
EMISSIONS SCENARIOS

What are they and what do they tell us?

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In general, our society tends to plan for events in the relatively short-term - politicians think mostly about a single electoral cycle of four to five years; businesses for the most part are concerned with the annual profit margin or with short-term returns on investment; and individuals are concerned mostly about events over the coming year only occasionally raising our horizons to think perhaps about our children's' education or our retirement. Yet concern about humanity's newly discovered and inadvertent capacity to alter global climate forces governments, organisations and individuals to take a much longer-term view of the future than is conventional. Decisions that we take now, and in the few years to come, may well have profound effects for the climate inherited by our grandchildren and by generations beyond ... and thereby greatly influence the ability of such future societies to prosper.

Unfortunately, as the adage goes, "... forecasting is very difficult, especially if it is about the future". In terms of climate change, current thinking suggests that the likely range of global warming during the coming century is between 1.5 and 6°C, with a rise in average sea-level of between 20 and 90cm. Between about a third and a half of this range originates from the unknown future rather than from any deficiencies in our climate models. In what direction will global society move in the decades to come? Greater globalisation or balkanisation? Stabilising of global population or doubling to 12 billion or more? Greater consumerism or a reduction in the material intensity of our lifestyles? A prolongation of our carbon-based economy or the rapid decarbonising of energy systems? It is uncertainties about these trends that underlie an important systemic source of uncertainty about future climate predictions.

Future levels of global greenhouse gas (GHG) emissions, and by association future climate, are a product of very complex, ill-understood dynamic systems, driven by forces such as population growth, socio-economic development and technological progress. This makes long-term predictions about emissions, and therefore climate, virtually impossible. However, given that near-term policies may have profound long-term climate

impacts policy makers need a summary of what is understood about possible future GHG emissions. This is where emission and climate scenarios come in...

Scenarios are images of the future, or alternative futures. They are neither predictions nor forecasts. Rather, each scenario is one alternative image of how the future might unfold. As such they enhance our understanding of how systems behave, evolve and interact and serve to summarise both current understanding and current uncertainties. They are useful tools for scientific assessments, learning about complex systems behaviour and policymaking, and assist in climate change analysis, including climate modelling and the assessment of impacts, adaptation and mitigation.

Since 1990, the Intergovernmental Panel on Climate Change (IPCC) has published a series of assessments on climate change, expanding and refining their assessments as our understanding and knowledge-base has increased. The early IPCC scientific assessments based their climate predictions on a small number of alternative greenhouse gas emissions scenarios. In the 1990 assessment, four such scenarios were proposed - a "Business-as-Usual" case and three variants. These scenarios were rather hurriedly constructed and were designed to ensure doubling of pre-industrial carbon dioxide concentrations in the atmosphere by certain fixed dates rather than being based on any coherent underlying vision of the future. The 1996 IPCC assessment relied upon six new emissions scenarios - labelled IS92a to IS92f - each of which was associated with different assumptions about future population growth, GDP per capita and carbon intensity of energy supply. Although none of the six were proposed by the IPCC as normative, the *de facto* standard rapidly became the IS92a scenario around which a large majority of climate modelling and impacts, adaptation and policy analysis has been conducted in recent years.

The recent IPCC *Special Report on Emissions Scenarios* (SRES) - edited by Nebojša Nakicenović and Rob Swart and published in October 2000 - matures the way we think about the future and about the climate that the future will deliver to us. The 1990 and 1996 IPCC assessments, and the way in which they were used by climate modellers, were flawed for a number of reasons. This new emissions report from the IPCC has, however, done the climate change debate a great service in three main ways - by undermining the concept of the "business-as-usual" scenario, by adopting for each scenario an underlying narrative of vision of the future, and by adopting an open process of review and adjustment.



**The IPCC Special
Report on Emissions
Scenarios**

Edited by Nebojša
Nakićenović and Rob
Swart

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The SRES report clearly lays to rest the notion, still favoured by some climate modellers, of a "business-as-usual" emissions scenario, and by association therefore a "business-as-usual" climate future. As the report makes clear, "... *there is no single most likely, 'central', or 'best guess' scenario, either with respect to SRES scenarios or to the underlying literature.*" The future will not be like the past, certainly not in terms of the energy, political and cultural paths that the world takes in the decades to come. To limit our thinking, and our climate modelling, to one "preferred" future is not only the height of arrogance, it is downright dangerous. That is why Shell, and a number of other transnational corporations, routinely consider several alternative scenarios in their long-term business planning. Indeed, the SRES report benefited considerably from the intellectual input provided by one of the pioneering Shell scenario planners.

Second, the SRES emissions scenarios are founded on storyline narratives rather than on otherwise disconnected quantitative assumptions about future population growth, GDP per capita and energy intensity. Yes, these numbers are articulated for each scenario (and comprehensive tables of these and other numbers are usefully provided in the report), but each scenario holds together because of the underlying thinking about the sort of world being described. Thus the contrast between the A1 and B1 worlds stems from the different perspectives on materialism embodied in these two scenarios. They have identical populations, and both have institutions for global governance and are technologically progressive. But the difference in values between these two worlds makes a huge difference to the demand for energy and in the uptake of different energy technologies.

Consequently, the B1 world yields just over 5 billion tonnes of carbon emitted per year by 2100, compared to the A1 world with up to 30 billion tonnes – over four times current levels. The difference for climate beyond the twenty-first century of these two scenarios, although not within the scope of the SRES report to comment on, is considerable. Of course one can argue over whether our society will or will not reduce its material intensity in the decades to come, but that is the joy and essence of scenarios – they force us to think about the future we really *do* want. If we don't know where we are going, we will never get there.

The third laudable attribute of the SRES report has been the openness of the three year process which fashioned the scenarios. The core writing team of 28 experts from 12 countries was supported by six modelling teams from North America, Europe and Japan. These modelling teams provided alternative quantifications of each of the narratives, a diversity that yielded an eventual set of 40 different emissions scenarios being spawned by the four core storylines. These quantifications were in turn subject to an open review process lasting nine months whereby any research group or interested organisation were able to comment on the underlying assumptions or on the quantifications themselves.

This volume is crucial contextual reading for understanding the forthcoming Third Assessment Report of the IPCC – due summer 2001 - and it also provides the context for the next generation of vulnerability and adaptation studies on climate change now underway. It is essential reading for anyone who is researching in the area of future climate change and its implications. The report also has a wider relevance still in that it exemplifies an inclusive, systematic and structured approach to thinking about the global future of the twenty-first century. And in relation to climate change it demonstrates that the future, and therefore future climate, is not given. The next time you read or hear of a climate prediction being made for the year 2100, or beyond, make sure you seek out the underlying future worldview or narrative on which that prediction has been made. The chances are it will be represented by one of the 40 scenarios in this SRES report.

The challenge now presenting itself to climate change scientists is not simply to predict future climate – as if that were ever really achievable – but to provide society with the options and tools it needs to choose its own climate future. The latest emission and climate scenarios begin to sketch out what some of these choices are ... and their implications.

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