



Institute
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What would be a sustainable economic and finance system in the public interest?

The Frank Redington Prize

by Chris Sutton

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Introduction

Donald Wyman was head of horticulture at Harvard University's Arnold Arboretum from 1935 to 1970. Under Wyman's stewardship the Arnold Arboretum moved from the previous norm of planting trees in clusters by strict botanical sequence to planting schemes designed to create beautiful landscape views for visitors.² On his retirement he had a species of crabapple tree named after him. Even though he worked at the Arnold for 35 years much of what Wyman planned, planted and nurtured could only ever have been for the benefit of future generations of visitors. At the arboretum he created vistas he would never witness.

In 1960 Wyman wrote an article for the journal *Arnoldia* (also known as the Bulletin of Popular Information of the Arnold Arboretum) in which he passed on his advice for anyone considering starting a new arboretum in North America.³ The advice was comprehensive and went far beyond plant species selection to include consideration of the purposes for which the arboretum was being created, the personnel needed for such a project and sections on organisation, finance, publicity, mapping and education.

This essay will argue that our economic and finance systems are in need of a Wyman approach with design focused on the benefit to future generations combined with a comprehensive understanding of how such a venture might be planned.

The current system is beset by intergenerational problems

The essay question pre-supposes that all is not well with our existing economic and finance system. We would do well then to begin with some diagnosis. Of course, what is wrong with the current system is both a matter for debate and the potential for a lengthy essay of its own. Particular criticisms of the status-quo are likely to depend on individual economic, political and social leanings. Therefore, it is more constructive to seek a theme inherent in the current system that endangers sustainability and can act against significant elements of public interest, and then to offer systematic revisions that address that theme. This essay argues that the key aspect of the current system that works against sustainability and the public interest is the existence of widespread and growing intergenerational inequality.

Intergenerational unfairness or transfers of wealth can be found across many economic sectors and societal functions. They are particularly prevalent in housing and social security, are becoming more pronounced in employment, and are a major component of the climate crisis.

Climate change as an intergenerational problem

Anthropogenic climate change, the biggest challenge the world faces, is a multi-faceted intergenerational problem.⁴ The generational nature of the climate crisis touches physics, economics, finance, politics and risk management. In terms of physics, the activities that induce warming: burning fossil fuels in particular, but also deforestation, industrial processes and farming methods, emit greenhouse gases which will raise atmospheric temperatures in future years. This has been happening since James Watt's steam engine with climate-damaging activities escalating sharply. During the industrial revolution and much of the twentieth century we did not know about the consequences of these changes in energy and land use. That we continue to emit large volumes of greenhouse gases now despite strong scientific consensus on their effects is primarily due to the intergenerational nature of the economics of climate change. The benefits of extracting and then burning fossil fuels are enjoyed directly by producers and consumers today. The costs either of damage done by climate change or of necessary remedial actions will be borne by others in future

generations – spread over many countries and across centuries. Economists refer to these costs as externalities. The polluters do not pay, those who profit from selling fossil fuels do not pay, those who enjoy economic growth driven by increased energy use do not pay. Instead their children, grandchildren and great great great great grandchildren will pay. Future costs of present-day greenhouse gas emissions are not reflected in the present economic and financial system.

There is a further, more subtle intergenerational transfer going on with present policy reactions to climate change and the nature of the transition to net-zero. That is the intergenerational transfer of risk. Most recent Intergovernmental Panel on Climate Change publications have highlighted the use of a carbon budget. This is the notion that there is a certain amount of CO₂ that can be emitted in total consistent with various targets for global average temperature rises. The trajectory of decarbonization agreed at COP26 and other for a mean that meeting carbon budgets will only now be possible if as yet unproven (at scale) carbon capture technologies play a significant role. There is a risk that these technologies will not meet expectation or will only do so at higher than anticipated cost. In this way the present generation of policymakers are transferring risk to future generations even when they commit to tackling climate change.

There are many aspects to solving the climate crisis: multinational policy agreement, changing consumer behaviours, commitment of capital by asset owners and lenders, engineering solutions, and others. However, each of these require that we face up to the intergenerational nature of climate change.

Housing as an intergenerational problem

Another important intergenerational inequality that is embedded in the existing financial system relates to housing. A combination of supply-side issues, the nature of mortgage finance, demographics and taxation have caused the operation of residential housing markets to involve a considerable intergenerational transfer of wealth.⁵ People who bought freehold property in the past are sitting on (or perhaps more accurately sleeping in) sizeable unrealised capital gains. These gains are exacerbated by a shortage of supply and in particular supply not adjusting for demographic changes and geographical shifts in employment. These capital gains are realised when homeowners downsize in retirement which in turn requires the next generations of families to find mortgage finance for inflated house prices. The nature of the intergenerational wealth transfer is thereby threefold. First capital gains are realised by older homeowners at the expense of younger working families. Second those younger property buyers face higher mortgage costs as a percentage of their income than their predecessors turning the wealth transfer into a disposable income effect. Thirdly, some of the capital gains are reinvested in holiday homes or buy-to-let properties which widens the impact of the supply shortage and extends the transfer of wealth to leaseholders paying higher rents.

Social security as an intergenerational problem

Intergenerational wealth transfers are found within many social security programmes.⁶ This is most clearly the case with unfunded or pay-as-you-go national pension arrangements where older citizens are the recipients of taxes or social security contributions levied on those in employment. Whilst the demographic structure and labour markets in a country are stable these transfers will be tolerated because current taxpayers will become future beneficiaries at a comparable average value of contributions and pension. However, unexpected changes in employment opportunities will upset this equilibrium. Sudden rises in unemployment or a move from traditional employment structures to the informal economy will both increase demand for unemployment benefits and reduce the tax base for social security contributions. Note that in the current economic system with shareholder return and corporate efficiency goals determining short term employment levels, these intergenerational imbalances are more likely to occur. The growth of the informal economy is of particular concern and is becoming a feature embedded within the current economic system. Social security is therefore another area where intergenerational inequity is a weakness of the existing systems.

Data science may be creating new intergenerational problems

Intergenerational issues linked to employment may be worsened in the next few years through the growing use of data science across many sectors of the economy. To be clear what follows is not a Luddite's reaction to data science. Throughout history, technological advances have changed the nature of employment opportunities and created disruption to those working with the technology being superseded. In 1880 there were a lot of farriers and no car mechanics. In 1910 there were many switchboard operators but no mobile phone network customer service. Over the next decade a number of activities currently undertaken by people might be replaced with automated services or so-called artificial intelligence. However, the intergenerational aspects of this change are subtly different from past technological advances. That is because the new technologies rely on data collected from past and present human skilled workers to feed the very algorithms that will eventually replace them. Most skilled workers learnt from previous generations of those similarly skilled. That might have been through educational qualifications, an apprenticeship, workplace training or watching YouTube videos. With growth in data science these skills are being codified and then harvested with no compensation for those currently skilful and by organisations that have no intention of passing the knowledge on to future generations but instead will monetise the data which they obtained at very little cost. We do not generally think about it in this way, but the step change use in data science is an intergenerational issue. If we had an economic system that was built to cope with questions of intergenerational fairness, all this would be acceptable. The danger of the current system is that too many skilled occupations will not realise what they have lost to big data until it is too late.

Intergenerational problems are an inevitable consequence of the current system

How do intergenerational inequalities and the associated wealth transfers arise? Through a combination of motivation and accounting. The motives are maximisation of wealth and of efficiency for incumbents. We should not be surprised by this as these optimisations are at the heart of classical financial theories and embedded in economic practices that rely on market values. The accounting is more about what is not accounted for: costs borne later and by others as a result of that wealth or efficiency optimisation. If someone can increase the value of their assets or improve the efficiency of an operation by using resources in such a way that costs or risk are passed on to others in future years then the result is some intergenerational transfer of wealth and an inequality of treatment across generations. And in the present economic and finance system, people, companies and governments can and do all the time. Our economic and finance system has hard-coded the motivations and turned a blind-eye to the lack of accounting, thereby making intergenerational unfairness inevitable.

Sustainable and in the public interest

Having highlighted the problems of intergenerational inequity bound up with the current system, we pause to take a closer look at the characteristics of a redesigned system being sought. The essay question highlights sustainability and the public interest. These are widely used terms. But are they well understood? We look at each in turn.

A careful definition of sustainable

The adjective *sustainable* has a couple of definitions. The first, most widely used, and most readily applied to finance, relates to the ability to keep something at a certain level or rate. It is in this sense that we might talk of sustainable economic growth. However, Oxford's English dictionaries supply a second meaning of *sustainable*: 'able to be upheld or defended'. When *sustainable* is applied to environmental concerns, we would do well to consider both meanings. Sustainable practices are not only those that maintain environmental metrics at certain levels, they are also ones which can be defended. Our finance system has begun to address the first meaning through ESG investors' concerns but has given less consideration to the second meaning. The proposals in this essay will include a more complete approach to sustainability and in particular to what the presence of

intergenerational unfairness says about what could be upheld. With intergenerational issues we require practices that can be upheld with future generations.

Intergenerational problems are not sustainable

It should be self-evident that economic systems into which intergenerational unfairness is built are not sustainable. Today's wealth and efficiency relies on future generations taking on some of the costs or risks associated with the acquisition of that wealth or the enjoyment of efficiency gains. Further wealth accumulation or efficiency improvements will require increasing the cost or risk burdens on future generations. There will inevitably come a generation that is unable to bear the costs or the risks. Then both meanings of sustainable will fail: the level of wealth and the rate of efficiency improvement cannot be maintained and the means cannot be upheld. Therefore, an economic system that is sustainable needs to deal with these intergenerational issues.

Actuaries have a growing interest in sustainability

In recent years both interest and expertise in sustainability has grown within the actuarial profession. The Institute and Faculty of Actuaries own Sustainability practice Board notes, 'The social, business and financial worlds are increasingly being affected by environmental and societal risks, the likelihood of future changes and the measures taken by governments to try to deal with them. As long-term risk managers, such developments are of crucial interest to actuaries.'⁷

Defining the public interest

For something to be in the public interest it needs to support the wellbeing of the general public, of society or perhaps of some notional representative member of society. In the UK the public interest has a legal meaning, and the Attorney General has a constitutional role in both defining and safeguarding the public interest⁸ although many legal professionals would stress that the judiciary also have an important role.⁹ The Institute of Chartered Accountants in England and Wales also has a history of engaging with what implications "public interest" has for professional work. In particular the ICAEW stresses a need to evaluate it on a case-by-case basis rather than by means of a generalised definition. Their public interest framework¹⁰ explicitly links public interest considerations with professional ethics and warns that citation of public interest can be a 'smokescreen' for the advocate's own self-interest.

Intergenerational problems are not in the public interest

The relationship between intergenerational fairness and the public interest is not a straightforward one and indeed would make for an excellent philosophy dissertation. At first sight the continuation of the system that generated the intergenerational problems highlighted above seem to be very much in the interest of the current public. However, that is only true in the same sense that all-you-can-eat buffets are good for diners. It is a mistake we should only make once (but for some reason that is not the case).

Actuaries are becoming more interested in the public interest

In the last couple of years, the Institute and Faculty of Actuaries have sought more engagement with the public interest element of professional practice. Introducing his new approach to thought leadership in the profession, then IFoA President Tan Suee Chieh argued that 'As actuaries, we have an obligation to address the systemic risk underpinning our professional work. Our public interest duty requires us to respond proactively and boldly on issues that we can influence like the pandemic, the climate crisis and widening inequality.'¹¹

Who can solve intergenerational problems?

Earlier we saw that intergenerational unfairness and wealth transfers are inevitable under the present economic and finance system. What can be done to solve this? Perhaps the more pertinent question is who can act to solve this? It can be argued that the cohort of people who benefit from intergenerational inequity cannot be relied upon for a solution. Today that means the economically active, those building wealth in particular, cannot be the ones to solve intergenerational problems. The people winning with a stacked deck are not unilaterally going to ask for new cards. Therefore, to find solutions to intergenerational problems we need to look to future generations who stand to benefit from the solutions. However, the reader will notice a non-sequitur here. Only those who suffer the ill-effects of intergenerational unfairness have the necessary economic incentives to solve intergenerational problems but by the time these future generations succeed to thrones of political and economic power it will already be too late in terms of climate change and other intergenerational issues. Interestingly there is evidence that with respect to climate change schoolchildren understand this tension already. IPCC author Prof. Julia Steinberger has written about the reaction she got on returning to her high school in Geneva to give a talk on climate change science only to be confronted by this very question of who can solve the problem.¹² Therefore we need an economic and finance system that can bridge this generational divide: a system that the current generation of greenhouse gas emitters, homeowners and technology entrepreneurs can be relied on to establish; and a system that will give future generations a chance at sustainability.

The sacrifice bunt

What is required of this generation is the economic and financial equivalent of what baseball fans know as the *sacrifice bunt*. A certain Deputy Chief Medical Officer has made use of sporting analogies de rigueur in science communication during the COVID-19 pandemic.¹³ As a long-time UK-based Toronto Blue Jays baseball team fan, I am well used to puzzled looks at baseball analogies, but honestly across the pantheon of sports there is nothing quite like the sacrifice bunt.

The objective in baseball, what scores runs, is getting a batter around first, second and third base back to home plate to score before three batters are out. The most glamorous way to do that is hitting the ball out of the park, hitting a home run. Attempting to hit a home run is colloquially known as “swinging for the fences”. Economically we live in a swinging for the fences world, one that likes glamorous solutions with instant impact. However, the best teams in baseball have the ability to manufacture runs by steadily advancing a teammate that is already on first base around the other bases 90 feet at a time. The sacrifice bunt is the baseball batting opposite of a home run, no swing at all, a bat held out horizontally waiting for the 95mph ball to hit it, hoping it will dribble out a few feet in front giving the teammate enough time to advance to the next base whilst the batter knows they will be out in the process (hence the sacrifice).¹⁴ The batter who bunts is voluntarily giving up something of their own prospects in the game to advance a teammate and leaving the glory to another batter who will come up after them.

The intergenerational nature of climate change and the associated difficulty of who is able to solve the problems of externalities and warming, means that we need to transition our economic system from a “swing for the fences” to a “sacrifice bunt” approach. We need present-day actors who are prepared to forego a little of their own prospects to advance the environment so that future generations have a chance to stay in the game. The remainder of this essay will focus on what these bunts might be.

A three-part solution

The challenge in new economic and finance system design is to find ways of equipping future generations with the ability to solve intergenerational problems with which they are about to be encumbered. Three components are suggested below: a broader perspective on governance, improved ambition and content within education, and renewed hope. We will look at each of these

three in turn. In each case we explain the system transformation being suggested, we show what is required for the most important of the intergenerational challenges, climate change, and we show how actuaries can help.

1 Governance

The first proposal is a broader perspective on governance that incorporates intergenerational issues by widening the scope of governance objectives. Governance for corporations is described by Standard and Poor's as 'the distribution of rights and responsibilities among different participants in corporations, including the board of directors, managers, shareholders, and stakeholders.'¹⁵ Governance is about who makes decisions, how those decisions are made and recorded, and for whom the decisions are made. With the growth in ESG investment there is a lot being written about Governance. It would be very easy to write a three-point essay on a sustainable economic system where the third point was all about Governance. But this proposal is different. Most ESG governance literature focuses on what good governance might look like, usually by recording what bad governance has looked like, often with reference to high-profile corporate controversies. This essay does not argue for a different system of governance as much as a different ambition for governance in the face of intergenerational issues. This means a reform of governance in high-intergenerational-fairness-impact situations (such as major greenhouse gas emitters) so that the objectives of governance functions are altered to explicitly include the interest of future generations. We will expand this by reference to climate change.

What governance is required for climate change?

In the UK, the key purpose of a board of directors is 'to ensure the company's prosperity by collectively directing the company's affairs, while meeting the appropriate interests of its shareholders and relevant stakeholders'. And significantly, in terms of who 'relevant stakeholders' are, 'It is for the board to judge, on a case-by-case basis, which stakeholders it treats as 'relevant' and which of their interests it is appropriate to meet'.¹⁶ So governance is built to generate 'prosperity' for the company and leaves the company to decide (subject to law) which stakeholders are 'relevant' in that quest for prosperity. It is therefore very unlikely that the interests of future generations will be seen as 'relevant' by company boards. These standards will not lead to intergenerational fairness, they are part of the system that seeks to optimise for the present generation of shareholders. As we have already seen, with fossil fuel companies this may have disastrous affects for future generations.

A broader perspective on the role of governance would create an obligation on the board in high impact companies (such as fossil fuel extractors) to meet the interests of future generations. In the case of coal, oil and gas producers meeting such an obligation would almost certainly involve leaving some of their fossil fuel reserves in the ground.

Interestingly the present system of governance in this sector has led to companies operating in a way that is precisely the opposite of the interest of future generations. Oil majors have argued publicly, including during COP26, that they need to continue to pump oil in order to generate the revenue to invest in renewable energy and other green technologies.¹⁷ This is logically, morally and macro-economically absurd. The notion is that a small set of companies need to be allowed to knowingly make the climate crisis worse for all in order to generate the revenues that they will reinvest back into new ventures that are at all times designed to generate financial returns to their own shareholders. Yet the current system of governance allows this.

How can actuaries help?

If these reforms to governance are to occur, actuaries can help in two ways: through advocacy and enabling. As trusted advisors to many asset owners, actuaries are well placed to advocate for

governance reform. Where (as in the fossil fuel example above) we seek governance output that balances the interests of different generations, techniques in actuarial mathematics will be helpful in illustrating multi-generational impacts of operational and financial decisions. Actuaries should be able to adapt equation-of-value type techniques used in long-term insurance businesses to multi-year metrics for resources and climate.

2 Education

If intergenerational problems are to be solved by the next generation, because the people who create these problems cannot be relied upon, we need to provide education that equips future generations with the skills and competencies to achieve this. This means that, at all levels of education, content needs to be forward-looking. We need to ensure that education gives both greater awareness of these intergenerational problems and builds the skills that will be needed. This re-focus of content in education needs to occur across academic disciplines, however in an essay commissioned by the actuarial profession it is natural to focus on education in mathematical sciences.

What education is required for climate change?

Climate solutions will be varied across engineering, finance and other sectors all of which will use mathematics as a foundation. Therefore, we need to ensure that future generations of mathematicians are informed and equipped with reference to climate change and its effects. A framework for this is already being developed under the banner Education for Sustainable Development.¹⁸ This seeks to link education content to the UN Goals for Sustainable Development. Throughout the mathematics syllabus there is the opportunity to embed analysis of climate change with skills in algebra, geometry, modelling and statistics all needed for the range of solutions we require. Improvements in energy efficiency, transportation, allocations of capital, flood mitigations and many other areas will require able mathematicians. There are many complex mathematical problems that need to be solved as we tackle climate change.

How can actuaries help?

The actuarial profession plays an important role in mathematical education both directly and indirectly. The Institute and Faculty of Actuaries has already recognised this in becoming a signatory to the Green Finance Education Charter.¹⁹ In its direct education impacts the profession needs to continue to integrate climate change and other sustainability applications into its own actuarial statistics and actuarial modelling examination syllabus. Indirectly, actuaries have influence over the mathematical education at schools and universities as employers of mathematicians as student actuaries. The profession should be able to work with other bodies to advocate for educational content that will help equip future generations of actuaries to contribute to the solutions we seek.

3 Hope

If intergenerational issues and the climate crisis in particular are not to overwhelm us, it is important in the present that our words and actions are marked by hope for the future.

There is a lot written about what we should think now and how we should act now, but less about incorporating genuine hope. This bridges the gap between present day decisions and future outcomes. By “hope” we do not mean the colloquial “I hope it is not going to rain this afternoon”. Real hope is something far deeper, it is a confident assurance about what is to come. It involves honesty about our present situation without losing a sense of anticipation of what is possible in the future. We often think of hope being a consequence of how we think and act now, but actually the reverse should be true. Rather than today-centric decision making, our focus on intergenerational issues means we should be led by tomorrow. What we are able to conceive for the future and for others should guide

our decision making and activities now. 'To grasp this is to gain a very different perspective from that of today, when this world easily means all'.²⁰ To effect this change, we will need a deliberate change of mindset with respect to hope.

What hope is required for climate change?

In climate analysis we have become very used to presentations with a number of future scenarios. The IPCC publish them and keep them updated, regulators ask financial institutions to model their businesses under them in stress tests, even media coverage of COP26 introduced the public to a range of climate scenarios given the commitments that governments were and were not making. However, these published scenarios and the allocation decisions that are made alongside them are divorced from those who will be most impacted by climate change. There was very visual expression of this separation at COP26 in Glasgow with delegates inside the conference hall separated from activists outside both geographically by the River Clyde and demographically with respect to age. All of our climate scenarios are presentations of how bad things might get and reach younger audiences alienated from the ability to do anything about it. We need to enrich our climate communications with genuine hope about what is possible, remembering that real hope does not sacrifice honesty about the current predicament but does seek confident assurance for the future.

How can actuaries help?

The actuarial profession is, perhaps surprisingly, well placed to support the creation of genuine hope, that confident assurance, for the future in matters of intergenerational fairness. That is because actuaries have been doing something similar, albeit quietly, for over 100 years. If we go back to the Institute of Actuaries' Royal Charter of 1884, the second object of its establishment is recorded as 'For the extension and improvement of the data and methods of the science which has its origin in the application of the doctrine of probabilities to the affairs of life, and from which life assurance annuity reversionary interest and other analogous institutions including Friendly Societies derive their principles of operation'.²¹ Life assurance companies, Friendly Societies (and other subsequent financial institutions) have continued trading on the "confident assurance" given by actuaries and actuarial mathematics. Buying and selling long-term assurance contracts requires that hope which actuaries can provide. Indeed, the best-known contribution of Frank Redington after whom the profession's call for essays on system redesign is named, is his Immunisation Theory designed so that life assurance companies and pension funds in the 1950s could better give that assurance to members in the face of changing interest rates.²² Without an intergenerational understanding of interest, mortality and reserves there would not be financially stable long-term product providers. The hope that actuaries can give in the climate crisis is a natural extension of this approach to a new set of intergenerational problems.

Conclusion

Establishing a new arboretum is an intergenerational endeavour. When Donald Wyman wrote for those who in 1960 were entertaining thoughts of doing so themselves, he was imparting 25 years of experience. He wrote of tree species and propagation and planting schemes, but he also saw that at the foundation of the project included governance, education and hope. On governance, 'a planning committee responsible for preparing definite plans associated with a campaign for raising funds should be carefully selected [with] representatives from prominent civic organizations who would represent the desire of the people to have an arboretum and the will to work for one'.²³ On education, 'the director or superintendent of the arboretum might ... work with groups for the general education of the public in better appreciation of the arboretum by residents of a community'.²⁴ The thread running through governance and education is the desire to connect the planned arboretum to the local community so that the present-day community have connection to the project from which future generations will mainly benefit. Wyman's own planting at the Arnold Arboretum was full of hope. A

scheme that prioritises views to be enjoyed by others in the future over present-day botanical order illustrates the nature of the hope that is required in the presence of intergenerational issues today. Like a new arboretum we need an economic and finance system that is well governed and financed, provides well thought-out educational resources and is grounded in genuine hope for the future.

References

- ¹ Chris Sutton FIA FHEA, Senior Lecturer in Actuarial Science, Queen Mary University of London.
- ² 'Remembering Donald Wyman' (1993) *Arnoldia*, vol.53, no.3, p.2.
- ³ Donald Wyman (1960) 'How to Establish an Arboretum or Botanical Garden', *Arnoldia*, vol.20, no.11-12, pp.69-83.
- ⁴ For a more complete treatment of the intergenerational aspects of climate change see Henry Shue (2022) *The Pivotal Generation: Why we have a moral responsibility to slow climate change right now*, Princeton
- ⁵ For a more complete treatment of the intergenerational issues in the housing market see K Henehan, M Gustafsson, N Cominetti, K Handscomb, L Judge, J Leslie & L Try, (2021) *An intergenerational audit for the UK: 2021*, Resolution Foundation.
- ⁶ IFoA COVID-19 Action Taskforce, 6th January 2021, 'Social Security systems act as a window on future COVID-19 related imbalances', <https://blog.actuaries.org.uk/blog/social-security-systems-act-window-future-covid-19-related-imbalances>
- ⁷ Institute and Faculty of Actuaries <https://www.actuaries.org.uk/practice-areas/sustainability/about-sustainability>
- ⁸ Jeremy Wright QC MP, then Attorney General, speaking at UCL Law Faculty, 9th January 2016 <https://www.gov.uk/government/speeches/the-attorney-general-on-who-should-decide-what-the-public-interest-is>
- ⁹ Policy Exchange, Judicial Power Project (2016) blog by Rebecca Elvin <https://policyexchange.org.uk/who-should-decide-who-decides-the-public-interest/>
- ¹⁰ ICAEW, 'Acting in the public interest: a framework for action', 2012, <https://www.icaew.com/technical/trust-and-ethics/ethics/the-public-interest>
- ¹¹ Tan Suee Chieh, 'Reinventing the profession: a call to action', IFoA blog, 4th February 2021, <https://blog.actuaries.org.uk/blog/reinventing-profession-call-action>
- ¹² Julia Steinberger (2022) 'The kids are not ok' blog for the Centre for the Understanding of Sustainable Prosperity <https://cusp.ac.uk/themes/s1/blog-js-the-kids-are-not-ok/>
- ¹³ Planes, trains and football games: Jonathan Van-Tam's best analogies, The Guardian, 13th January 2022, <https://www.theguardian.com/world/2022/jan/13/football-planes-and-trains-jonathan-van-tam-best-analogies>
- ¹⁴ See for example https://www.youtube.com/watch?v=Kq6JGsv7_oA
- ¹⁵ S&P Global, 'What is the G in ESG?', 24th February 2020, <https://www.spglobal.com/en/research-insights/articles/what-is-the-g-in-esg>
- ¹⁶ Institute of Directors, 'What is the role of the board?', 13th September 2021, <https://www.iod.com/resources/factsheets/company-structure/what-is-the-role-of-the-board/>
- ¹⁷ 'Oil giant Shell says it needs oil to pay for green shift', BBC News interview with Ben van Beurden, CEO Shell outside COP26, 3rd November 2021, <https://www.bbc.co.uk/news/business-59154930>
- ¹⁸ Advance HE (2021) 'Education for Sustainable Development Guidance', <https://www.advance-he.ac.uk/knowledge-hub/education-sustainable-development-guidance>
- ¹⁹ IFoA 6th August 2020, <https://www.actuaries.org.uk/news-and-insights/news/foa-signs-green-finance-education-charter>
- ²⁰ R.C. Lucas (1980) *Fullness and Freedom*, IVP, p.29.

- ²¹ The Royal Charter of Incorporation of the Institute of Actuaries, 29th July 1884, <https://www.actuaries.org.uk/system/files/field/document/Charter%2C%20Byelaws%2C%20Rules%20and%20Regulations%20%28incl.%20disciplinary%20scheme%29%20-%20last%20amended%201%20Nov%202021.pdf>
- ²² Frank Redington (1952) 'Review of the Principles of Life Office Valuations', *Journal of the Institute of Actuaries*, vol. 78, pp. 286-340.
- ²³ Donald Wyman (1960) p.75.
- ²⁴ Donald Wyman (1960) p.83.



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