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Titel	Ersteller
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> The next generation of scenarios for climate change research and assessment	Moss et al.
> Titel	Mustermann

Zeigt ob PDF-Dokument vorhanden ist

Metadaten eines Eintrags bearbeiten

The next generation of scenarios for climate change research and assessment

Infos

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Titel The next generation of scenarios for climate change research and assessment

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Climate and Earth system m...

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Seite 750

As a result, an increasing number of scenarios are being developed to explore conditions consistent with...

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Energy Agency<sup>33</sup> and the Millennium Ecosystem Assessment<sup>34</sup>) or have played a substantial role in shaping the scenario development process (the Energy Modelling Forum). Overviews of scenario development in climate change research are available<sup>32,35,36</sup> (see also timeline in Fig. 1).

**Motivations for new scenarios**

Although the previous IPCC scenario development process was iterative, new scenarios and a new process are being developed.

**Box 1 | Models and frameworks**

Scenarios are generated and used within analytic frameworks in climate change research. These frameworks include models, climate models, and models that assess impacts, adaptation and vulnerability.

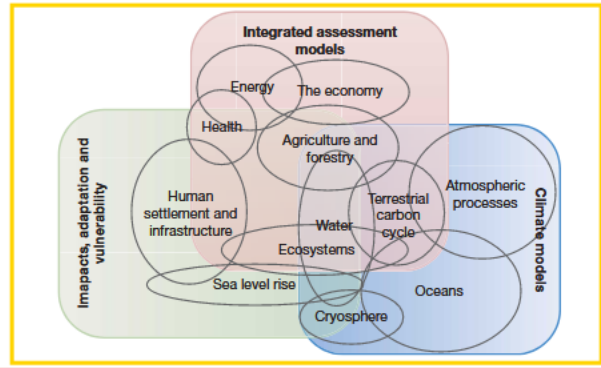
(1) Integrated assessment models represent key features of human systems, such as demography, energy use, technology, the economy, agriculture, forestry and land use. They also incorporate simplified representations of the climate system, ecosystems, and in some cases, climate impacts<sup>12</sup>. These simplified representations are calibrated against more complex climate and impact models. Because of their breadth, these models integrate information needed to study the interactions of human systems (including potential climate policies) and environmental processes that affect climate change and its impacts. Integrated assessment models typically disaggregate the world into a dozen or more regions with time steps of about a decade. Integrated assessment models are used to develop emissions scenarios, estimate the potential economic impacts of climate change and the costs and benefits of mitigation, simulate feedbacks, and evaluate uncertainties. Because they are increasingly comprehensive and include more detail about air pollutant emissions and land use, these models are increasingly important for research on the interaction of climate change with other policy objectives (such as air-pollution control and biodiversity protection).

(2) Climate models<sup>44,84</sup> are numerical representations of the Earth's natural systems used to study how climate responds to changes in natural and human-induced perturbations. There are a wide variety and complexity of climate models. Atmosphere-ocean general circulation models are the most complex physical climate models, and include components that simulate interactions of the atmosphere, ocean, land and sea ice. They divide the atmosphere and oceans into thousands of grid cells, and include interactive land-surface and biophysical processes. Regional climate models focus on subcontinental scale geographies at finer resolution. Earth system models are

increase over pre-industrial levels, as well as 'overshoot' scenarios in which radiative forcing peaks and then declines to a target level<sup>38-42</sup>. In addition, increasing attention to the impacts of climate change and the need for adaptation has spawned an interest in climate scenarios that focus on the next two to three decades with higher spatial and temporal resolution and improved representation of extreme events. Analysis of these scenarios also requires development of socioeconomic scenarios suitable for support analysis of vulnerability.

Physical climate models, and include additional ecological and biogeochemical processes, such as the land and ocean carbon cycle, vegetation and atmospheric chemistry, which respond to changes in climate simulated by the Earth system models of intermediate complexity represent many of the key systems and processes, but with simplified equations and reduced spatial resolution. These models are useful for sensitivity experiments, questions involving long timescales (hundreds to thousands of years), or when a large number of simulations are required. Simple climate models incorporate fewer detailed processes in the atmosphere-ocean system and at coarser spatial scales. They are useful for exploring key uncertainties and have been incorporated into many integrated assessment models.

(3) Assessing impacts, adaptation and vulnerability to climate change depends on a wide array of methods and tools that includes both quantitative and qualitative approaches. Prominent approaches include observations, modelling, assessment techniques that engage stakeholders in participatory processes, economic evaluation methods and decision analysis<sup>85</sup>. The models and frameworks span the range from biophysical to economic, and explore the consequences of changes in climate for climate-sensitive resources and activities, such as agriculture, water resources, human health, ecosystems and coastal infrastructure. These frameworks inform decision makers of the potential risks and opportunities presented by climate change, and provide a means of evaluating the impacts associated with different magnitudes of climate change and the comparative effectiveness of various response strategies and management options. When impact models include representations of changes in fluxes of greenhouse gases to the atmosphere from natural and managed systems, they are useful for studying climate system 'feedbacks'; for example, from forest dieback or permafrost melting. The figure depicts the domains of the three sets of models and frameworks<sup>86</sup>, and illustrates that the models increasingly are covering overlapping substantive domains, which underscores the importance of coordination and consistency in using scenarios.



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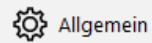
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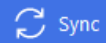
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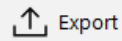
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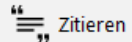
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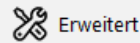
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

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