

Critics of the Stern Review present both a case of bad economics and fundamentally flawed science

Bob Ward objects to the attacks made by climate sceptics on Lord Nicholas Stern's landmark analysis of the economic impact of climate change, the Stern Review, saying that their criticisms are based on shoddy economics and numerous misrepresentation of facts.



The Global Warming Policy Foundation was launched by Lord Lawson of Blaby in November 2009 to lobby against efforts to tackle climate change. Over the past three years, it has published a number of campaign pamphlets that attack individuals and organisations, such as the Royal Society and the BBC, which it perceives as the most influential communicators of mainstream knowledge and understanding about climate change.

In September 2012, the Foundation turned its attention to [the Stern Review](#), the influential report on the economics of climate change which was published in October 2006. The Review was prepared by a team at Her Majesty's Treasury, led by Nicholas Stern, now I.G. Patel Professor of Economics and Government and [Chair of the Grantham Research Institute on Climate Change and the Environment](#) at London School of Economics and Political Science (LSE).



The pamphlet, called '[What is wrong with Stern?](#)', was written by Peter Lilley, the Conservative Party Member of Parliament for Hitchin and Harpenden. In 2008, Mr Lilley was one of just five MPs, out of 646, [who voted against the Climate Change Bill](#), which introduced legal targets for reducing emissions of greenhouse gases by the UK. His main argument was that reducing emissions would be too expensive and not worthwhile.

Nearly 100 pages in length, Mr Lilley's pamphlet for the Global Warming Policy Foundation is a bitter assault against the Stern Review using a combination of misrepresentation, bad economics and fundamentally flawed science, and simply recycles erroneous allegations that were made, and debunked, six years ago.

Mr Lilley's main gripe is the following conclusion from the Stern Review:

"Using the results from formal economic models, the review estimates that if we don't act, the overall costs and risks of climate change will be equivalent to losing at least 5% of global GDP each year, now and forever."

Mr Lilley describes this finding as "simply untrue" and dismisses the impacts of climate change on the grounds that "they will be largely in the very distant future". In fact, the Stern review describes in detail [the robust methodology of its modelling](#) in Chapter 6 (of 27). It uses the PAGE2002 integrated assessment model to explore the costs of climate change impacts based on the A2 emissions scenario published by the Intergovernmental Panel on Climate Change in 2001, which projects a mean temperature rise of 3.9°C by 2100 (compared to an overall combined warming range of 1.4 to 5.8°C for the six IPCC reference scenarios). This 'baseline climate' scenario was explored through 1000 runs of the model,

yielding a mean loss in global per capita GDP of 0.2% in 2060, rising to 0.9% in 2100 and 5.3% in 2200.

But Mr Lilley gives an inaccurate description of the operation of PAGE2002: “The model is given a range of assumptions of impacts on the GDP of each geographic area for a 2.5°C rise in temperature. Thus, a 2.5°C temperature rise is deemed to reduce GDP by between 1.5% and 4%.”

Professor Chris Hope, who designed the PAGE2002 model, pointed out that [these figures in Mr Lilley’s pamphlet are wrong](#): “I have no idea where he found those figures. In the default PAGE2002 model, the actual reductions in GDP from economic losses for a 2.5°C temperature rise are between -0.1% and 1% of GDP with a median loss of 0.5%. That’s right. The default PAGE2002 model actually allows a small chance that the impacts of global warming will be positive, and Lilley overstates the median impacts in the model by a factor of four.”

The Review used the information about how global GDP would be affected by the impacts of the baseline climate scenario, taking into account the uncertainties across 1000 runs, to estimate global welfare costs. This meant converting per capita global GDP at each point in time between 2001 and 2200 into consumption, then calculating the social utility of per capita consumption, before multiplying by global population.

This calculation for each of the 1000 model runs also took into account, through a discount rate, the standard economic assumption that the extra utility produced by additional consumption falls as the level of consumption rises. In essence, this means that an extra pound is considered to be worth more to a poor person than it is to a rich person.

This assumption places greater weight on near-term consumption than on consumption in the distant future, because in most scenarios for climate change, the world will be richer in the future as a result of economic growth. However, these model runs also acknowledged that climate change could substantially reduce consumption growth in the future. Different impacts across the 1000 runs resulted in different growth rates, and required different discount rates.

This approach to discounting was emphasised throughout the Review, [particularly in Chapter 2](#), which states: “The discount rate is the rate of fall of the discount factor. There is no presumption that it is constant over time, as it depends on the way in which consumption grows over time”, and “a single constant discount rate would generally be unacceptable for dealing with the long-run, global, non-marginal impacts of climate change”.

Yet Mr Lilley ignores this and instead makes the entirely false statement that the Review “adopts an ultra-low rate without disclosing it”. This mistake is compounded in the vitriolic Foreword by Professor Richard Tol, which endorses Mr Lilley’s pamphlet and wrongly states: “The Stern Review uses a single discount rate”.

It is clear from Mr Lilley’s criticism that he favours high discount rates which would mean that even if huge damages mount over the next few centuries from unmanaged climate change, they should be treated today as being of negligible importance on the grounds that everybody will be much richer.

The Review points out that when social utility is calculated and aggregated across different possible outcomes over time, the resulting measure could most immediately be expressed in terms of expected ‘utils’. But the significance of ‘utils’ would be difficult for most people to grasp, so instead the Review applied the balanced growth equivalent, which essentially measures the utility generated by a consumption path in terms of the consumption now that, if it grew at a constant rate, would generate the same utility. Mr Lilley describes this as a “novel and misleading practice”, when in fact the [balanced growth equivalent was first described in the Journal of Economic Theory](#) in 1972 by Nicholas Stern and James Mirrlees, who was awarded the Nobel Memorial Prize for Economics in 1996.

The Review concludes from the model runs, using the balanced growth equivalent, that: “Climate change is projected to reduce average global welfare by an amount equivalent to a permanent cut in per-capita consumption of a minimum of 5%”. But it explicitly acknowledges that this is likely to be an underestimate of the costs of unmanaged climate change.

First, in each of the 1000 runs, it was assumed, as a simplification, that “the world instantaneously overcomes the problems of climate change in the year 2200 (zero damages and zero adaptation) and all runs grow at an arbitrary 1.3% into the far-off future”. Second, the Review notes that integrated assessment models do not fully incorporate all of the potential consequences that could arise from climate change, including ‘socially contingent’ impacts such as migration and conflict.

So Mr Lilley’s central criticism of the Stern Review is based on misrepresentations and bad economics. But Mr Lilley is also fundamentally mistaken in his criticisms of the presentation of the science of climate change in the Review. He claims his pamphlet “takes the IPCC assessment of the scientific literature as given”, but then contradicts it throughout. For instance Mr Lilley states that “Stern draws heavily on non-peer reviewed and alarmist literature to paint an exaggerated picture of the key risks of global warming”. He suggests that rising sea levels “is the most iconic fear aroused by global warming”, but then indicates that “the oceans are set to rise at a rate similar to the average of the last 18,000 years”.

In fact, [the IPCC Fourth Assessment Report](#), published in 2007, states: “Global sea level rose by about 120 m during the several millennia that followed the end of the last ice age (approximately 21,000 years ago), and stabilised between 3,000 and 2,000 years ago. Sea level indicators suggest that global sea level did not change significantly from then until the late 19th century. The instrumental record of modern sea level change shows evidence for onset of sea level rise during the 19th century.”

Mr Lilley also complains that “Stern highlights the number of people forecast to suffer increased water stress, although twice as many will enjoy reduced water stress”. In fact, [the IPCC Fourth Assessment Report](#) states: “Water stress is modelled to decrease by the 2050s on 20 to 29% of the global land area (considering two climate models and the SRES A2 and B2 scenarios) and to increase on 62 to 76% of the global land area... The change in the number of people under high water stress after the 2050s greatly depends on emissions scenario: substantial increase is projected for the A2 scenario; the speed of increase will be slower for the A1 and B1 emissions scenarios because of the global increase of renewable freshwater resources and the slight decrease in population.”

Hence it becomes clear why Mr Lilley dislikes the Stern Review so much: it acknowledges the risks identified by strong scientific analysis, instead of downplaying or dismissing them, and it uses robust economic methods to rigorously evaluate the potential future impacts of unmanaged climate change, rather than complacently disregarding the welfare of future generations.

The Stern Review created vigorous debate among economists when it was first published six years ago, and its contributors have subsequently published a number of peer-reviewed papers that have elaborated on the analysis, addressed criticisms and offered clarifications.

The Review remains a highly-regarded and influential document, and its reputation has been strengthened by subsequent research and analysis which have shown that the risks posed by unmanaged climate change are huge, while sensible preventative action is both affordable and attractive. Mr Lilley’s pamphlet, by contrast, offers nothing new and instead recycles flawed and feeble arguments that collapse under scrutiny, apparently the result of a confused attempt to force confounding evidence into an ideological straitjacket.

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