Supplementary Material

Inter-relationships between adaptation and mitigation

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This supplementary material should be cited as:
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This Supplementary Material is in support of Chapter 18. The Supplementary Material cannot and should not be read in isolation. It can only be read in association with the chapter.

Matrix of adaptation-mitigation linkages

This material was prepared by contributors from the Stockholm Environment Institute, Oxford.

Introduction

Inter-relationships between adaptation and mitigation have been identified through examples in the published literature. This Supplementary Material lists examples of linkages with full citations and an analysis of the type of linkage. The many examples have been clustered according to the type of linkage. In the main chapter, Figure 18.2 shows a sample of the linkages documented in the literature, ordered according to the entry point and scale of decision making. Table 18.1 lists all of the types of linkages documented. The categories are illustrative; some cases occur in more than one category or could shift over time or in different situations. For example, watershed planning is often related to managing climatic risks in using water but if hydroelectricity is an option, then the entry point might be mitigation, and both adaptation and mitigation might be evaluated at the same time or even with explicit trade-offs.

A wide range of linkages have been documented in the literature. Many of the examples are motivated by either mitigation or adaptation, with largely unintended consequences for the other. Most of the examples do not concern explicit trade-offs between the costs of mitigation and investment in adaptation. It appears that public decision-making is taking a precautionary view of risk and accepting responsibilities for reducing emissions based on some consideration of equity.

Table 1: This table contains the explanation of the codes and the key to the values in the matrix.

Table 2: This table is a database of examples of linkages between adaptation and mitigation. It contains the reference and short abstract for each example. It also contains a set of fields that we used to code the example. However, we have not done this consistently and the codes are for internal purposes only – they are not used in describing the linkages in the IPCC WGII Chapter 18.

Criteria for selection: We accepted any example where the authors made a connection between adaptation and mitigation, even if the linkage is indirect. We have a preference for articles published in peer-reviewed journals, but accepted any publication that meets the IPCC criteria. We sought only to cite a few cases of each example. For instance, there are hundreds of articles on rural energy use, the switch to low-carbon sources and the benefits for health, education and livelihoods – we only cite a few examples that illustrate the general case. However, some of the citations are to websites and the results of searches of the grey literature. We include this material in the matrix, but do not rely on it for the conclusions of the chapter.

References: A large Endnote library of citations also exists.
Table 1: Description of fields in matrix

<table>
<thead>
<tr>
<th>Field</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.</td>
<td>Sequential record number</td>
</tr>
<tr>
<td>Acronym</td>
<td>An internal code for sorting the cases, not consistently used in this version</td>
</tr>
<tr>
<td>CCLink</td>
<td>Who made the link to CC? How strong is the link?</td>
</tr>
<tr>
<td>Actors</td>
<td>What is the main locus of decision making?</td>
</tr>
<tr>
<td>No. Actors</td>
<td>How many actors are involved in making key decisions?</td>
</tr>
<tr>
<td>Planning</td>
<td>What is the level of planning?</td>
</tr>
<tr>
<td>Geography</td>
<td>What is the geographic scope of the link?</td>
</tr>
<tr>
<td>Timing</td>
<td>What time frame is contemplated in making the decisions?</td>
</tr>
<tr>
<td>Driver</td>
<td>What drives decisions about this link?</td>
</tr>
<tr>
<td>Framework</td>
<td>What is the dominant analytical framework used by stakeholders?</td>
</tr>
<tr>
<td>Conflict</td>
<td>Is the link part of a conflict among actors? Or is it a win-win action?</td>
</tr>
<tr>
<td>Costs</td>
<td>How expensive is the action to implement?</td>
</tr>
<tr>
<td>Nature of link</td>
<td>What types of links are there between the adaptation and mitigation aspects of the link?</td>
</tr>
<tr>
<td>Ecosystem</td>
<td>What ecosystem or environmental services are affected?</td>
</tr>
<tr>
<td>Extreme events</td>
<td>Does the link relate to extreme events?</td>
</tr>
<tr>
<td>Poverty</td>
<td>What are the distributional effects on poverty?</td>
</tr>
<tr>
<td>Multiplier/ scale</td>
<td>Are there significant multipliers or do the effects scale up?</td>
</tr>
</tbody>
</table>

### Field Definitions

- **No.**: Sequential record number
- **Acronym**: An internal code for sorting the cases, not consistently used in this version
- **CCLink**: Who made the link to CC? How strong is the link?
- **Actors**: What is the main locus of decision making?
- **No. Actors**: How many actors are involved in making key decisions?
- **Planning**: What is the level of planning?
- **Geography**: What is the geographic scope of the link?
- **Timing**: What time frame is contemplated in making the decisions?
- **Driver**: What drives decisions about this link?
- **Framework**: What is the dominant analytical framework used by stakeholders?
- **Conflict**: Is the link part of a conflict among actors? Or is it a win-win action?
- **Costs**: How expensive is the action to implement?
- **Nature of link**: What types of links are there between the adaptation and mitigation aspects of the link?
- **Ecosystem**: What ecosystem or environmental services are affected?
- **Extreme events**: Does the link relate to extreme events?
- **Poverty**: What are the distributional effects on poverty?
- **Multiplier/ scale**: Are there significant multipliers or do the effects scale up?
### Table 2: Matrix of examples of adaptation-mitigation linkages

<table>
<thead>
<tr>
<th>No.</th>
<th>Acronym</th>
<th>Title</th>
<th>Description</th>
<th>Drivers</th>
<th>Stakeholders and actors</th>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Acon</td>
<td>Air-conditioning and heatwaves</td>
<td>Increased frequency or duration of heatwaves leads to increased adoption of air-conditioning in businesses, homes and cars. The electricity requirement for air-conditioning increases greenhouse gas emissions, stimulating a cycle of toxic emissions.</td>
<td>Smith et al. 2002; Eyre, N., M. Al-Mahroos, R. Al-Ahmad, H. Al-Obaidi, 2004.</td>
<td>Multipliers could be significant</td>
<td>Long term (20 or more years)</td>
</tr>
<tr>
<td>2</td>
<td>Solr</td>
<td>Rural electrification programme with solar energy in remote region</td>
<td>In the programme of rural electrification, considerable supply of power generated by conventional methods using renewable resources is proving to be unsustainable and, in many respects, unaffordable as far as supply to rural areas, particularly remote places, is concerned. On the other hand, the decentralized approach based on a series of lower concentration of renewable resources, such as solar energy, is proving to be sustainable for various reasons, gradually being recognized as a viable alternative for such remote places. The feasibility of a decentralized solar photovoltaic (SPV) system is evident from a broad-based socio-economic and environmental point of view, as a source of power compared to that from conventional sources in a remotely located island. The study, based on a sample survey, conducted in the island of Maldives, shows the potential of decentralised electricity generation with SPV systems.</td>
<td>Chakrabarti, S. and S. Chakrabarti, 2002: Rural electrification programme with solar energy in remote region: a case study in an Island, Energy Policy, 30, 33–42.</td>
<td>National Few Win-win Social Indicators Strategic Medium cost Local Potential Multipliers could be significant</td>
<td>Long term (5-20 years)</td>
</tr>
</tbody>
</table>

### Description fields:

- **No.**: Number of example
- **Acronym**: Abbreviation for the example
- **Title**: Title of the example
- **Description**: Description of the example
- **Drivers**: Drivers of the example
- **Stakeholders and actors**: Stakeholders and actors involved in the example
- **Scale**: Scale of the example

Fearnside, P.M., 1999: Technologies for the conversion of woody biomass to fuels for heat and power generation are outlined: combustion, gasification, pyrolysis, biochar and biochemical conversion. Examples are given of current development and implementation of these technologies in Brazil. Plantations can be developed to create carbon sinks that are potentially tradable. Electricity utilities and large power consumers are being encouraged to invest in reforestation and afforestation to offset their carbon emissions. A plan to triple the commercial plantation forest estate by 2020 is currently being implemented, and would offset up to 8% of Australia’s GHG emissions during the first Kyoto commitment period (2008–12).

Chan, W.W. and J.C. Lam, 2004: Tourism development in Mallorca: is water supply a constraint? Tourism, 12, 4-28. This paper evaluates the physical and human factors that have contributed to the present water supply problems on Mallorca, with particular reference to the role of tourism in these issues. Various water management initiatives have been introduced during the last decade, although the effectiveness of these schemes for both residents and tourists remains unknown. The water supply crises on Mallorca represent a microcosm of many of the water management problems today and the lessons learned on the island may be applicable to other Mediterranean tourist destinations.

Chan, W.W. and J.C. Lam, 2000: Energy-saving, supporting tourism sustainably. A case study of hotel heating pool heat pumps. Journal of Sustainable Tourism, 11, 74 - 83. Based on energy-related measurements, this article evaluates the energy consumption, energy-saving potential, and financial feasibility of using heat pumps for hotel outdoor swimming pools in sub-tropical climates. A hotel pool of a city-centre hotel was investigated. It was found that the average coefficient of performance (COP) was around 2.1. The measured electricity consumption was 24.8 kWh and the total heat output was 44.1 kWh for the heating season studied (late October to late April). Compared with conventional electric boilers and gas-field condensing/non-condensing boilers, the total energy savings during the heating season ranged from 26.5 to 32.5 MWh. Greenhouse and noxious emissions can also be indirectly reduced by around 12,000 kg. A discounting network development in Mallorca: is water supply a constraint?

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| No. | Acronym | Title | Description | Citations | Driver | Link to CC (mitigation) | Link to CC (adaptation) | Extreme | Actors | Number | Conflict | Framework | Planning | Cost | Geography | Multiplier | Timing | Ecosystems | Poverty | Manageable | Medium cost | National | Local action only | Potential illegitimate effects | Managed resource | Neutral or ambiguous effect |
|-----|---------|-------|-------------|-----------|--------|------------------------|------------------------|---------|-------|--------|---------|-----------|----------|------|-----------|----------|-------|-----------|--------|-----------|-----------|--------|----------------|--------|----------------|----------------|-----------------|----------------|----------------|------------------|
### Table: Projects

<table>
<thead>
<tr>
<th>No.</th>
<th>Acronym</th>
<th>Title</th>
<th>Description</th>
<th>Citation</th>
<th>Driver</th>
<th>Link to CC (mitigation)</th>
<th>Link to CC (adaptation)</th>
<th>Extremes</th>
<th>Actors</th>
<th>Number</th>
<th>Conflict</th>
<th>Framework</th>
<th>Planning</th>
<th>Cost</th>
<th>Geography</th>
<th>Multiplicity</th>
<th>Timing</th>
<th>Ecosystems</th>
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<td>Local</td>
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<td>The potential role of local action and development</td>
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<tr>
<td>111</td>
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</tbody>
</table>

### Case Studies

- **Case Study 1:**
  - Title: Urban recycling and the development of sustainable local community structures.
  - Description: This case study examines the urban recycling and the development of sustainable local community structures. The study shows that urban recycling projects can have significant economic and environmental benefits.

- **Case Study 2:**
  - Title: Community forest management in Mexico: carbon mitigation and biodiversity conservation through rural development.
  - Description: This case study highlights the benefits of community forest management in Mexico, demonstrating how such projects can contribute to poverty reduction and ecosystem conservation.

### References


with the potential for global warming (IPCC, 1995); therefore the increase in the temperature of the Kiel region is well above average. This increase in temperature has led to an increase in the number of the heat islands. The causes of the UHI include urban reflectivity to solar radiation; lower surface moisture availability; lower vegetation cover; and loss of the natural land cover. Inter-relationships between adaptation and mitigation

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18 Medium-term climate change opportunities and challenges for mitigation and adaptation

19 Energy Adapt Climate change North Atlantic comparisons

20 Buildings Buildings and climate change

21 Goals Sustainable livelihoods and climate change adaptation

22 Coherence The planning response to climate change advice on better practice

23 Synergies A continuous relationship map on Global Climate and Economic Development

24 ODA Adaptation to climate change in German official development assistance

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**Table 1: Inter-relationships between adaptation and mitigation**

<table>
<thead>
<tr>
<th>No.</th>
<th>Acronym</th>
<th>Title</th>
<th>Description</th>
<th>Citation</th>
<th>Driver</th>
<th>Low to CC (mitigation)</th>
<th>Low to CC (adaptation)</th>
<th>Extirnous</th>
<th>Actors</th>
<th>Number</th>
<th>Conflict</th>
<th>Framework</th>
<th>Planning</th>
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<th>Ecosystems</th>
<th>Poverty</th>
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</thead>
<tbody>
<tr>
<td>18</td>
<td>Medium-term climate change opportunities and challenges for mitigation and adaptation</td>
<td>Medium-term climate change opportunities and challenges for mitigation and adaptation</td>
<td>Tufts University, The Clean Air Partnership</td>
<td>get climate change opportunities and challenges for mitigation and adaptation</td>
<td>Local</td>
<td>Existing network</td>
<td>Consensus</td>
<td>Policy</td>
<td>5-20 years</td>
<td>Multipliers</td>
<td>Cost-effectiveness could be significant</td>
<td>Climate change mitigation</td>
<td>Medium-term climate change</td>
<td>20 years</td>
<td>Neutral or ambiguous effect</td>
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<tr>
<td>19</td>
<td>Energy Adapt Climate change North Atlantic comparisons</td>
<td>Energy Adapt Climate change North Atlantic comparisons</td>
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<tr>
<td>20</td>
<td>Buildings Buildings and climate change</td>
<td>Buildings and climate change</td>
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<td>21</td>
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<tr>
<td>22</td>
<td>Coherence The planning response to climate change advice on better practice</td>
<td>The planning response to climate change advice on better practice</td>
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<tr>
<td>23</td>
<td>Synergies A continuous relationship map on Global Climate and Economic Development</td>
<td>A continuous relationship map on Global Climate and Economic Development</td>
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</tbody>
</table>
Climate

National Large

Social

Strategic

Low cost

National Local action

Near term Threatened --

number

conflict

consensus

only

Link

Anticipating

suggested by authors

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http://www.hhh.umn.edu/img/assets/9685/global_climate_econdvlp_report.pdf


Respondents suggested that legislation should be modified to build in climate change risk, particularly to: mitigate against specific climate impacts such as sea level rise; modify laws for construction of roads and buildings to increase their ability to withstand every day weather; create a Disaster Fund for road maintenance in anticipation of increased future flooding and thereby develop a national energy policy.

Lee County in Florida have ... avoided damage and loss to road systems, which in some cases could be repaired in a day.

http://www.tyndall.ac.uk/publications/working_papers/wp35.pdf


These measures represent a blending of ‘new’ or ‘external’ techniques with traditional knowledge in order to ensure both effective and local ownership. The results of this approach have been laudable. Reduced barren soil cover, improved soil moisture regimes, increased well water levels, biomass regeneration, and dramatic increases in fodder availability, milk production, and vegetable farming are some of the results reported by participating villages. Coupled with micro-enterprise development and an increase in savings groups, these results have translated into more secure livelihoods, diversified asset bases and reduced exposure to climate related shocks. In short, drought-prone communities have been able to make themselves less vulnerable to drought. In the face of projected increases in extreme events, this reduced vulnerability will improve their capacity to adapt to climate change.


In Andra Pradesh, India, experiments growing paddy rice with a minimum amount of water during dry years has resulted in an overall reduction of water demand by farmers. Traditionally, no crops are grown in the irrigation tank command areas before the tanks are half-full of water, which usually happens by the end of August. This is in spite of the fact that enough silt moisture would be available in the command areas earlier. Experiments in 2001 demonstrated, and repeated in one area in 2002, the ability of paddy rice to grow in water depths of 30 cm, with a 40% overall reduction in water demand by farmers. Traditionally, no crops are grown in the irrigation tank command areas before the tanks are half-full of water, which usually happens by the end of August. This is in spite of the fact that enough silt moisture would be available in the command areas earlier. Experiments in 2001 demonstrated, and repeated in one area in 2002, the ability of paddy rice to grow in water depths of 30 cm, with a 40% overall reduction in water demand by farmers. Traditionally, no crops are grown in the irrigation tank command areas before the tanks are half-full of water, which usually happens by the end of August. This is in spite of the fact that enough silt moisture would be available in the command areas earlier. Experiments in 2001 demonstrated, and repeated in one area in 2002, the ability of paddy rice to grow in water depths of 30 cm, with a 40% overall reduction in water demand by farmers. Traditionally, no crops are grown in the irrigation tank command areas before the tanks are half-full of water, which usually happens by the end of August. This is in spite of the fact that enough silt moisture would be available in the command areas earlier. Experiments in 2001 demonstrated, and repeated in one area in 2002, the ability of paddy rice to grow in water depths of 30 cm, with a 40% overall reduction in water demand by farmers.


26 Water Experimenting with different approaches to water resources allocation increases yields in Andra Pradesh, India

SM.18-9
30. **Self-response: Certain change initiative**

This project focuses on the climate change component as part of the Egypt Environmental Initiatives Fund (EEIF). This project assists the Government of Egypt in reducing the growth of greenhouse gas emissions by converting 50 brick factory kilns near Cairo to natural gas technology. The project helps factory owners/managers install the new equipment and train maintenance staff. A pilot project resulted in a reduction of carbon emissions by 50 percent of carbon dioxide and 80 percent of smoke by 96 percent. Funding for the project came from CIDA’s Climate Change Initiative to support implementation of the Kyoto Accord.

31. **-self-response: Internal change and sustainable development**

Internal change and sustainable development have the potential to reduce the vulnerability of environmental systems of the 21st century. The potential impacts and mitigation of climate change need to be addressed within the context of sustainable development. Primarily, Climate Change and Sustainable Development presents a comprehensive and accessible overview of the latest state-of-the-art research and literature on the assessment of climate change. The book begins with a discussion of the IPCC. Our current knowledge of the basic science of climate change is described, before moving on to future scenarios of development within the context of climate change. Possible adaptation and mitigation measures, including cost and benefit analysis, are discussed. The book will be an invaluable textbook for researchers and policy makers involved in all aspects of climate change.

32. **Livelihoods, vulnerability and adaptation to climate change in the Morogoro region, Tanzania**

People in the Morogoro region have lived with significant climate variability in the past and are likely to face increased climate variability and changing climate in the future. Households use a wide range of strategies as a response to current climate variability. Cultivations have been expanded, crops are chosen in the light of weather expectations, and people are increasingly growing crops for market exchange where access to markets is not a constraint. Non-farm activities are also becoming important and in places already form the main source of income. However, the range of traditional adaptation strategies, such as crop diversification, terracing, crop rotation, and livestock production is being reduced due to a decline in the availability of land, good agricultural practices, and external inputs. As a result of these changes, the adaptive capacity of households is likely to be reduced.

33. **EnergyAdapt: Fuel efficient stoves project, Pakistan**

The EnergyAdapt project is a social entrepreneur project based in Pakistan. It follows the best results and effectiveness of the smokeless stove project that was established in the late 1980s. The project is being implemented in collaborative and participatory ways to ensure the sustainability and scalability of the project. It is an initiative by the Pakistan Rural Support Project (PRSP) and the United States Agency for International Development (USAID). The project aims to improve the health and well-being of women and children by reducing indoor air pollution through the use of fuel-efficient stoves. The project has been widely adopted in various parts of Pakistan, and it has been successful in reducing indoor pollution and improving the health of women and children.

34. **SilverAdapt: Small scale adaptation project, Nepal**

The SilverAdapt project is a small-scale adaptation project that aims to develop and implement climate-resilient livelihoods and ecosystems in the mountainous areas of Nepal. The project focuses on developing and implementing initiatives that can help communities adapt to the impacts of climate change. The project involves working with local communities to develop and implement initiatives that can help communities adapt to the impacts of climate change. The project is supported by the United Nations Development Programme (UNDP) and the Ministry of Agriculture and Cooperatives of Nepal.
<table>
<thead>
<tr>
<th>No.</th>
<th>Acronym</th>
<th>Title</th>
<th>Description</th>
<th>Citation</th>
<th>Driver</th>
<th>Link to CC (mitigation)</th>
<th>Link to CC (adaptation)</th>
<th>Extremes</th>
<th>Actors</th>
<th>Number</th>
<th>Conflict</th>
<th>Framework</th>
<th>Planning</th>
<th>Cost</th>
<th>Geography</th>
<th>Multiplier</th>
<th>Timing</th>
<th>Ecosystems</th>
<th>Poverty</th>
</tr>
</thead>
<tbody>
<tr>
<td>34</td>
<td>EnergyAdap</td>
<td>Sustainable energy technology development (MRTED), Egyptian</td>
<td>The project objective is to reduce greenhouse gas emissions and promote the sustainable use of wild medicinal plants through the adoption of renewable energy technology represented by the Solar Agriculture/Deforestation Tunnel (SADT). The project will provide a sustainable solution to the problem of deforestation and lack of access to clean drinking water by enabling farmers to improve the crop yields and the productivity and the quality of the products of the deforestation process; provide employment opportunities for women. Through backwash linkages with labour-intensive post-harvest activities, provide an economically sustainable local production base for the regulation of the technology; fund the capacity of local institutions in the field of renewable energy and the bulk supply of seeds; and establish an effective system to incorporate their local production technology in SADT.</td>
<td><a href="http://gef.sgp.undp.org/down">http://gef.sgp.undp.org/down</a> LOAD/SGPCaseStudiesBook.complete.pdf</td>
<td>Sustainable</td>
<td>Local</td>
<td>Small</td>
<td>network</td>
<td>Win-wt</td>
<td>Sustainable</td>
<td>development</td>
<td>Operation</td>
<td>Low cost</td>
<td>Local</td>
<td>Local action only</td>
<td>Near term</td>
<td>Unmanaged ecosystems</td>
<td>Linked to climate change mitigation and adaptation</td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>EnergyAdap</td>
<td>Sustainable energy technology development (MRTED), Egyptian</td>
<td>The project objective is to reduce greenhouse gas emissions and promote the sustainable use of wild medicinal plants through the adoption of renewable energy technology represented by the Solar Agriculture/Deforestation Tunnel (SADT). The project will provide a sustainable solution to the problem of deforestation and lack of access to clean drinking water by enabling farmers to improve the crop yields and the productivity and the quality of the products of the deforestation process; provide employment opportunities for women. Through backwash linkages with labour-intensive post-harvest activities, provide an economically sustainable local production base for the regulation of the technology; fund the capacity of local institutions in the field of renewable energy and the bulk supply of seeds; and establish an effective system to incorporate their local production technology in SADT.</td>
<td><a href="http://gef.sgp.undp.org/down">http://gef.sgp.undp.org/down</a> LOAD/SGPCaseStudiesBook.complete.pdf</td>
<td>Sustainable</td>
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<td>Small</td>
<td>network</td>
<td>Win-wt</td>
<td>Sustainable</td>
<td>development</td>
<td>Strategic</td>
<td>Medium cost</td>
<td>to implement</td>
<td>Local</td>
<td>Local action only</td>
<td>Near term</td>
<td>Unmanaged ecosystems</td>
<td>Linked to climate change mitigation and adaptation</td>
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<td>37</td>
<td>Policy</td>
<td>The role of technology development in climate change emissions reduction: the case of Finland</td>
<td>The technology programme results from a total of 27 projects from the Finnish CLIMATE technology programme. These were used to investigate the prospects of greenhouse gas mitigation technologies under Finnish conditions, including all emissions sources and all Kyoto gases. The estimated impacts of climate change on the energy system were also taken into account in the analysis. Systematic investments in technology development were found to yield substantial benefits in the long term by reducing emissions to levels well below the targets set in the National Climate Change Programme. These findings have been confirmed by other studies.</td>
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The effects of adaptation and mitigation on the impacts of sea-level rise are studied. Without either, the impacts of sea-level rise would be substantial, almost wiping out entire nations. Adaptation would reduce impacts by a factor of 10 to 100. An adaptation depends on the availability of resources for adaptation, and partly due to the increased sensitivity to wetland loss by adaptation. Without either, the impacts of sea-level rise would be substantial, almost wiping out entire nations. Adaptation would reduce impacts by a factor of 10 to 100. An adaptation depends on the availability of resources for adaptation, and partly due to the increased sensitivity to wetland loss by adaptation. Without either, the impacts of sea-level rise would be substantial, almost wiping out entire nations. Adaptation would reduce impacts by a factor of 10 to 100. An adaptation depends on the availability of resources for adaptation, and partly due to the increased sensitivity to wetland loss by adaptation. Without either, the impacts of sea-level rise would be substantial, almost wiping out entire nations. Adaptation would reduce impacts by a factor of 10 to 100. An adaptation depends on the availability of resources for adaptation, and partly due to the increased sensitivity to wetland loss by adaptation. Without either, the impacts of sea-level rise would be substantial, almost wiping out entire nations. Adaptation would reduce impacts by a factor of 10 to 100. An adaptation depends on the availability of resources for adaptation, and partly due to the increased sensitivity to wetland loss by adaptation.
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<tr>
<td>50</td>
<td>Insur</td>
<td>Climate change, insurance and the building sector: technological synergies between adaptation and mitigation</td>
<td>The more severe weather associated with climate change is likely to increase buildings insurance claims, but it is proposed that changes to mitigate climate change may also add synergistically, by introducing adaptation which makes buildings more resilient to natural disasters. There is potential for cost and material savings in using renewable energy-efficient and innovative energy as part of a strategy to make buildings more climate-resilient.</td>
<td>Mills, E., 2003: Climate change, insurance and the building sector: technological synergies between adaptation and mitigation. Building Research and Information, 31, 257-277.</td>
</tr>
<tr>
<td>54</td>
<td>Agric</td>
<td>Investigating options for attenuating methane emission from Indian rice fields</td>
<td>The development of methods and strategies to reduce the emission of methane from paddy fields is a central component of ongoing efforts to protect the Earth's atmosphere and to avert possible climate change. It appears from this investigation that there can be more than one strategy to contain methane emissions from rice fields. Since rice is the primary source of methane emission in tropical Asia, prioritising among the mitigating options may involve water management, organic amendments, fertiliser application and reduction of rice cultivation. It is always better to adopt multi-pronged strategies to contain CH$_4$ efflux from rice wetlands. Use of fermented manures with low C/N ratio, selection of low CH$_4$ emitting rice cultivars, and implementation of one or two short aeration periods before the heading stage can be effective options to minimize CH$_4$ emission from paddy fields. Among these strategies, water management, which appears to be the most cost-effective and eco-friendly way for methane mitigation, is only possible when excess water is available for reflooding after short soil drying periods and with the right timing and at the right stage. However, in tropical Asia, rice fields are flooded naturally during the monsoon rainy season and fully controlled drainage is often impossible. In such situations, water deficits during the vegetative and reproductive stages may drastically affect the rice yields. Thus, care must be taken to mitigate methane emission without affecting rice yields.</td>
<td>Singh, S.N., A. Verma and L. Tyagi, 2003: Investigating options for attenuating methane emission from Indian rice fields. Environment International, 29, 547 - 553.</td>
</tr>
<tr>
<td>51</td>
<td>Trade</td>
<td>Equitable cost-benefit analysis of climate change policies</td>
<td>The literature of welfare-maximising greenhouse gas emission reduction strategies pays remarkably little attention to equity. The first method, inspired by Kant and Rawls, maximises net present welfare, without international cooperation, as if all regions share the fate of the region most affected by climate change. Optimal emission abatement varies greatly depending on the spatial and temporal resolution; that is, the grid at which ‘maximum impact’ is defined. The second method is inspired by Varian’s no-envy. Emissions are reduced so as to equalise total costs and benefits of climate change over all countries of the world and over all time periods. Emission reductions are substantial. This method approximately preserves the inequities that would occur in a world without climate change. The third method uses non-linear aggregation of welfare (the utilitarian default is linear) in a cooperative setting. This method cannot distinguish between sources of inequity. The higher the aversion to inequity, the higher the optimal greenhouse gas emission reduction.</td>
<td>Tol, R.S.J., 2001: Equitable cost-benefit analysis of climate change policies. Ecological Economics, 36, 71-95.</td>
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### Comparative Table: Mitigation and Adaptation Strategies for Climate Change

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<th>Low in CC (adaptation)</th>
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<th>Actors</th>
<th>Number</th>
<th>Conflict</th>
<th>Framework</th>
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<th>Geography</th>
<th>Multiplier</th>
<th>Timing</th>
<th>Ecosystems</th>
<th>Poverty</th>
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<tr>
<td>10</td>
<td>EVAH</td>
<td>Energy intensity of emissions from tourism</td>
<td>European travel and tourism policy recognizes the potential contribution the domestic sector can make in reducing energy consumption. In the UK, improvements to existing dwellings are likely to play a critical role in realizing such potential. There is growing evidence that the global climate is changing. In the UK, energy efficiency improvements have a considerate impact on overall energy consumption.</td>
<td>Beccia, S. and D. Patacca, 2005: Understanding energy consumption patterns of tourist attractions and activities in New Zealand. Tourism Management, 26, 141-153.</td>
<td>Beccia, S., 2002: The impact of climate change uncertainties on the performance of energy efficiency measures applied to dwellings. Climate Change, 52, 39-52.</td>
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<tr>
<td>12</td>
<td>EVAH</td>
<td>Geoscientific intervention: Geoengineering</td>
<td>It has been suggested that climate change induced by anthropogenic CO₂ could be counteracted with geogengineering schemes designed to diminish the solar radiation incident on the Earth's surface. Though the spatial and temporal pattern of these emissions is not known, the impact of such schemes could be substantial.</td>
<td>Govindasamy, B., K. Caldeira and P.B. Duffy, 2003: Geoengineering Earth's radiation balance to mitigate climate change from a quadrupling of CO₂. Geophysical Research Letters, 30, 157-168.</td>
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56. **No.** 56  
**Acronym** Geo-eng  
**Title** The effects of iron fertilisation on carbon sequestration in the Southern Ocean  
**Description** Extreme actors: Number Conflict Framework Planning Cost Geography Multiplier Timing Ecosystems Poverty  
**Driver** Link to CC (mitigation)  
**Link to CC (adaptation)**  
**Exe**nct  
**Actors**  
**Number**  
**Conflict**  
**Framework**  
**Planning**  
**Cost**  
**Geography** Multiplier Timing Ecosystems Poverty  
**Potential large-scale effects** Medium term (5-30 years)  
**Managed resource**  
**Likely link**—assess by LAs

57. **No.** 57  
**Acronym** Water  
**Title** Do hydroelectric dams mitigate global warming? The case of Brazil’s Curua-Una Dam  
**Description** Extreme actors: Number Conflict Framework Planning Cost Geography Multiplier Timing Ecosystems Poverty  
**Citations** Fearnside, P.M., 2001: Do hydroelectric dams mitigate global warming? The case of Brazil’s Curua-Una Dam. Mitigation and Adaptation Strategies for Global Change, 10, 675-691.  
**Driver** Link to CC (mitigation)  
**Link to CC (adaptation)**  
**Exe**nct  
**Actors**  
**Number**  
**Conflict**  
**Framework**  
**Planning**  
**Cost**  
**Geography** Multiplier Timing Ecosystems Poverty  
**Potential large-scale effects** Medium term (5-30 years)  
**Managed resource**  
**Likely link**—assess by LAs

58. **No.** 58  
**Acronym** affor  
**Title** Conflicts between biodiversity and carbon sequestration programmes: economic and legal implications  
**Description** Extreme actors: Number Conflict Framework Planning Cost Geography Multiplier Timing Ecosystems Poverty  
**Driver** Link to CC (mitigation)  
**Link to CC (adaptation)**  
**Exe**nct  
**Actors**  
**Number**  
**Conflict**  
**Framework**  
**Planning**  
**Cost**  
**Geography** Multiplier Timing Ecosystems Poverty  
**Potential large-scale effects** Medium term (5-30 years)  
**Managed resource**  
**Likely link**—assess by LAs

59. **No.** 59  
**Acronym** affor  
**Title** From the mountain to the tap: how land use and water management can work for the rural poor  
**Description** Extreme actors: Number Conflict Framework Planning Cost Geography Multiplier Timing Ecosystems Poverty  
**Driver** Link to CC (mitigation)  
**Link to CC (adaptation)**  
**Exe**nct  
**Actors**  
**Number**  
**Conflict**  
**Framework**  
**Planning**  
**Cost**  
**Geography** Multiplier Timing Ecosystems Poverty  
**Potential large-scale effects** Medium term (5-30 years)  
**Managed resource**  
**Likely link**—assess by LAs

60. **No.** 60  
**Acronym** affor  
**Title** Forests and floods: drowning in fiction or thriving on facts?  
**Description** Extreme actors: Number Conflict Framework Planning Cost Geography Multiplier Timing Ecosystems Poverty  
**Driver** Link to CC (mitigation)  
**Link to CC (adaptation)**  
**Exe**nct  
**Actors**  
**Number**  
**Conflict**  
**Framework**  
**Planning**  
**Cost**  
**Geography** Multiplier Timing Ecosystems Poverty  
**Potential large-scale effects** Medium term (5-30 years)  
**Managed resource**  
**Likely link**—assess by LAs
### Inter-relationships between adaptation and mitigation

#### Supplementary Material: Chapter 18

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<td>61</td>
<td>ADP</td>
<td>Forests and hydrological services reconciling public and science perceptions</td>
<td>This paper compares and contrasts the science and public perceptions of the role of forests in relation to water quality (annual and seasonal runoff and discharge) and erosion. It is suggested that the disparity between the two perceptions needs to be addressed before we are in a position to devise and implement effective and appropriate policies and strategies for the protection of indigenous forests. Examples are given of three interactive forest hydrological research programmes. In the UK, South Africa and Paraguay. Through the involvement of stakeholder groups, often with representatives comprising both the science and public perceptions, interactive research programmes were designed not only to devise new research, but also to disseminate research findings by the stakeholders. Following the approach, a new programme of research is outlined, aimed at improving our knowledge of forested seasonal flows, which represents DFID’s contribution to the UK Year of Mountains, 2002. It is concluded that if we move towards a reconciliation of the different perceptions and to connect policy to science, there is an urgent need for new support mechanisms.</td>
<td>National</td>
<td>Multiplier</td>
<td>Short-term consensus</td>
<td>Strategic</td>
<td>--</td>
<td>National</td>
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<td>Multi-functional resource with poverty reduction</td>
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<td>62</td>
<td>CC</td>
<td>Cultural values</td>
<td>The traditional agricultural landscape of Japan known as satoyama consists of mountainous forests, rice paddies, grasslands and villages. It supports great diversity of plant and animal species, many of which are significant to the Japanese culture. The satoyama landscape is currently being rapidly converted to residential and industrial uses in order to meet expanding metropolitan areas, with the loss of many species. Only 7% of the land in the Yamanashi area remains as satoyama. City residents and other farmers have been concerned with this loss of biocultural heritage. Many local residents value the experience of participating in agricultural and conservation activities. Once they are made aware of the threat faced by the satoyama landscape, in a particularly successful programme, conservation efforts and fund-raising are linked to ‘Totoro’, an imaginary forest animal featured in a popular animated film.</td>
<td>National</td>
<td>Small</td>
<td>Social consensus</td>
<td>Strategic</td>
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<td>Local action only</td>
<td>New term</td>
<td>Managed</td>
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<td>63</td>
<td>CC</td>
<td>Resilience and the capacity to manage resilience in regional socio-ecological systems</td>
<td>The sustainability of regional development can be usefully explored through several different lenses. In situations in which uncertainties and change are key features of the ecological landscape and social organisation, critical factors for sustainability are resilience, the capacity to cope and adapt, and the conservation of sources of innovation and renewal. However, interventions in socio-ecological systems with the aim of inhibiting resilience need to be considered as distinct from interventions with the intention of promoting greater resilience. It is argued that if we draw the insights from a diverse set of case studies from around the world in which members of the Blackfoot Alliance have engaged in sustainable practice, there is potential for improved capacity to manage resilience. Three specific propositions were explored: (1) participation builds trust, and deliberation leads to the shared understanding needed to mobilise and self-organise; (2) involved and empowered communities improve the link between knowledge, action, and socio-ecological contexts in ways that allow societies to respond more adaptively at community and regional levels; (3) strategies to promote joint distributions of benefits and voluntary rules enhance the adaptive capacity of subnational groups and society as a whole. Support was found for parts of all three propositions. In exploring the sustainability of regional socio-ecological systems, we are usually faced with a set of ecosystem goods and services that interact with a collection of societal and economic goods and services. We need to ask: The resilience of what, to what? We must also ask: For whom?</td>
<td>Local</td>
<td>Indicators</td>
<td>Low cost</td>
<td>Local</td>
<td>Local action only</td>
<td>Neat term</td>
<td>Managed</td>
<td>--</td>
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<tr>
<td>64</td>
<td>CC</td>
<td>Resilience and the capacity to manage resilience in regional socio-ecological systems</td>
<td>Human adaptation remains an insufficiently studied part of the subject of climate change. This paper examines the question of human adaptation to climate change in the Canadian western Arctic. We have been tracking climate change throughout the 1980s. We analyse the adaptive capacity of this community to deal with climate change. Short-term responses to changes in boreal activities, which are identified by co-operative management. The second component is related to cultural and ecological adaptations of the Inuit and for Inuit for living in a highly variable and uncertain environment. We employ the concept of adaptive strategies. These strategies are unique to the Inuit. On a continuum in space and time. This study suggests new ways in which theory and practice can be combined by applying the concept of adaptive strategies.</td>
<td>Local</td>
<td>Local action only</td>
<td>Neat term</td>
<td>Local</td>
<td>Local action only</td>
<td>Neat term</td>
<td>Unique</td>
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**Inter-relationships between adaptation and mitigation**

- **Driver**: Link to CC (mitigation) and Link to CC (adaptation)
- **Extremes**: National, Multiplier
- **Conflict**: Short-term consensus, Strategic
- **Framework**: Planning, Cost, Geography, Multiplicity, Timing
- **Ecosystems**: National, Multi-functional resource with poverty reduction

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**Notes**

Inter-relationships between adaptation and mitigation: Supplementary Material: Chapter 18

<table>
<thead>
<tr>
<th>No.</th>
<th>Acronym</th>
<th>Title</th>
<th>Description</th>
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<th>Driver</th>
<th>Anticipated long-term climate change</th>
<th>Cost in CC (mitigation)</th>
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<th>Actions</th>
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<th>Timing</th>
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<tr>
<td>65</td>
<td>Policy</td>
<td>Linking</td>
<td>Adaptation and mitigation in Climate Change Policy</td>
<td>How people privately and collectively adapt to climate risk can affect the costs and benefits of public mitigation policy (e.g., Kyoto), an obvious point often neglected in social policy making. Herein we use the economic theory of externalities to understand the optimal mix of mitigation and adaptation strategies, in which private and collective adaptation affects the risk. This allows us to better understand the crosslink between mitigation and adaptation policies, making it possible to provide more risk reduction with less waste. Policies that are formulated without considering the crosslink can substantially undermine the effectiveness of public-sector policies and programmes because of unintended conflicts. This chapter provides the necessary theoretical and practical lessons to be learned from the literature, and identify important research questions to spur further discussion in the next round of inquiry.</td>
<td>Kane, S. and J.F. Shogren, 2000: Linking adaptation and mitigation in climate change policy.</td>
<td>Linking</td>
<td>Adaptation</td>
<td>Large number</td>
<td>Cost-benefit or cost-effectiveness</td>
<td>Policy</td>
<td>10 = Moderate</td>
<td>250-500 = Moderate effects</td>
<td>15 = Moderate</td>
<td>15 = Moderate</td>
<td>0.5 = Medium</td>
<td>15 = Moderate</td>
<td>15 = Moderate</td>
<td>0.5 = Medium</td>
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<tr>
<td>66</td>
<td>Synergies</td>
<td>Synergy of adaptation and mitigation strategies in the context of sustainable development: the case of Vietnam</td>
<td>An emerging topic in current climate policy negotiations is the political momentum for recognizing adaptation to climate change as a crucial part of a comprehensive climate policy. However, there are a number of arguments and douts raised by politicians, negotiators and environmentalists alike with regard to the nature of this political momentum. The first of all the articles in this unique position contradicts and synergizes between these two strategies and analyze the implications for developing countries and sustainable development targets. We then use Vietnam as a case study to demonstrate how to integrate mitigation and adaptation strategies that can provide additional benefits to the social and environmental quality of life in developing countries.</td>
<td>Dang, H.H., A. Michaelowa and D.D. Tuan, 2003: Synergy of adaptation and mitigation strategies in the context of sustainable development: the case of Vietnam.</td>
<td>Synergy of</td>
<td>Adaptation</td>
<td>Large number</td>
<td>Large-scale effects</td>
<td>Sustainable development</td>
<td>Policy</td>
<td>10 = Moderate</td>
<td>250-500 = Moderate effects</td>
<td>15 = Moderate</td>
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<tr>
<td>67</td>
<td>Synergies</td>
<td>Mitigation versus adaptation: the political economy of competition between climate policy strategies and the consequences for developing countries</td>
<td>So far, the dominant package of international climate policy has been mitigation, while adaptation has been in the back seat. However, with LDCs starting to push for adaptation side payments it has recently gained importance. The allocation of public funds for adaptation is an important question. In this chapter, we focus on the political economy of competition between mitigation and adaptation activities. The most outstanding difference between mitigation and adaptation is that mitigation activities contribute to global public good whereas most forms of adaptation are club goods. Technical adaptation such as building seawalls can be distinguished from social adaptation, e.g., different trade off patterns. Generally, there is a trade-off between mitigation and adaptation activities. The choice between mitigation and adaptation strategies depends on the decision-making context. While mitigation will be preferred by society with a strong climate protection industry and low mitigation costs, the evolution of adaptation is linked to the occurrence of severe weather events. The policy choice in industrialized countries faced back and forth between long-term adaptation and short-term climate change activities. In contrast, the industrialized countries entrust the adaptation need in developing countries through declining mitigation policies. Unless this adaptation is financed by industrialized countries, developing countries will be worse off than in a mitigation-only strategy.</td>
<td>Michaelowa, A., 2001: Mitigation versus adaptation: the political economy of competition between climate policy strategies and the consequences for developing countries.</td>
<td>Mitigation versus</td>
<td>Adaptation</td>
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<td>Medium term (5-20 years)</td>
<td>Sustainable development</td>
<td>Policy</td>
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<td>250-500 = Moderate effects</td>
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<td>68</td>
<td>Corporate</td>
<td>Corporate governance and climate change: making the connection</td>
<td>This report is the first comprehensive examination of how 100 of the world's largest corporations are positioning themselves to compete in a carbon-constrained world. With the launch of the Kyoto Protocol in 2005, managing greenhouse gas emissions is now routine part of doing business in key global trading markets. At the United States imposed on the international competitiveness of American industry. Greenhouse gas reductions will shift the global competitiveness of US industry.</td>
<td>Cogan, D.G., 2006: Corporate governance and climate change: making the connection.</td>
<td>Corporate governance and climate change: making the connection.</td>
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<td>Large number</td>
<td>Medium term (5-20 years)</td>
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<td>16</td>
<td>Budgets</td>
<td>Adaptation to climate change: a paper for the International Climate Change Taskforce</td>
<td>The issues this paper focuses on include: funding for adaptation policies; research and capacity building; insurance; and linkages between adaptation and development issues. It also explores how this issue might be tackled in future climate change and development negotiations, while making use of the UN’s existing mechanisms and funding. The paper offers a number of ways to enhance the ability of vulnerable countries to adapt to climate change.</td>
<td>Huq, S., 2005: Adaptation to climate change: a paper for the International Climate Change Taskforce. Institute for Public Policy Research, 20 pp.</td>
<td>Long-term climate change</td>
<td>Short-term</td>
<td>Multiplier</td>
<td>Medium-term</td>
<td>Win-win</td>
<td>Sustainable development</td>
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<td>Large-scale effects</td>
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<td>Consistent with poverty reduction</td>
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**Policy**

- Integrated strategies to reduce vulnerability and advance adaptation, mitigation and sustainable development

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<th>Actors</th>
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<td>16</td>
<td>Policy</td>
<td>Integrated strategies to reduce vulnerability and advance adaptation, mitigation and sustainable development</td>
<td>Determination of adaptive and mitigative capacities (and availability of technological options, and access to economic resources, social capital and human capital) largely overlap. Several factors underlying or related to these determinants are also climate-related, such as extreme events, population dynamics, and loss of life and impact on economic development. The paper highlights that these factors have the potential to concurrently advance adaptation, mitigation and sustainable development. These approaches range from broad measures of sustainable development forward (by developing and nurturing institutions, policies and infrastructure to stimulate economic development, technological change, human and social capital, and reducing specific barriers to sustainable development) to reducing vulnerabilities to urgent climate-sensitive risks that hinder sustainable development (e.g., hunger, malaria, water shortage, coastal flooding and threats to biodiversity) faced specifically by many developing countries. Based on these considerations, the paper identifies integrated strategies to reduce vulnerability and advance adaptation, mitigation and sustainable development.</td>
<td>Goklany, I.M., 2007: Integrated strategies to reduce vulnerability and advance adaptation, mitigation and sustainable development. Mitigation and Adaptation Strategies for Global Change, 12, 755-786.</td>
<td>Long-term climate change</td>
<td>Medium-term</td>
<td>Multiplier</td>
<td>Large-scale</td>
<td>Sustainable development</td>
<td>Strategic</td>
<td>Large-scale effects</td>
<td>Medium-term</td>
<td>Managed resources</td>
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