doubling each decade or two is well within the plausible range. The

volume of scientific papers is said to have doubled every 15 years since 1900. One attempt to measure the growth in “information” suggests a rate of increase around 66 percent per annum in the early twenty first century (Lyman and Varian, 2003).

Economic historian Angus Maddison records a dramatic history of accelerating economic change in his Millennial Report (Maddison, 2001). In the first thousand years after the birth of Jesus Christ, the economic output of humanity increased hardly at all—by one sixth, all contributed by population growth and none from rising production per person. By contrast, world output expanded 300 times in the second millennium. Over this second one thousand years, world population increased 22 times and average output 13 fold. The expansion in the second millennium was concentrated overwhelmingly in the last two centuries. In the eight centuries to 1820, “the advance in per capita income was a slow crawl—the world average rose about 50 percent. Most of the growth went to accumulate a fourfold increase in population”. By contrast, “between 1820 and the end of the millennium, per capita income rose more than 8 times and population more than 5 fold” (Maddison, 2001).

The early twenty first century has seen continued exponential growth in economic output. The world is heading towards an addition to annual economic output in the first two decades of the third millennium that exceeds the annual increment contributed by the entire earlier history of humanity. Global economic development is on this course despite the wounding of growth in the advanced countries in the Great Crash of 2008 (Garnaut with Llewellyn Smith, 2009). Since the Great Crash, almost all of the world’s increase in output has come from the developing countries.

Modern economic growth has maintained its huge momentum in the twenty first century because the conditions that release it have now been met in much of the developing world, first of all but not only in the large Asian countries. That is wonderful news for human welfare in the period ahead, but deeply challenging for the long-term balance between human economic activity and the maintenance of the environmental conditions that underpin human civilisation.

There has been an historic change over the last half century in the division of economic expansion between output per head and population. If sustained, this will ease the task of restoring a sustainable balance between the increase in human material welfare and pressure on the environment. We now know that fertility falls reliably with growth in incomes and with the improvement in economic security and female education and self confidence and access to modern medical knowledge that accompanies it. It can be accelerated by deliberate action by the State and international community to expand access to information and contraceptive devices. The decline in fertility with economic development crosses humanity’s many cultures, and seems to be impervious to the sermons of Imams as well as Popes. Whereas population growth accounted for almost all of the increase in output through the first millennium and most through the second, and for almost two fifths in the last two decades of the second millennium, it will represent only about one fifth in the first two decades of the third millennium. If there is no great disruption of global economic development in the period

ahead, it is reasonable to expect an end for the time being of human population growth in the third quarter of this century, and then, at least for a while, a decline in population.

Modern science and technology and modern economics tell us that continued access to the manifold benefits of modern economic growth can be reconciled with stability of the natural environment. The reconciliation requires a change in the composition of production and consumption which, in turn, is built on technological change. The reconciliation in a market economy requires policy interventions to ensure that households and firms pay for the environmental costs that they would otherwise impose on others. While technically available, such interventions are immensely difficult politically. Our success in managing these difficulties will be one determinant of the success of human civilisation in the Anthropocene.

The rate of change in human beliefs and social organisation and political institutions is hard to measure, but seems to have moved at least at the pace of change in scientific knowledge and economic output.

The rate of change in governance structures and institutions has been stunning through the era of modern economic growth. Apparently immutable features of human governance have been discarded and replaced in the twinkling of history's eye. When modern economic growth emerged in Britain a quarter of a millennium ago, most of Eurasia containing most of humanity was governed by hereditary despotisms. There was no place in Eurasia or beyond in which government by the people was an idea spoken often enough to be granted the dignity of ridicule. Outside Eurasia and its significant offshore islands to the east (Japan), south (now in Indonesia and Sri Lanka) and west (Britain), there was mostly little commitment to an over-arching State with authority reaching beyond the village or the tribe.

How much and how quickly things have changed!

The differential geographic spread of modern economic growth after the Napoleonic Wars underpinned the dominance for a century or so of the strange phenomenon of imperialism, in which most of the people on earth came to be governed by the small proportion of humanity that was resident in Europe, the United States of America and Japan. The great empires governed the world with confidence and apparent security until the descent into the thirty year civil war in Europe in 1914. From the height of confidence in 1913, Empire's legitimacy was destroyed in a mere three decades.

After the peace of 1945, the global political order settled briefly into a division among liberal democratic (mostly the economically successful), Leninist and nationalist authoritarian states. The international order was dominated by two "super powers", which became the arbiters of the big issues. And then, after a few decades, the new order fell apart between 1989 and 1991. An American political scientist foolishly proclaimed the end of history (Fukuyama, 1992), in which the liberal democracy that had come to be associated with the advanced economies would stand without challenge.

The end of history ended quickly. The international and domestic policy travails of the surviving superpower interacted with the sustained rapid growth of the large Asian developing

countries in particular to change fundamentally the international economic, political and strategic balance. The international political system began to move towards a multi-polar balance, in which no important international action could be taken without the acquiescence of four large entities: China, the United States, an increasingly interdependent Europe, and India (Garnaut, 2012). In this world, the next tier of powers, with Indonesia, Japan, Russia and Brazil particularly significant, would exercise more influence than their equivalents in the bi-polar world of the Cold War. The pace of change towards the new multi-polar system was sharply accelerated by the Great Crash of 2008 (Garnaut with Llewellyn Smith, 2009).

Human history will not now stand still, any more than in 1815, or 1913, or 1945, or 1989, or 2008. Change in the political superstructure will continue to be driven by the restless advance of modern science and economic growth. The immediate challenge for humanity is to build the domestic and international political institutions and the ethical systems that can manage the great challenges of the Anthropocene.

We have no good reason now to expect in advance either success or failure in approaching this new challenge. Yet once more, our species is stepping into a great unknown.

We can be sure that there will be surprises in the period ahead.

We can be sure that established ideas, values, habits and institutions will be transformed in the journey.

We can be sure that our big brains, capacity for altruism and experienced with building order in large and complex societies will be helpful in meeting the challenges ahead.

We can be sure that finding a productive balance between public and private interests will be crucial to successful outcomes in these as in earlier challenges to humanity. We can also be sure that the right balances will have to be invented and built for the new circumstances.

The Climate Change Policy Challenge

It is good news that the science identified the anthropogenic climate change problem before its consequences had overwhelmed us, and while there was still time to avoid at least the worst of the possibilities. Just in time, as the scientific knowledge only became firm enough for confident response late in the twentieth century, and in the best of circumstances a policy response lags the scientific identification of a problem.

In my work on the two reviews of climate change policy from 2007 to 2011, I was required to form judgements as a layperson about the science that suggested substantial costs and risks from anthropogenic climate change (Garnaut 2008, 2011a). I concluded that the main propositions from the climate science had been established within confidence limits that would be sufficient to support action in other aspects of our private lives and our contributions to public policy. The main propositions are that the earth is warming, that this is to a considerable extent the consequence of emissions of “greenhouse gases” from human activity, and that the continued increase in emissions that would occur under business as usual would

increase the warming to an extent that introduced large risks of disruption to established patterns of life.

In my original Climate Change Review, I described climate change mitigation as a diabolical policy problem (Garnaut, 2008, p. xviii). I said that it is harder than any other issue of high importance that has come before the Australian polity in living memory. Climate change presents a new kind of challenge. It is uncertain in its form and extent, rather than drawn in clear lines. It is insidious, rather than (as yet) directly confrontational. It is long term rather than immediate, in both its impacts and its remedies. Any effective remedies lie beyond any act of national will, requiring international cooperation of unprecedented dimension and complexity. While an effective response to the challenge would play out over many decades, it must be put in place over the next few years.

In the Update of the Climate Change Review in 2011, I emphasised another dimension of the diabolical nature of the climate change policy problem (Garnaut, 2011a). An efficient remedy—including the introduction of a price on emissions—shifts the distribution of income away from some business interests in the short term. These interests know more clearly what they will lose, than the diffuse members of society at large know what they will gain. The losers from reform are also in a stronger position than the beneficiaries to organise and to pay for collective political action, because they are more concentrated and more easily identified. The outcome is a bias against public policy reform in the public interest. This bias is well understood from the extensive literature on trade protection in economics and political science (Olson, 1982; Garnaut and Anderson, 1987).

Mitigation action has been strongly contested in the domestic politics of all of the developed countries and many of the developing. It is no accident that effective mitigation has been most strongly contested in the three developed countries that have by far the largest emissions per person: Australia, Canada and the United States. These are, by definition, the countries in which emissions-intensive economic activities are largest and business interests in opposition to mitigation action strongest.

The mainstream science identifies most likely outcomes, as well uncertainty. The future reality may turn out to be more severe or more benign. The bad end of the probability distribution extends into the catastrophic even with moderately successful mitigation.

In other aspects of our lives and public policy, humans respond to the presence of uncertainty on matters of high importance for their welfare by paying more than its expected value for protection against bad outcomes. In our private lives, we buy insurance for our houses. In the public sphere, Governments outlay considerable amounts on Defence. The presence of uncertainty increases the case for early and strong action. Illogically, and inconsistently with expenditure on insurance and Defence, uncertainty is used by opponents of mitigation as an argument against expenditure on climate change mitigation (Garnaut, 2010).

The Challenge of Collective Decisions on Public Goods

Climate change mitigation is a global public good. The benefits from one country's mitigation flow through to all others in proportion to their vulnerability to climate change. Each country will do too little from the perspective of global welfare if it assesses only the costs and benefits of mitigation to itself. All countries will judge that the global mitigation effort is inadequate from its own point of view if each country adopts this narrow perspective in setting its own mitigation policies.

The previous paragraph describes the characteristic problem of achieving an adequate supply of public goods in both national and international spheres through collective action.

There are several ways in which the problem can be resolved to allow adequate supply of public goods in both national and international arenas.

In the national arena, the problem of adequate supply of public goods can be resolved through individuals accepting internal constraints on their behaviour—personal ethical constraints of religious or secular origin. It can be solved through individuals accepting the legal authority of a national body, whether established initially by conquest and force, or some form of agreement. Or it can be solved through agreement on issues as they arise.

In the international sphere, the problem can be solved through the threatened or actual application of military, economic and other forms of power. It can be solved through states voluntarily acting in ways that are consistent with their assessment of their fair contribution to an adequate outcome. It can be solved through individual states ceding authority to a supra-national body with coercive powers. Or they can be solved through agreement on issues as they arise.

The success in general and the wealth in particular of nations depends on the efficiency with which the collective action problem in the supply of public goods is solved. Global peace and prosperity depend on the effectiveness with which the problem is resolved among states.

The Problem of International Cooperation

Effective cooperation on climate change mitigation requires close cooperation at many levels. It requires shared understandings on the climate science. It requires agreement on an appropriate level of mitigation for the world as a whole. It requires agreement on an appropriate distribution of the mitigation burden across countries. It requires common standards and processes for measuring, recording and verifying emissions. Processes are required for enforcing commitments to agreed goals. There is a need for shared understanding on the instruments that can be used to reduce emissions—and whether international trade in offsets or emissions entitlements is among them.

The search for a basis for cooperation began in 1992. Given the scale and complexity of the agenda, the surprise to me is the extent of progress in the two decades since then. Elements of all means of securing supply of international public goods have been applied: coercion by powerful states; voluntary action; some agreed cession of authority in the Kyoto Protocol

(perhaps rendered nugatory by Canada's unilateral repudiation of its commitments in 2011); and agreement on specific issues.

A Framework Convention on Climate Change comprising all member countries of the United Nations was established to govern the international effort. Decisions were supposed to meet the impossible standard of unanimity, guaranteeing that formal progress on some matters would be slow and limited.

Early progress was made on the largest ever international cooperative effort on science under the auspices of the Intergovernmental Panel on Climate Change. Parties adopted standards for measurement of emissions on a comparable basis. At Durban in 2011 this was supported by agreement on reporting and verification of emissions. In Cancun in 2010 there was agreement on limiting greenhouse gas emissions so as to hold temperature increases above pre-industrial levels to 2 degrees Celsius. Mechanisms have been established for trade in emissions entitlements and in carbon offsets and these are working on a considerable scale after considerable learning by doing. Objectives have been defined and some progress made in establishing mechanisms for financing mitigation of and adaptation to climate change in developing countries.

One could take some comfort on the extent of progress in international cooperation if the task of reducing absolute levels of emissions to hold temperature increases to the agreed level were not both urgent and important.

The hardest part has been the allocation of emissions reductions responsibilities amongst countries. Here the challenge has been to find a way forward that works in the emerging international power structure, in which success depends on the acquiescence of all of the four major powers and is influenced as well by positions of the next tier of states.

The 1997 attempt to define a comprehensive agreement on emissions reductions by developed countries turned out to be poorly judged. Its exclusion for the time being of obligations on developing countries meant that it was politically unacceptable in the new power structure, and environmentally inadequate in the twenty first century world in which economic growth is concentrated in the developing countries. Its "top down" approach, seeking an overall agreement on what each country would contribute, could not work when the single great power lost its way in the 1990s, and is inconsistent with the emerging multi-polar power structure of the twenty first century.

After disappointment about failure to extend the "top down" agreement on emissions reductions at Copenhagen in 2009, a different approach emerged from discussions in Cancun in 2010 and Durban in 2011. Commitments to constrain emissions to 2020 would be voluntary—enforced by domestic political pressure, national laws and international peer review. More ambitious commitments would emerge over time as communities became more comfortable that mitigation could be undertaken at moderate cost, and as confidence increased in each country that others were contributing their fair shares.

The experience so far suggests that the new approach to international cooperation is supporting faster progress. All substantial economies, developed and developing, have made meaningful commitments to reduce emissions. The voluntary commitments to reduce emissions are large in Europe, and considerable in the United States, China and most other large economies. Australia's unconditional commitment, supported by both sides of partisan politics, is modest, but accompanied by bipartisan statements that it is prepared to go further in the context of strong global action.

The voluntary nature of agreements and growing confidence in the potential for low-carbon economic growth have for the time supported stronger commitments. The United States commitment at Cancun is to reduce emissions by 17 percent below 2005 levels by 2020. China's is to reduce the emissions intensity of economic activity by 40 to 45 percent between 2005 and 2020. These are big changes for the world's largest national sources of emissions. Both countries are taking major mitigation steps and on current policies have reasonable prospects of meeting their commitments. Amongst the other great powers, Europe has retained its commitment to large absolute reductions in emissions through the continuing economic stagnation. India has contributed the important commitment that its emissions per person will never exceed the falling levels of the developed countries.

Of the front line developed countries which will be highly influential to the global outcome, the United States seems to have passed its peak and put emissions on a downward path, one and a half or two decades earlier than official projections suggested only four years ago. This is being achieved through Federal and state regulation, an emissions trading scheme in some states, private harassment of coal, fiscal support for development of low-emissions technologies, and a large expansion of gas supplies to facilitate the reduction in coal use. Most recently, the Federal Environment Protection Agency has placed tight restrictions on emissions from motor vehicles and is in the process of doing the same for power generation. The proposed power generation regulations would exclude coal from new plants in the absence of effective carbon capture and storage. Many of the United States policies are contested in domestic politics, and the future path of emissions reduction will be influenced by the outcome of Federal elections late in 2012.

Australia has introduced policies that will allow it to meet its unconditional and eventually conditional targets at relatively low cost, and is approaching a peak in emissions earlier than expected a few years ago. While the goals of mitigation and the legislated Renewable Energy Target have bipartisan support, the centre-piece of the current Australian mitigation effort, emissions pricing, is politically contested.

Canada has said that it will match United States mitigation commitments; this was once thought to be a way of avoiding action, but will place future Canadian governments under considerable pressure.

If it were not for the scale and urgency of the task, humanity might take some satisfaction from the progress that has been made. Humanity is groping its way towards correction of what

Stern called the largest market failure ever known. But there is a long way to go and time is running out.

The National Policy Challenge

Australia is, at once, the developed country with the greatest vulnerability to climate change and the highest greenhouse gas emissions per person.

The costs of the world adjusting away from use of fossil fuels are especially high for Australia, with the developed world's second largest endowment per person after Norway. But once the adjustment is made, the world of low-emissions energy is even more favourable to Australia than today's fossil energy economy: we have the developed world's most valuable endowment per capita by far of low-carbon energy potential.

As Machiavelli (1532) advised the Medici princes in Florence, reform attracts the fervent opposition of interests which lose from it, and the indifference of beneficiaries. Australia's large industries producing and using fossil fuels have dominated the debate over mitigation policy. The low-emissions industries which will one day be large are not yet here to make their case.

My Climate Change Review used the output from the mainstream science to estimate the cost of climate change to Australia with several levels of global mitigation effort. I concluded that the benefits of Australia playing its proportionate part in a global effort to hold the temperature increase to 2 degrees exceeded the benefits (Garnaut, 2008).

Since then, Australia has legislated to introduce a package of mitigation policies. Companies with large emissions are required to purchase a permit for each tonne of carbon dioxide equivalent. The pricing of carbon emissions generates large amounts of revenue that are returned to the community as tax cuts and social security increases, transitional assistance for trade-exposed industries, support for investments that will reduce emissions, and some other industry support in the early years. The support for low-emissions industries can, in principle, be applied to correction of market failures that otherwise would lead to underinvestment in research, development and commercialisation of new technologies. The extent to which industry funding will be applied to these purposes will be determined by corporate boards with commercial and technical experience.

In three years time, the overall number of emissions permits will be steadily reduced, equating to a reduction of at least 12 million tonnes per annum. This is in line with the bipartisan unconditional target in the absence of global action, of reducing emissions by five percent of its 2000 levels by 2020. The legislation has established an independent body, the Climate Change Authority, to assess the extent of international action and to recommend whether greater reductions up to 25 percent are required for Australia to make a comparable effort to other countries.

In my view, the policies are well judged to allow Australia to contribute its fair share now to a global climate change mitigation effort at reasonably low cost, and to increase that contribution in an efficient way as part of an increasing global effort over time.

The carbon laws come into effect on July 1, two weeks from now.

The carbon pricing policies have been subject to fierce criticism from affected industries, by the Opposition parties in the Federal Parliament, by an activist community of fervent believers that the mainstream science is wrong, and by many in the business community and some others who believe that Australia is making a larger effort than other countries.

The negative responses have dominated print media reports of the carbon pricing discussion. This reality is closely associated with a concentration of print media within a single ownership that is unique in the developed world.

There is no doubt that when Australians are asked whether they support or oppose a carbon price, they oppose it—by 52 percent to 37 percent in favour in the Essential Research Poll in September 2011. Polls by other firms and polls by Essential Research at other times have generated similar responses. But when they have been asked what they think of carbon pricing accompanied by the return of revenue to low- and middle-income households—that is, when they are asked for their response to Australian policy as distinct from its caricature—the responses are reversed. Essential Research in September 2011 said that 50 percent supported the policy and 37 percent opposed.

The Lowy Institute's regular polling of attitudes to climate change mitigation has also focussed on responses to carbon pricing, without reference to the return of revenue to households and businesses¹.

The Lowy Institute Poll 2012 contains interesting additional detail on Australian attitudes. One third of the 63 percent who responded that they opposed the Government's carbon pricing legislation agreed that it was "not strict enough to reduce emissions". The author of the Lowy Institute paper describes the result as "intriguing" (Hanson, 2012).

The media commentary has suggested a decline in concern for climate change. I would have thought that the decline is real. However, another intriguing result from both the Essential Research and Lowy polls is a large preponderance of "more concerned" over "less concerned" responses to questions about changes in attitudes since the Australian discussion of climate change mitigation began.

In the Lowy Poll, 38 percent of respondents who said that they opposed carbon pricing agreed with the proposition that Australia should not "act before others". There is also concern that the initial carbon price in Australia will be above the current price in other countries which have adopted carbon pricing. There has been special concern for Australia doing more and

¹ As a long-time member of the Lowy Institute's Board of Directors, I share responsibility at a governance level for any imperfections in this work.

earlier than the two countries with the world's largest total emissions, China and the United States.

As the Productivity Commission explained in its report to the Australian Multi-Party Committee on Climate Change in 2011, international comparison of the costs of mitigation are immensely difficult (Productivity Commission, 2011).

Neither is it a simple matter to compare across countries the effects of mitigation policies in reducing emissions. The international community has settled on comparing effort with reference to rates of reduction in emissions in developed countries and rates of reduction in emissions intensity or reductions from "business as usual" in developing countries. By this standard, Australia's unconditional target of minus 5 percent from 2000 levels in 2020 is not excessive action.

The fixed Australian carbon price at the beginning will exceed current European levels. It is, however, below European prices in early 2011, when the level of the carbon price was the subject of consultations with business. At that time, there was strong Australian business resistance to integration of the Australian and European trading schemes. Such integration from the time of expiry of the fixed price in 2015 is now favoured by many parts of Australian business that opposed it in 2011. Integration with the European scheme would have advantages. There is no certainty that that it would generate lower prices than would otherwise prevail.

There is a tendency for the starting carbon price in Australia to be compared simply with carbon prices in other countries with an emissions trading scheme in assessing comparative mitigation effort. This does not take account of the reality that European countries apply many emissions reduction policies beyond the emissions trading scheme, that have higher costs than are imposed by the emissions trading scheme itself. Neither does it take account of the reality that other countries without explicit carbon pricing are undertaking considerable mitigation effort—albeit in ways that impose large costs in per unit of reduction of emissions (Productivity Commission, 2011).

Much of the concern about Australia's carbon price compared with others has its origins in concern for the competitiveness of trade-exposed industries. The large proportion of permits that are allocated free to trade-exposed and emissions-intensive industries reduces costs for these industries to between \$1.35 and \$8 per tonne. The cost of direct action to reduce emissions in emissions-intensive and trade-exposed industries exceeds these levels in many countries, including China.

I provided a large amount of information on comparative effort in emissions reduction as they were in mid-2011 in Update Paper 2 and the Final Report of the 2011 Garnaut Climate Change Review (Garnaut, 2011b and 2011a).

Since then, progress in other countries has exceeded my expectations as reported in 2011. Most importantly, action in China and the United States has intensified considerably. There can now be greater confidence than a year ago that the two largest emitters will meet the

mitigation targets placed before the international community in Cancun. President Barack Obama stressed the importance of meeting these commitments in his address to the Australian Parliament in November 2011.

While carbon pricing is the lowest cost means of reducing emissions, it does not currently contribute a high proportion of the mitigation effort outside Europe. There has been unexpected movement towards emissions trading schemes outside Europe over the past year. I commented last year on arrangements for emissions pricing in New Zealand, and in New York and the Northeast of the United States. Now, California and Korea have legislated to introduce carbon pricing over the past year. Two Chinese provinces and five cities have introduced pilot schemes, and the national Government has spoken of the possibility of national carbon pricing from 2015. One of the five “pilot cities”, Shenzhen, has raised with Hong Kong the development of a cross-border trading arrangement. Singapore is looking closely at the Australian example, including its return of revenue to taxpayers and support for trade-exposed industries.

The awkward voluntary “pledge and review” that was agreed in Cancun has been associated with faster progress than I anticipated in my 2011 Update paper and Final Report.

The Ethical Challenge

My own climate change reviews and the recommendations for Australian policy that emerged from them were conducted within an economic public policy framework. The analysis of the public interest had a systematic and explicit ethical basis (see Garnaut, 2010; Garnaut, 2008 Chapter 1; Garnaut 2011a, Chapter 1). However, the reviews steered clear of analysis of ethics in personal behaviour relating to emissions of greenhouse gases.

Personal ethical judgements, of course, are important to our stance on public policy, and manifested in the way we interact with the policy-making systems. In addition, the ethical concerns of many citizens in many countries are demonstrated by the choice of “green” and “sustainable” products at some financial cost to the consumer.

Voluntary actions are of some quantitative importance, although the empirical reality is that they are small compared with the requirements of an effective response to the problem. After all, law is the main mechanism used by civilised society to solve problems of market failure and efficient provision of what economists call “public goods”.

To use an analogy applied by Nicholas Stern in an address to the Australian National Press club in 2010, it would be convenient, and cheap, for a builder on one block of land to throw the waste cement and bricks and steel and wood over the fence onto a neighbour’s property. Most citizens would not do it because they would consider it to be wrong. Most of us would consider the builder who threw waste onto a neighbour’s property to be behaving badly. But to ensure a more complete imposition of the costs of waste on the person responsible for them, we support laws that impose penalties.

The personal ethical dimensions are explored systematically in a forthcoming book by Oxford University Professor of Philosophy John Broome (Broome, forthcoming 2012). Broome takes as one starting point the reality identified in the science: a small addition of greenhouse gases to the atmosphere will impose damage on others. The addition of an amount that can be calculated in relation to one individual's contribution to global emissions in a lifetime will damage some people. We do not know which people, or exactly when. But if we reduce our individual emissions by a specified amount, we will improve the value of human lives somewhere and at some time. An ethical, personal decision to undertake any activity that increases greenhouse gas emissions therefore requires us to take account of the damage that the action imposes on others.

Reflecting on Broome's argument, most people agree that it is not relevant in judging the ethical value of a decision that hurts others, that the identity of the victims is not known. We would judge people harshly if they fired gunshots from a distance, or drove a car recklessly, into a crowd of strangers. Separately, we would want the actions to be treated by the law as crimes.

Neither is it relevant that the damage may be incurred in the future. Employers who expose employees to asbestos after medical science has defined the dangers to health are judged to be acting badly. Separately, civilised societies have come to regard such actions by employers as crimes.

Increasingly, as people think through and discuss and therefore socialise the issues, more of us will come to see emissions of greenhouse gases as a personal ethical as well as a public policy issue. Investment and employment at least in excessively emissions-intensive economic activity will raise ethical issues. These changes in ethical judgements will over time influence the law.

Even if the average costs of emissions to society is covered by appropriate carbon pricing that is embodied in law, there can still be scope for personal ethical considerations to enter decisions to engage in activities that generate emissions. The Australian carbon pricing legislation, for example, provides for voluntary purchases of carbon "offsets" to be added back to Australian emissions for purposes of administering emissions reduction targets.

Many citizens are likely to be more sensitive to the personal ethics of greenhouse gas emissions if the law is seen as doing too little to reduce emissions.

Can Humanity Manage the Anthropocene?

After all of the achievements of hundreds of generations since the trek from Africa, and the magnificent change of these last two hundred years, will these early years of the Anthropocene really be the apogee of human achievement?

Let us bring together the strands for an answer to the question that is the title of this lecture.

I focus on climate change, perhaps the hardest of the challenges that must be met for the question to be answered in the affirmative.

Success on this challenge requires the emergence of more effective cooperation among all substantial states than has hitherto been practised. Success requires the extension of the human capacity for altruism beyond the tribe and the nation, to humanity. On these hard things, I think we are making progress. We have made a start on the innovation in ideas and institutions that will be necessary for effective international cooperation on climate change—a rather better start than is acknowledged both by those who want mitigation to be stronger, and those who wish it to fail.

But it is a modest start, and slow, with resistance and cross-currents. And we don't have time to be slow for much longer.

The battle goes on in every state. It is at its most fierce in the three developed countries with the largest emissions per person. In two of these, Australia and the United States, measures have been adopted to change substantially the trajectory of emissions and overall emissions are moving towards falling more or less in line with targets, despite blistering assaults from private interests. Currently, Canadian mitigation is concentrated in provincial and personal efforts and major changes at a national level would be required to reach a stated goal of matching United States emissions reductions.

The history of our species tells us not to be surprised by the unexpected. If we succeed in avoiding heavy consequences from anthropogenic climate change, it would be no more of a surprise than the establishment of democratic order in Europe after the long civil war of the twentieth century. It would be no more of a surprise than the emergence of modern economic growth through Western Europe, North America, Oceania and Japan in the decades after the end of the Napoleonic Wars. It would be no more of a surprise than the end of imperialism in a couple of decades from the middle of the twentieth century. It would be no more of a surprise than the extension of modern, internationally-oriented economic growth in the world's two most populous countries in the last quarter of the twentieth century, after a quarter century pursuing policies that were inimical to that outcome.

The outcomes in the big challenges ahead of humanity will be affected by growing awareness over time of what is at stake. They will be affected by growing realisation that modern civilisation requires new forms and degrees of international cooperation. They will be affected by clearer understanding of the costs of current excessive influence of vested private interest on public policy. They will be affected by the gradual application of ethical principles, old and new, to the new circumstances.

But neither should we be surprised if humanity fails. It might be foolish beyond any reasonable calculation for such an intelligent and successful species to fall at such a low hurdle as climate change mitigation, after its big brain has alerted it to the dangers. But no more foolish than to accept war as the way to resolve tensions among European States a century ago, when the

foreseeable consequence was the destruction of much of what was then seen as the essence of European civilisation.

Neither is it a comfort that many of what we now see as large steps forward for human civilisation emerged from periods of disorder and misery. I have already mentioned 1820 and 1945. We could go back to earlier ultimately civilising interventions by some of the great monsters of human history—of Qin Shihuang, Julius Caesar, Genghis Khan and Napoleon. Findlay and O'Rourke's ambitious recent history of international trade reveals a disturbing association of the productive expansion of the extent of the market with war over the past thousand years (Findlay and O'Rourke, 2007).

But now, facing the fateful challenges of the Anthropocene, we do not have the luxury of being able to step back from civilisation and then to advance at a later time.

Will we make enough use of our big brains; of the accumulated wisdom of our civilisation; of our capacity for cooperative action and for its extension into wider communities as the economic and technological bases of our societies expand?

Since we are talking about the raw human condition, I leave the last words to the writer who understood it best.

"Our doubts are traitors, and make us lose the good we oft might win, by fearing the attempt".

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