18

Supplementary Material

Inter-relationships between adaptation and mitigation

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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

Field							Definition
No.							Sequential record number
Acronym							An internal code for sorting the cases, not consistently used in this version
CCLink	Strong link made by authors	Link suggested by authors	Likely link-- assessment by LAs	--			Who made the link to CC? How strong is the link?
Actors	Global	National	Local	--			What is the main locus of decision making?
No. Actors	Few	Small network	Large number	--			How many actors are involved in making key decisions?
Planning	Policy	Strategic	Operational	--			What is the level of planning?
Geography	Global	National	Local	--			What is the geographic scope of the link?
Timing	Near term	Medium term (5-20 years)	Long term (20 or more years)	--			What time frame is contemplated in making the decisions?
Driver	Anticipating long-term climate change	Reacting to climate events	Part of development planning	Other social, economic or political drivers		--	What drives decisions about this link?
Framework	Cost-benefit or cost-effectiveness	Indicators	Legal	Social consensus	Sustainable development	Others???	What is the dominant analytical framework used by stakeholders?
Conflict	Longstanding conflict	Negotiated conflict	Consensus	Win-win		--	Is the link part of a conflict among actors? Or is it a win-win action?
Costs	Requires large investment	Medium cost to implement	Low cost	--			How expensive is the action to implement?
Nature of link	Direct finance	Direct material flow	Information	Indirect		--	What types of links are there between the adaptation and mitigation aspects of the link?
Ecosystem	Unique	Threatened	Managed resource	Unmanaged ecosystem		--	What ecosystem or environmental services are affected?
Extreme events	Climate event	Climatic episode	Non-climate disaster	--			Does the link relate to extreme events?
Poverty	Strong link to poverty reduction	Consistent with poverty reduction	Neutral or ambiguous effect	Increased inequality or poverty		--	What are the distributional effects on poverty?
Multiplier/ scale	Potential large-scale effects	Multipliers could be significant	Local action only	--			Are there significant multipliers or do the effects scale up?

Table 2: Matrix of examples of adaptation-mitigation linkages

Description fields:	Drivers	Stakeholders and actors	Scale

No.	Acronym	Title	Description	Citations	Driver	Link to CC (mitigation)	Link to CC (adaptation)	Extremes	Actors	Number	Conflict	Framework	Planning	Cost	Geography	Multiplier	Timing	Ecosystems	Poverty
						--													
1	Acon	Air- conditioning and heatwaves	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, assuming a typical mix of sources.	Smith et al. 2002; Eyre, N., T.E. Downing, R. Hoekstra, K. Rennings (with contributions by R.S.J. Tol), 1997: Global warming damages. Report to the EC ExternE Project. Brussels: European Commission.		--													--
2	Acon	Energy, sustainable development and health	Air-conditioning increases energy consumption, which increases greenhouse gas emissions if no carbon dioxide-neutral technology is used for energy production. Energy supply failed during the summer heatwave of 2003 in some European countries, when the energy demand rose. Anthropogenic heat production might worsen the urban heat- island effect: Wilby (2003) assumes that the increasing trend in the nocturnal urban heat island in London in spring, summer and autumn has been caused in part by the greater use of air-conditioning in recent decades. The need to use extra energy to counteract the urban heat island disproportionally affects resource-constrained people, who often live in urban areas and thus face the heat-island phenomenon even more directly. http://www.euro.who.int/document/eehc/ebakdoc08.pdf	Menne, B. and A. Markandya, Eds., 2004: Energy, sustainable development and health. Background document of the Fourth Ministerial Conference on Environment and Health, Budapest, Hungary, 23–25 June 2004, 122 pp.													
3	Solr	Rural electrification programme with solar energy in remote region: a case study in an Island	In the programme of total electrification, centralised supply of power generated by conventional methods using exhaustible resources is proving to be uneconomic and, more importantly, unmanageable so far as supply to rural areas, particularly remote places, is concerned. On the other hand, the decentralised approach based on supply of power produced with renewable energy resources available locally is, for various reasons, gradually being recognized as a viable alternative for such remote places. The feasibility of a decentralised solar photovoltaic (SPV) system is examined 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 an island called 'Sagar Dweep' in West Bengal, India, shows that within a short spell of time of four years, there have been noticeable improvements and significant impact on education, trade and commerce, entertainment, health etc. as a result of supply of power from SPV power plants. Productivity level of some agricultural activities as well as women's participation in different economic activities (at night), other than household work, have shown definite signs of betterment. The SPV system is also superior to other conventional systems when considering its environmental effects. Thus, on the whole, there seems to be a strong case for the locally installed SPV system in spite of its current unfavourable position in respect of the direct cost of production.	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.	Part of development planning	Strong link made by authors	Likely link-- assessment by LAs	Non-climate disaster	National	Small network	Win-win	Indicators	Strategic	Requires large investment	Local	Multipliers could be significant	Long term (20 or more years)	Managed resource	Strong link to poverty reduction
4	Solr	Strategy for promotions and development of renewable technologies in Bangladesh: experience from Garmeen Shakti	This paper discusses experiences from the renewable energy programme of Grameen Shakti (GS), which is aimed to provide energy to rural areas. GS has already spent 3 years in marketing solar home systems in rural Bangladesh. Within this short period, GS gathered a lot of experience in marketing the solar home system. Up to July 1999, GS had sold 1147 solar home systems and the installed capacity was 53.3 kWp. Customers use these systems for various purposes such as, lighting houses, shops, offices, watching TV, operating computers and so on. The systems are functioning well. Some of the customers have enhanced income through PV systems by extending working hours and selling power to neighbours. There are various obstacles to the expansion of PV programmes in rural Bangladesh, the main barrier being the high cost of the PV module. To make the system affordable, customers need an easier financing scheme. GS offers easier financing terms to the customers so that they can afford solar home systems. http://www.retsasia.ait.ac.th/Publications/GS-WREC%2099.pdf	Barua, D.C., 2001: Strategy for promotions and development of renewable technologies in Bangladesh: experience from Garmeen Shakti. *Renewable Energy*, **22**, 205-210.	Other social, economic or political drivers	Likely link-- assessment by LAs	Likely link-- assessment by LAs	Non-climate disaster	National	Few	Win-win	Indicators	Strategic	Medium cost to implement	Local	Potential large-scale effects	Long term (20 or more years)	Managed resource	Strong link to poverty reduction
5	Solr	Renewable energy technologies for fuelwood conservation in the Indian Himalayan region	Biomass, particularly fuelwood, is the main source of energy for cooking, water heating and space heating in rural households. On account of the exponential rise in the human and livestock population, there is tremendous pressure on forest lands, resulting in their degradation and heavy depletion of the resource. The situation is particularly serious in the fragile Himalayan ecosystem, which is facing large-scale deforestation and soil erosion. This paper presents the current energy utilisation status and the factors that influence it in rural households in villages located in central Himalayas zone in Himachal Pradesh. The paper identifies energy conservation measures and renewable energy technologies, which can be used in this area for conserving fuelwood. Results of field testing of some of these devices in the study area are also presented.	Prasad, R., S. Maithal and A. Mirza, 2001: Renewable energy technologies for fuelwood conservation in the Indian Himalayan Region. *Sustainable Development*, **9**, 103.	Anticipating long-term climate change	Link suggested by authors	Link suggested by authors	Climatic episode	National	Few	Win-win	Social consensus	Strategic	Medium cost to implement	Local	Multipliers could be significant	Medium term (5-20 years)	Threatened	Consistent with poverty reduction
6	Solr	Experimental study of using renewable energy in the rural areas of Oman	This paper shows the Ministry of Water Resources' efforts to exploit the Sultanate's renewable energy. Groundwater from Heelat Ar Rakah camp's well was found unfit for consumption due to high concentrations of fluoride and hydrogen sulphide (H_2S) gas. For the first time in Oman, solar power was used to run a reverse osmosis desalination plant to produce fresh water for the camp and a wind turbine was installed to generate electricity in order to run the submersible pump in the camp's well.	Al Malki, A., M. Al Amri and H. Al Jabri, 1998: Experimental study of using renewable energy in the rural areas of Oman. *Renewable Energy*, **14**, 319-324.	Part of development planning	Likely link-- assessment by LAs	Likely link-- assessment by LAs	--	National	Small network	Win-win	Sustainable development	Strategic	Low cost	Local	Multipliers could be significant	Medium term (5-20 years)	Unique	Consistent with poverty reduction

No.	Acronym	Title	Description	Citations	Driver	Link to CC (mitigation)	Link to CC (adaptation)	Extremes	Actors	Number	Conflict	Framework	Planning	Cost	Geography	Multiplier	Timing	Ecosystems	Poverty
7	Affor	The potential for bioenergy production from Australian forests, its contribution to national greenhouse targets and recent developments in conversion processes	Australia is highly dependent on cheap fossil fuels for energy generation and under the Kyoto Protocol was one of only three industrialised nations to be granted an increased greenhouse gas (GHG) emissions target. To help meet an effective GHG reduction of at least 20% below expected growth rates for GHG so that there is an increase of only 8% above 1990 levels by 2010, Australia has implemented a mandatory target for electricity retailers to obtain an additional 9.5 TWh/yr of electricity from renewable sources by 2010. Forest biomass could be a significant and effective renewable energy source. There is a potentially large supply of low-cost residual woody biomass from sawlog-driven harvesting, thinnings, and wood processing. There are also abundant land-clearing residues available, but these sources are not sustainable. Various technologies for the conversion of woody biomass to fuels for heat and power generation are outlined: combustion, gasification, carbonisation, densified fuels manufacture, and biochemical conversion. Examples are given of current development and implementation of these technologies in Australia. The establishment of new plantation forests can create carbon sinks that are potentially tradeable. Electricity utilities and large power consumers are being encouraged to invest in reforestation and afforestation to offset their carbon emissions. A plan to treble the commercial plantation forest estate by 2020 is currently being implemented, and would offset up to 6% of Australia's GHG emissions during the first Kyoto commitment period (2008–12).	Fung, P.Y.H., M.U.F. Kirschbaum, R.J. Raison and C. Stucley, 2002: The potential for bioenergy production from Australian forests, its contribution to national greenhouse targets and recent developments in conversion processes. *Biomass and Bioenergy*, **22**, 223-236.	Anticipating long term climate change	Strong link made by authors	Strong link made by authors	Climate event	Global	Large number	Consensus	Legal	Policy	Requires large investment	National	Multipliers could be significant	Long term (20 or more years)	Managed resource	Neutral or ambiguous effect
8	Affor	Forests and global warming mitigation in Brazil: opportunities in the Brazilian forest sector for responses to global warming under the Clean Development Mechanism	Brazil has a special place in strategies for combating global warming because its vast areas of tropical forest represent a potentially large source of emissions if deforested. A number of issues need to be settled to properly assign credit for carbon in the types of options presented by the Brazilian forest sector. These include definition of the units of carbon (permanent sequestration versus carbon-ton-years, the latter being most appropriate for forest options), the means of crediting forest reserve establishment, adoption of discounting or other time-preference weighting for carbon, definition of the accounting method (avoided emissions versus stock maintenance), and mechanisms to allow programme contributions to be counted, rather than restricting consideration to free-standing projects. Silvicultural plantations offer opportunities for carbon benefits, but these depend heavily on the end use of the products. Plantations for charcoal have the greatest carbon benefits, but have high social impacts in the Brazilian context. Plantations also inherently compete with deforestation reduction options for funds. Forest management has been proposed as a global warming response option, but the assignment of any value to time makes this unattractive in terms of carbon benefits. However, reduced-impact logging can substantially reduce emissions over those from traditional logging practices. Slowing deforestation is the major opportunity offered by Brazil. Slowing deforestation will require understanding its causes and creating functional models capable of generating land-use change scenarios with and without different policy changes and other activities. The ups and downs of Brazil's deforestation rate have so far had little to do with deliberate programmes to control or influence the process. Achieving this control will require a major effort in which contributions from the private sector will be needed.	Fearnside, P.M., 1999: Forests and global warming mitigation in Brazil: opportunities in the Brazilian forest sector for responses to global warming under the Clean Development Mechanism. *Biomass and Bioenergy*, **16**, 171-189.	Anticipating long term climate change	Strong link made by authors	Strong link made by authors	Climate event	Global	Large number	Longstanding conflict	Legal	Policy	Requires large investment	National	Multipliers could be significant	Long term (20 or more years)	Unique	Increased inequality or poverty
9	Tour	Energy-saving supporting tourism sustainability: A case study of hotel swimming pool heat pump	Based on energy-related measurements, this article evaluates the thermal performance, energy-saving, indirect emissions and financial feasibility of using heat pumps for hotel outdoor swimming pools in sub-tropical climates. A rooftop pool of a city-centre hotel was investigated. It was found that the average coefficient of performance (COP) was around 2.0. The measured electricity consumption was 24.6 MWh and the total heat output was 49.1 MWh for the heating season studied (mid-December 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 approach was adopted to compute the net present value of fuel costs over a lifecycle of 10 years. It was found that, over a 10-year life cycle, the energy cost could be reduced by HK$226,400 when a heat pump with an average COP of 2.0 was used instead of a conventional electric boiler. Derived from the energy cost saving over other conventional types of water-heating equipment, the simple pay back period can be about 2 years and the lowest internal rate of return can be 39%.	Chan, W.W. and J.C. Lam, 2003: Energy-saving supporting tourism sustainability: A case study of hotel swimming pool heat pump. *Journal of Sustainable Tourism*, **11**, 74 - 83.	Anticipating long term climate change	Strong link made by authors	Link suggested by authors	Climatic episode	National	Small network	Win-win	Sustainable development	Operational	Low cost	Local	Potential large-scale effects	Long term (20 or more years)	Managed resource	Neutral or ambiguous effect
10	Tour	Tourism development in Mallorca: is water supply a constraint?	The successful revitalisation of the tourism product on the popular Mediterranean tourist destination of Mallorca, Balearic Islands, Spain, since 1990, following a period of 'stagnation' in the 1980s, may be jeopardised by emerging environmental pressures, particularly water shortages and climatic change. 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 unproven. The water supply issues on Mallorca represent a microcosm of similar problems being experienced in other Mediterranean resorts and beyond. The case is emblematic of how environmental issues are becoming more central to tourism management, as well as suggesting a potentially important variant on the tourism life-cycle model of Butler (1980).	Essex, S., M. Kent and R. Newnham, 2004: Tourism development in Mallorca: is water supply a constraint? *Journal of Sustainable Tourism*, **12**, 4-28.	Reacting to climate events	Link suggested by authors	Strong link made by authors	Climatic episode	National	Small network	Long-standing conflict	Legal	Policy	Medium cost to implement	National	Local action only	Long term (20 or more years)	Unmanaged ecosystem	--

No.	Acronym	Title	Description	Citations	Driver	Link to CC (mitigation)	Link to CC (adaptation)	Extremes	Actors	Number	Conflict	Framework	Planning	Cost	Geography	Multiplier	Timing	Ecosystems	Poverty
11	UrbF	Urban food growing: the experience of two UK cities	Case-studies of the adjacent cities of Leeds and Bradford and how urban food-growing in cities can have social, environmental and economic benefits. The environmental benefits include preserving biodiversity, tackling waste and reducing transport and transport-based emissions. Also beneficial is the awareness of environmental issues and the resurgence of other green programmes. Socially the projects have resulted in urban regeneration, tackling crime and combating discrimination against vulnerable groups like women, ethnic minorities and the elderly.	Howe, J. and P. Wheeler, 1999: Urban food growing: the experience of two UK cities. *Sustainable Development*, **7**, 13-24.	Part of development planning	Link suggested by authors	Link suggested by authors	Climatic episode	Local	Small network	Consensus	Social consensus	Operational	Medium cost to implement	Local	Potential large-scale effects	Medium term (5-20 years)	Managed resource	Consistent with poverty reduction
12	UrbRecy	Horse-power: urban domestic recycling and the development of sustainable local community structures	Case-study of an urban recycling scheme, starting in the city of Leicester, which met with astounding success. The proposal of using horse-drawn carriages to collect recyclable materials from home is being developed as the horse-drawn carriages are accepted locally for other tasks such as for fairs, weddings and tourism. The advantages of the recyling scheme have included environmental awareness, using fewer fuel-based vehicles for tranporting materials, less pollution and less landfill or incineration. The project also has many disadvantages such as possible animal rights claims and traffic hazards.	Holland, L., 1999: Horse-power: urban domestic recycling and the development of sustainable local community structures. *Sustainable Development,* **7**, 47-53.	Part of development planning	Likely link--assessment by LAs	Likely link--assessment by LAs	--	Local	Small network	Consensus	Social consensus	Operational	Low cost	Local	Multipliers could be significant	Medium term (5-20 years)	Managed resource	Neutral or ambiguous effect
13	RlAdapt	Making rain, making roads, making do	The north-east of Brazil is characterised by a semi-arid environment with highly variable rainfall and frequent drought. Its population, particularly rural inhabitants who practise rainfed agriculture, are especially vulnerable to climatic extremes that compromise fragile livelihood systems. Since the end of the 19th century, the government has assumed responsibility for solving the drought problem through programmes designed to reduce immediate impacts and permanently diminish the overall vulnerability of the population. This paper focuses on the central north-eastern state of Ceará, where the history of drought has been particularly savage and the public policy response particularly ambitious. Based on 3 years of research, it first documents the vulnerability of rural Ceará, then traces the history of public efforts to mitigate these climatic crises, with particular focus on the role of seasonal forecasting. At the same time, the paper uses field data to report household coping mechanisms of rural inhabitants to drought. The conclusions argue for the need to combine both public and private responses in effective drought planning.	Finan, T.J. and D.R. Nelson, 2001: Making rain, making roads, making do. *Climate Research*, **19**, 97–108.	Reacting to climate events	Likely link--assessment by LAs	Strong link made by authors	Climate event	National	Large number	Long-standing conflict	Legal	Operational	Requires large investment	National	Multipliers could be significant	Medium term (5-20 years)	Threatened	Strong link to poverty reduction
14	RlForMan	Community forest management in Mexico: carbon mitigation and biodiversity conservation through rural development	Forest management is an important carbon mitigation strategy for developing countries. As demonstrated by the case of Mexico, community forest management is especially effective because it offers tangible local benefits while conserving forests and sequestering carbon. Community forestry receives minimal government support now, but the Clean Development Mechanism (CDM) of the Kyoto Protocol could leverage additional resources to promote the approach in Mexico and elsewhere. It is argued that adequately designed and implemented community forestry management projects can avoid deforestation and restore forest cover and forest density. They comprise promising options for providing both carbon mitigation and sustainable rural development. These kinds of projects should be included in the CDM.	Klooster, D. and O. Masera, 2000: Community forest management in Mexico: carbon mitigation and biodiversity conservation through rural development. *Global Environmental Change*, **10**, 259 - 272.	Part of development planning	Strong link made by authors	Strong link made by authors	Climatic episode	National	Large number	Negotiated conflict	Sustainable development	Strategic	Low cost	Local	Potential large scale effects	Long term (20 or more years)	Threatened	Strong link to poverty reduction
15	Agric	Applying agroecology to enhance the productivity of peasant farming systems in Latin America	The great majority of farmers in Latin America are peasants who still farm small plots of land, usually in marginal environments utilising traditional and subsistence methods. The contribution of the 16 million peasant units to regional food security is, however, substantial. Research has shown that peasant systems, which mostly rely on local resources and complex cropping patterns, are reasonably productive despite their land endowment and low use of external inputs. Moreover, analysis of NGO-led agroecological initiatives shows that traditional crop and animal systems can be adapted to increase productivity by biologically restructuring peasant farms which in turn leads to optimisation of key agroecosystem processes (nutrient cycling, organic matter accumulation, biological pest regulation, etc.) and efficient use of labour and local resources. Examples of such grassroots projects are herein described to show that agroecological approaches can offer opportunities to substantially increase food production while preserving the natural resource base and empowering rural communities.	Altieri, M.A., 1999: Applying agroecology to enhance the productivity of peasant farming systems in Latin America. *Environment, Development and Sustainability,* **1**, 197-217.	Part of development planning	Likely link--assessment by LAs	Strong link made by authors	Climate event	Local	Small network	Win-win	Social consensus	Operational	Low cost	Local	Multipliers could be significant	Medium term (5-20 years)	Managed resource	Strong link to poverty reduction
16	ClimComm	Climate, communications, and innovative technologies: potential impacts and sustainability of new radio and internet linkages in rural African communities	RANET combines data from global climate data banks in the U.S., seasonal rainfall predictions from the international scientific community, data and forecasts generated in Africa, along with food security and agricultural information, to disseminate a comprehensive information package via a network of digital satellite, receiving stations, computers, radio, and oral intermediaries. Prior to RANET, this information was rarely available outside of capital cities, and much of it never travelled far beyond the research centres where it originated. http://www.col.org/speeches/mindafviii_case1.htm	Boulahya, M., M.S. Cerda, M. Pratt and K. Sponberg, 2002: Climate, communications, and innovative technologies: potential impacts and sustainability of new radio and internet linkages in rural African communities. Commonwealth of Learning, http://www.col.org	Other social, economic or political drivers	Likely link--assessment by LAs	Likely link--assessment by LAs	Climate event	National	Small network	Win-win	Cost-benefit or cost-effectiveness	Strategic	Low cost	Global	Local action only	Near term	Unmanaged ecosystem	Neutral or ambiguous effect
17	UrbHeat	The urban heat island phenomenon and potential mitigation strategies	A long-term strategy of planting shade trees and installing reflective materials for roofs and pavements can mitigate the urban heat island effect and help reduce associated economic, environmental and health-related costs. When the sun beats down on buildings covered with dark-coloured roofing materials, most of the heat collected by the roof is transferred inside, increasing the demand for air-conditioning. Installing highly reflective roofs will keep buildings cooler and reduce energy bills. Research conducted in Florida and California indicates that buildings with highly reflective roofs require up to 40 percent less energy for cooling than buildings covered with darker, less reflective roofs. Roads, parking lots, and driveways paved with dark, heat-absorbing materials (e.g., asphalt) also contribute to the urban heat island effect. Increasing the albedo of these surfaces through the use of reflective paving materials will help to reduce the surrounding ambient air temperature. http://www.asu.edu/caed/proceedings99/ESTES/ESTES.HTM	Estes, M.G., V. Gorsevski, C. Russell, D. Quattrochi and J. Luvall, 1999: The urban heat island phenomenon and potential mitigation strategies. Arizona State University, http://www.asu.edu/	Part of development planning	Likely link--assessment by LAs	Likely link--assessment by LAs	Non-climate disaster	Local	Few	Win-win	Social consensus	Policy	Medium cost to implement	Local	Multipliers could be significant	Medium term (5-20 years)	Unmanaged ecosystem	Neutral or ambiguous effect

No.	Acronym	Title	Description	Citations	Driver	Link to CC (mitigation)	Link to CC (adaptation)	Extremes	Actors	Number	Conflict	Framework	Planning	Cost	Geography	Multiplier	Timing	Ecosystems	Poverty
18	UrbHeat	Urban heat islands opportunities and challenges for mitigation and adaptation	The observation that cities can be significantly warmer than their rural surroundings is a phenomenon widely referred to as the urban heat island (UHI) effect. The causes of the UHI include generally lower urban reflectivity to solar radiation; lower surface moisture availability; lower vegetative cover; and substantial levels of waste heat release in cities. While current heat island intensities can be large and the impacts substantial, there are a number of environmental stressors that are likely to lead to even more intense heat island effects in the future. Specifically, there is a global trend toward increasing urban population densities (e.g., United Nations, 1999). This, combined with the potential for global warming (IPCC, 1995) may dramatically increase the severity of urban heat island-related impacts. http://www.cleanairpartnership.org/pdf/finalpaper_sailor.pdf	Sailor, D.J., undated: Urban heat islands opportunities and challenges for mitigation and adaptation. Tulane University. The Clean Air Partnership, http://www.cleanairpartnership.org	Anticipating long-term climate change	Strong link made by authors	Link suggested by authors	Non-climate disaster	Local	Small network	Win-win	Social consensus	Policy	Medium cost to implement	Local	Multipliers could be significant	Medium term (5-20 years)	Unmanaged ecosystem	Neutral or ambiguous effect
19	EnergyAdapt	Climate change: North Atlantic comparisons	Climate impacts and adaptation in Iceland. Despite the large uncertainty in climate change predictions, the (Icelandic) Government has begun to consider potential impacts and adaptation needs. For example, the National Energy Authority and the Icelandic Meteorological Office participated in a Nordic project assessing the effects of climate change on hydroelectricity production. Warmer temperatures could increase meltwater from the glaciers, increasing the flow in glacial rivers and hence benefit power production. Sea-level rise is also a concern, as the population is primarily located in settlements along the coast. The Government has commissioned analysis of the danger of flooding and land erosion, along with an assessment of the available measures to minimise consequent damages to roads, harbours and property. Potential sea-level rise will be taken into account when harbour infrastructure needs to be rebuilt. The conversion from oil-based space heating to geothermal sources was achieved over a period of 25 years. Following the establishment of an energy fund in the 1950s to provide infrastructure to connect even remote areas to the grid, oil use for heating fell from over 40% in the 1970s to less than 2% in 1998. http://www.scotland.gov.uk/library3/environment/ccna-11.asp	Kerr, A. and S. Allen, 2001: Climate change: North Atlantic comparisons. University of Edinburgh, The Scottish Executive Central Research Unit, Scottish Executive, http://www.scotland.gov.uk	Anticipating long-term climate change	Strong link made by authors	Strong link made by authors	Non-climate disaster	National	Large number	Consensus	Sustainable development	Operational	Requires large investment	National	Multipliers could be significant	Long term (20 or more years)	Managed resource	Neutral or ambiguous effect
20	Buildings	Buildings and climate change	The BBC website proposes that new building reguations may have to be created in order to cope with more serious weather as a consequence of climate change. http://www.bbc.co.uk/climate/adaptation/buildings.shtml	Climate change from the BBC Weather Centre: buildings and climate change, BBC, http://www.bbc.co.uk															
21	Ccadpt	Sustainable livelihoods and climate change adaptation	Participating communities implemented a package of mutually supportive sustainable livelihoods activities that fell under four broad categories: (a) awareness and institution building, (b) training, (c) rangeland rehabilitation and improvement, and (d) community development activities. Preliminary results exceeded original expectations, as over 700 ha of rangeland was improved and properly managed – far exceeding the 100 ha goal. Moreover, community training and development activities diversified local production systems so that pressure on marginal lands was reduced, thereby ensuring sustained success of project activities. Local livelihoods had been enhanced and communities were better equipped to cope with a range of stresses, including drought. Recognising the relevance of the pilot project's success to climate change adaptation, SEI-B and HCENR researchers returned to some of the original project communities to further understand the nature and enabling factors behind this success. http://www.iisd.org/pdf/2004/envsec_sustainable_livelihoods.pdf	IUCN, IISD, SEI-B and Intercooperation, 2004: Sustainable livelihoods and climate change adaptation. International Institute for Sustainable Development, http://www.iisd.org	Reacting to climate events	Strong link made by authors	Strong link made by authors	Climate event	Local	Few	Win-win	Sustainable development	Operational	Low cost	Local	Local action only	Near term	Threatened	Consistent with poverty reduction
22	GovResponse	The planning response to climate change: advice on better practice	Possible climate change impacts ->Potential impact on built environment -> Planning responseDrier summers with lower soil moisture and wetter winters -> Subsidence -> Spatial policies – avoiding areas at riskMore extremely hot days and fewer very cold days -> Reduced heating demands, increased cooling demands -> Policies on locationWarmer drier summers -> Greater requirement for outdoor environments -> Design adviceMore extreme weather events -> Damage to building fabric -> Policies on sustainable design/passive solar design backed up by design adviceMore frequent droughts -> Water shortages -> Policies on sustainable design and design of open/green spaces backed up by design advice. http://www.odpm.gov.uk/pub/498/ThePlanningResponsetoClimateChangeAdviceonBetterPracticePDF1234Kb_id1144498.pdf	Office of the Deputy Prime Minister, 2004: The planning response to climate change: advice on better practice. CAG Consultants and Oxford Brookes University. Department for Communities and Local Government, http://www.opdm.gov.uk															
23	Synergies	A consensus workshop report on Global Climate and Economic Development	Synergy is possible. Small scale and locally managed renewable and clean energy technology can help reduce global emissions and meet the energy needs of rural communities, while reducing local pollutants and dependence on imported fuels. For example, the Philippines recently passed a renewable energy bill to promote the development, use and commercialisation of renewable energy from local resources, such as wind, solar, biomass and hydro. One local community, Panay Island, rejected a coal power plant and is taking a local stakeholder approach to planning its energy needs by drawing on local resources. A wind farm is currently under development. This renewable energy system will not only spur economic development, but also improve the health of the local community relative to a coal-burning system, which can emit harmful chemicals and GHGs.	Kuzma, J. and L. Dobrovlny, Eds., 2004: The global climate and economic development. A report from the Humphrey Institute workshop series on 'Climate Change and Sustainable Development Paths to Progress', Hurbert H. Humphrey Institute of Public Affairs, http://www.hhh.umn.edu.	Part of development planning	Strong link made by authors	Likely link--assessment by LAs	--	National	Small network	Win-win	Social consensus	Strategic	Requires large investment	Local	Multipliers could be significant	Medium term (5-20 years)	Unmanaged ecosystem	--
24	ODA	Adaptation to climate change in German official development assistance	This KfW project is one of the German contributions to a programme initiated by the World Bank, which is aimed at preserving the unique biodiversity of Madagascar. The programme aims to identify (i) the factors that lead to a decline in biodiversity, (ii) the underlying mechanisms that trigger these factors and (iii) the current societal and institutional arrangements that have led to these mechanisms having an adverse effect on biodiversity. The overall goal of the programme is then to develop an institutional framework in which the factors and underlying mechanisms can be addressed. There are three national parks in Madagascar, each situated in the upstream part of a river catchment. As such, the vegetation helps to stabilise the soils on the slopes of the river catchments, as well as the runoff of river water, which is important for downstream agriculture (mainly cultivation of rice in paddy fields). However, increasing development pressure has led to an increase in soil erosion, which has affected river flow	Klein, R.J.T., 2001: Adaptation to climate change in German official development assistance: an inventory of activities and opportunities, with a special focus on Africa. GTZ, Eschborn, Germany, 42 pp.	Other social, economic or political drivers	Link suggested by authors	Link suggested by authors	--	Local	Small network	Negotiated conflict	Social consensus	Operational	Low cost	Local	Local action only	Near term	Threatened	Consistent with poverty reduction

No.	Acronym	Title	Description	Citations	Driver	Link to CC (mitigation)	Link to CC (adaptation)	Extremes	Actors	Number	Conflict	Framework	Planning	Cost	Geography	Multiplier	Timing	Ecosystems	Poverty
			and thereby agriculture. According to Ralph Kadel, project manager at KfW, the former arrangements whereby the local population did not have any rights of access or use of the national parks had an adverse effect. The local population was unaware of the importance of the national parks for the stability of downstream ecosystems and economic activities and continued to use the protected forests as a source of wood and for cattle grazing, despite increasing erosion. The newly proposed institutional framework is based on a participatory approach in which natural resources, management responsibilities and income are shared with the population. The new executive agencies for the national parks are semi-private/semi-public organisations, whilst there is also an increasing role for non-governmental organisations. The funding for the national parks, which is now almost exclusively derived from ODA, will have to be diversified with trust funds and tourism as important new contributors. Climate change and variability have never been considered explicitly in this project. However, the very idea behind the preservation of upstream ecosystems is the part these ecosystems play in regulating the microclimate of the river catchments. The vegetation, in ensuring the stability of soils and river flows, reduces the vulnerability of a catchment to both droughts and tropical storms. Preserving vegetation is thus a good precautionary and no-regret measure to prepare for climate change. http://www.hhh.umn.edu/img/assets/9685/global_climate_econdvlp_report.pdf															
25	Hazards	Report to the Cayman Islands' Government. Adaptation lessons learned from responding to tropical cyclones by the Cayman Islands' Government, 1988 - 2002	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 relief in situations of extreme weather; increase the minimum elevation for developments on reclaimed land to prevent future flooding; and develop a national energy policy. 'Lee County in Florida have …. passed disaster legislation that sets out a planning process that requires that any building built too close to the water, in the event that it is destroyed, cannot be rebuilt there but there is a setback provision which requires them to rebuild more inland. I thought this was quite clever. It mitigates against a repeat phenomena. Generations to come will thank you.' Respondent 7, 020626. http://www.tyndall.ac.uk/publications/working_papers/wp35.pdf	Tompkins, E.L. and L-A. Hurlston, 2003: Report to the Cayman Islands' Government. Adaptation lessons learned from responding to tropical cyclones by the Cayman Islands' Government, 1988 - 2002, Tyndall Centre for Climate Research, Working Paper 35, 46 pp.	Anticipating long term climate change	Link suggested by authors	Likely link--assessment by LAs	Climate event	National	Large number	Negotiated conflict	Social consensus	Strategic	Low cost	National	Local action only	Near term	Threatened	--
26	EnergyAdapt	Seeing the light: adapting to climate change with decentralised renewable energy in developing countries	No specific evaluation has been made of the greenhouse gas emissions reduction potential of the photovoltaic solar power stations at Diaoulé and Ndiébel (Senegal). However, on the basis of the capacities of the two stations (128 kWh/day or 46,720 kWh/yr, and considering the fact that the production of one MWh of electricity by a thermal plant of equivalent capacity releases 0.73 tonnes of CO_2, one can estimate the level of CO_2 emissions avoided by the solar stations at Diaoulé and Ndiébel to be about 34 tonnes of CO_2 per year. In addition to the amount of CO_2 emissions avoided, the solar plants contribute towards reducing the country's vulnerability to climate change and reinforce its capacity for adaptation. Also, the association of the solar plants with water pumping technologies helps to increase the availability of water resources, which also facilitates tree planting and reforestation activities, and the development of vegetable garden crops. The community should, therefore, be more resilient to climate stress. http://www.cckn.net/pdf/seeing_the_light_dre.pdf	Venema, H.D. and M. Cisse, Eds., 2004: Seeing the light: adapting to climate change with decentralized renewable energy in developing countries. International Institute for Sustainable Development and the Climate Change Knowledge Network, 186 pp.	Other social, economic or political drivers	Strong link made by authors	Link suggested by authors	Non-climate disaster	National	Small network	Win-win	Sustainable development	Operational	Requires large investment	National	Multipliers could be significant	Medium term (5-20 years)	Unmanaged ecosystem	Neutral or ambiguous effect
27	Water	Watershed restoration and development in Maharashtra State, India	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. http://www.iisd.org/pdf/2003/natres_livelihoods_cc.pdf	IUCN, SEI-B, IISD, and Intercooperation, 2003: Livelihoods and climate change. Internation Institute for Sustainable Development, http://www.iisd.org	Other social, economic or political drivers	Likely link--assessment by LAs	Link suggested by authors	Non-climate disaster	Local	Small network	Win-win	Social consensus	Operational	Low cost	Local	Local action only	Near term	Managed resource	Consistent with poverty reduction
28	Water	Experimenting with alternative approaches to water resources allocation increases yields in Andra Pradesh, India	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 towards the end of August. This is in spite of the fact that enough soil moisture would be available in the command areas earlier. Experimentation with early deep seeding and weeding in June demonstrated that under specific conditions a crop can be grown with considerably less water. The experience has important implications for management of the command area during dry years when not enough water would be available in the tanks and reservoirs. Using the new technique allows the entire command area to receive supplemented irrigation during the critical flowering and yield formation periods. Experiments carried out during a drought showed that though the yields per hectare would decrease by about 10 percent, the total yield in the command area would increase by as much as 50%. These types of experiments will need further support if societies are to adapt to changes in the hydrological cycle due to climate change. http://www.waterandnature.org/pub/Brochure-UICN-Change.pdf	Bergkamp, G., B. Orlando and I. Burton, 2003: Change: adaptation of water resources management to climate change. IUCN and Water and Nature Initiative, p. 57.	Reacting to climate events	Link suggested by authors	Strong link made by authors	Climatic episode	Local	Small network	Win-win	Social consensus	Operational	Low cost	Local	Multipliers could be significant	Near term	Managed resource	Consistent with poverty reduction

No.	Acronym	Title	Description	Citations	Driver	Link to CC (mitigation)	Link to CC (adaptation)	Extremes	Actors	Number	Conflict	Framework	Planning	Cost	Geography	Multiplier	Timing	Ecosystems	Poverty
29	Hazards	Reducing the risk of GLOFs (glacial lake outburst floods) in Nepal	Nepal is starting to reduce the risks of GLOFs by draining water from glacier lakes using siphons and pumps, cutting drainage channels for periodic water release, and building flood control measures downstream. With the support of The Netherlands, the government began a project to drain the Tsho Rolpa glacial lake by three metres,which reduced the risk of a GLOF by 20%. A channel was cut into the moraine, and a gate was constructed to allow water to be released as necessary. The four-year project cost US$3.2 million. Nepal's Tenth Plan aims to improve the country's ability to use existing water resources to provide farmers with year-round irrigation. An advantage of large hydropower reservoirs is that these reservoirs can provide dependable flows for electricity generation, supplement water supplies for domestic and agriculture uses during the dry season and, if properly designed, play a role in flood management. However, these possible benefits must be carefully weighed against the environmental impacts and the enhanced GLOF risks. http://www.iied.org/NR/agbioliv/gatekeepers/gk_abs/documents/GK118.pdf	Alam, M. and L.A. Murray, 2005: Facing up to climate change in south Asia, Gatekeeper Series 118, IIED, p. 14.	Anticipating long-term climate change	--	Likely link--assessment by LAs	Climatic episode	Local	Small network	Win-win	Indicators	Strategic	Medium cost to implement	National	--	Medium term (5-20 years)	Threatened	Neutral or ambiguous effect
30	GovResponse	Climate change initiative	This project focuses on the climate change initiative as part of the 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 monoxide emissions in participating factories by 95 percent, of carbon dioxide by 32 percent, and of smoke by 96 percent. Funding for this project came from CIDA's Climate Change Initiative to support implementation of the Kyoto Accord. http://cida71.acdi-cida.gc.ca/cidaweb/cpo.nsf/vLUWebProjEn/5B4965675FEFB30685256FF10031D76B?OpenDocument	CIDA website, 2005	Anticipating long-term climate change	Likely link--assessment by LAs	Likely link--assessment by LAs	--	Local	Small network	Win-win	Sustainable development	Operational	Requires large investment	Local	Multipliers could be significant	Medium term (5-20 years)	Unmanaged ecosystem	Neutral or ambiguous effect
31	GovResponse	Primer on climate change and sustainable development	Climate change and variability has become the primary environmental concern of the 21st century. The potential impacts and mitigation of climate change need to be analysed within the context of sustainable development. 'Primer on Climate Change and Sustainable Development' presents a condensed and accessible review of the latest state-of-the-art assessments of the Intergovernmental Panel on Climate Change. The book begins with a foreword from the chair 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 students of environmental science and policy, and researchers and policy makers involved in all aspects of climate change. http://www.cambridge.org/uk/catalogue/catalogue.asp?isbn=0521008883	Munasinghe, M. and R. Swart, 2005: Primer on climate change and sustainable development: facts, policy analysis, and applications. Cambridge University Press.															
32	Livelihoods	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 for households. A wide range of natural resources are also tapped. Charcoal, timber and brick production are important sources of income, and artesanal mining of gem stones and gold has increased lately. http://www.uea.ac.uk/env/cserge/pub/wp/edm/edm_2004_12.pdf	Paavola, J., 2004: Livelihoods, vulnerability and adaptation to climate change in the Morogoro region, Tanzania. Centre for Social and Economic Research on the Global Environment Working Paper, University of East Anglia, 22 pp.	Reacting to climate events	--	Link suggested by authors	Climatic episode	Local	Small network	Win-win	Sustainable development	Operational	Low cost	Local	Local action only	Near term	Managed resource	Neutral or ambiguous effect
33	EnergyAdapt	Fuel efficient stoves project - rural development project, Pakistan	The smokeless stove generates heat in a smaller area and is well insulated by a mud and brick enclave resulting in a smaller amount of fuelwood needed to generate the same amount of heat in an open fire. The lesser amount of smoke resulting from a smokeless stove compared to open fire cooking reduces the amount of harmful gas emissions, including carbon dioxide and carbon monoxide, contributing to the greenhouse effect. Notable Community Participation. A 3-day workshop will be held in 51 villages of Tehsil and district of Haripur. These workshops will be held at the village level. 30-40 women will be trained as 'chulha mechanics' during each workshop. The local blacksmiths or 'lohars' of each village will also be trained in making the steel chimneys, stove gates and the chimney damper. Thus, the women of the village should easily be able to have the 'chulha mechanic' make the stove and simultaneously they can recycle their old steel bins etc. by taking them to their 'lohar' and having him make the chimney etc. out of this material if they want to have the stove made in the cheapest possible way. Regularly, however, the blacksmith will use his own steel to make the stove chimney etc. Thus, the smokeless stove project has the salient characteristics of being simple in design and concept, easily imitable, sustainable, cost-effective and beneficial to the environment. . http://sgp.undp.org/index.cfm?Module=Projects&Page=ShowProject&ProjectID=4516	Fuel efficient stoves project, The GEF Small Grants Program website.	Part of development planning	Link suggested by authors	Likely link--assessment by LAs	--	Local	Small network	Win-win	Sustainable development	Operational	Medium cost to implement	Local	Local action only	Near term	Unmanaged ecosystem	Neutral or ambiguous effect

No.	Acronym	Title	Description	Citations	Driver	Link to CC (mitigation)	Link to CC (adaptation)	Extremes	Actors	Number	Conflict	Framework	Planning	Cost	Geography	Multiplier	Timing	Ecosystems	Poverty
34	EnergyAdapt	Renewable energy technology development (RETD), Egypt	The project objectives are: 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 Agricultural Dehydration Tunnel (SADT); to link local village producers to the SCD through technical assistance and training. Specific objectives: increase the income of local farmers by enabling them to improve the product quality and the productivity of the dehydration process; provide employment opportunities for women, through backward linkages with labour-intensive post-harvest activities; provide an economically sustainable local production base for the replication for this technology; build the capacity of local craftsman to replicate this technology in local villages and incorporate their local production techniques in SADT design. http://sgp.undp.org/index.cfm?Module=Projects&Page=ShowProject&ProjectID=4243.	Renewable energy technology development. The GEF Small Grants Program website.	Part of development planning	Link suggested by authors	Likely link--assessment by LAs	--	Local	Small network	Win-win	Sustainable development	Operational	Low cost	Local	Local action only	Near term	Unmanaged ecosystem	Consistent with poverty reduction
35	Budgets	Community action to address climate change: GEP small grants program	This project developed locally constructed solar water desalination units and installed them in the remote community of Cite Patate, providing these households with improved access to drinking water. The project also demonstrated the use of solar energy to desalinate water, an approach that may be usable in other areas of the island nation of Mauritius. This project improves access to clean drinking water for this isolated community. The previous drinking water obtained from the natural spring often carried diseases. Reduced drudgery: the women in these 21 families no longer have to walk 3-5 hours per day to find drinking water. Adaptation to possible impacts of climate change: By enabling these families to convert seawater into drinking water, the project increases the community's capacity to cope with long periods without rain. http://sgp.undp.org/download/SGPCaseStudiesBook.complete.pdf	Ebrahimian, E., 2003: Community action to address climate change: case studies linking sustainable energy use and improved livelihoods, GEF Small Grants Programme, United Nations Development Programme, p. 35.	Part of development planning	Likely link--assessment by LAs	Strong link made by authors		Local	Small network	Win-win	Sustainable development	Strategic	Medium cost to implement	Local	Multipliers could be significant	Near term	Managed resource	Consistent with poverty reduction
36	EnergyAdapt	Apayao communitybased resource management project (LUZON), Philippines	The project aimed to assist the two tribal communities in the installation and development and establishment of a clean, renewable energy source - a micro hydropower system to supply the power requirements of 90 households; and protection of the watershed in two indigenous communities in Apayao. It is expected that this project will be able to: (a) provide the initial support to attain food sufficiency; (b) develop local capacity; and (c) protect and conserve the remaining natural resources. The third objective is inherent to the other two objectives as this will spell out the success and sustainability of the resources base that directly affects food production and capacity building. http://sgp.undp.org/index.cfm?Module=Projects&Page=ShowProject&ProjectID=3728	Apayao community based resource management project (LUZON). The GEF Small Grants Program website.	Part of development planning	Likely link--assessment by LAs	--		Local	Small network	Win-win	Sustainable development	Strategic	Medium cost to implement	Local	Local action only	Near term	Unmanaged ecosystem	Neutral or ambiguous effect
37	Tech	The role of technology development in greenhouse gas emissions reduction: the case of Finland	This paper presents results from a total of 27 projects from the Finnish CLIMTECH 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 decreasing emissions reduction costs and by facilitating more ambitious reduction targets. Advanced biofuel production and utilisation technologies, as well as offshore wind power, have proved to have the largest potential by the 2030s. Results also indicated a clear relationship between technological development and national emissions-trading patterns. http://www.etsap.org/worksh_6_2003/2003P_lehtilla.pdf	Lehtilä, A., I. Savolainenb and S. Syri, 2003: The role of technology development in greenhouse gas emissions reduction: the case of Finland. International Energy Workshop, IIASA, 2738 - 2758.	Part of development planning	Strong link made by authors	--		National	Large number	Win-win	Sustainable development	Policy	Requires large investment	National	Multipliers could be significant	Long term (20 or more years)	Unmanaged ecosystem	Neutral or ambiguous effect
38	Hazards	Suffolk estuarine strategies: Alde and Ore estuary strategy	There are several areas in Suffolk that are becoming increasingly susceptible to flooding. The Agency has commissioned the development of long-term strategies to manage the flood defences for three of the Suffolk Estuaries: the Blyth, the Alde and Ore and the Deben. This project is known as the 'Suffolk Estuarine Strategies'. These flood management strategies are being developed on a river-by-river basis starting with the Blyth, followed by the Alde and Ore, then the Deben estuary. With sea levels expected to rise over the next 100 years, and with areas of land behind the current defences several metres lower than the normal high water in the estuary, steps must be taken to ensure that the response to changes in the risk of flooding is appropriate. http://www.suffolkestuaries.co.uk/PDFs/Alde&Ore_Shortlisting_Options_Factsheet.pdf	Suffolk Esturine Strategies, http://www.suffolkestuaries.co.uk	Part of development planning	--	Likely link--assessment by LAs		Local	Small network	Negotiated conflict	Cost-benefit or cost-effectiveness	Strategic	Medium cost to implement	Local	Local action only	Medium term (5-20 years)	Managed resource	Neutral or ambiguous effect
39	Water	Complementarity between mitigation and adaptation: the water sector	The water cycle, a fundamental component of climate, is likely to be altered in important ways by climate change. Climate change will most likely worsen the already exisiting water-related problems. Then the question is how should policy makers respond to this dilemma. Climate change mitigation, through greenhouse gas (GHG) emissions reduction and sequestration, is not a sufficient response. Adaptation will also need to feature as a response strategy. Mitigation and adaptation need to be viewed as complementary response to climate change.	Mata, J.M. and J. Budhooram, 2007: Complementarity between mitigation and adaptation: the water sector. *Mitigation and Adaptation Strategies for Global Change*, **12**, 799-807.	Anticipating long-term climate change	Strong link made by authors	Strong link made by authors						Policy						
40	Synergies	Climate change: combining mitigation and adaptation	Synopsis of how the global community must manage its energy consumption in order to effectively reduce the effects of climate change. The paper focuses on market utilisation, climate policy and hydrogen power.	Jaeger, C.C., 2005: Climate policy for the 21st century meeting the long-term challenge of global warming, Center for Transatlantic Relations, Johns Hopkins University–SAIS, 406 pp.															

No.	Acronym	Title	Description	Citations	Driver	Link to CC (mitigation)	Link to CC (adaptation)	Extremes	Actors	Number	Conflict	Framework	Planning	Cost	Geography	Multiplier	Timing	Ecosystems	Poverty
41	SLR	The double trade off between adaptation and mitigation for sea level rise: an application of FUND	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 before 2100; the global effect is much smaller. Adaptation would reduce impacts by a factor of 10 to 100. As adaptation depends on socio-economic status, the rank order of most-vulnerable countries is not the same as the rank order of most-exposed countries. Adaptation would come at a minor cost compared to the damage avoided. Because the momentum of sea level rise is so large, mitigation can reduce impacts only to a limited extent. Stabilising carbon dioxide concentrations at 550 ppm would cut impacts up to 2100 by about 10%. However, if the costs of emission reduction are also factored in, then avoided impacts are less by up to 25% (average 10%). This is partly due to the reduced availability of resources for adaptation, and partly due to the increased sensitivity to wetland loss by adaptation.	Tol, R.S.J., 2005: The double trade off between Adaptation and Mitigation for sea level rise: An Application of FUND. Research Unit for Sustainability and Global Change, Hamburg, Germany.															
42	Insurance	Climate change and the insurance sector: its role in adaptation and mitigation	The insurance industry has been slow to address climate change. With a focus on adaptation, a few reinsurers have carried out awareness-raising and research, while the UK insurance industry has been active in terms of risk reduction. The UNEP Insurance Industry Initiative seeks to discover best practice globally and inform the international policy-making process. Its research reveals that public–private collaboration is the most effective way to engage the insurance industry in reducing vulnerability. The same principle can help to avert the further progression of climate change through more enlightened investment policies.	Dlugolecki, A. and M. Keykhah, 2003: Climate change and the insurance sector: its role in adaptation and mitigation. *Journal of Corporate Environmental Strategy and Practice (GMI)*, **39**.															
43	Synergies	Toward an integrated analysis of mitigation and adaptation: some preliminary findings	Between 1999 and 2003, the Oak Ridge National Laboratory (ORNL) made a preliminary effort to integrate an analysis of mitigation and adaptation to climate change impact vulnerabilities in two ways: top-down and bottom-up. This paper briefly describes these early experiments and summarises their findings, both about climate change vulnerability reduction and about the challenges of integrated analysis, expanding upon results previously reported.	Wilbanks, T.J., P. Leiby, R. Perlack, J.T. Ensminger, S.B. Wright, 2003: Toward an integrated analysis of mitigation and adaptation: some preliminary findings. Oak Ridge National Laboratory, Tennessee, USA															
44	Synergies	On integration of policies for climate and global change	Currently envisaged mitigation of GHG emissions will be insufficient to appreciable limit climate change and its impacts. Adaptation holds the promise of ameliorating the impacts on a small subset of systems being affected. There is no question that both will be needed. However, climate change is only part of a broader multi-stress setting of global through to local changes. Privileging climate-related policies over other concerns leads to tragic outcomes. Climate policies need to be designed for and integrated into this broader and challenging context. This paper focuses on placing climate change within the broader context of global change and the importance of aligning climate policy objectives with the myriad other policies that still need to be implemented if our primary goal is improving human welfare rather than limiting our focus to climate change and its impacts.	Dowlatabadi, H., On integration of policies for climate and global change. Institute for Resources Environment and Sustainability & Liu Institute for Global Issues, The University of British Columbia, Vancouver.															
45	EnergyAdapt	Decentralised renewable energy and the climate change mitigation-adaptation nexus	This paper explores the role of decentralised renewable energy (DRE) projects as a simultaneously mitigative and adaptive response to climate change. We develop a general conceptual framework that illustrates how introducing modern energy services through decentralized renewable energy can stabilise the ecological and social determinants of climate change through vulnerability, while performing a critical climate change mitigation function.	Venema, H.D. and I. Rehman, 2007: Decentralized renewable energy and the climate change mitigation-adaptation nexus. *Mitigation and Adaptation Strategies for Global Change*, **12**, 875-900.															
46	Insurance	The iInsurance market place as a nexus for catalyzing synergisms between climate change mitigation and adaptation	The insurance industry is both a barometer of the changing climate and a market actor that can play a material role in decreasing the vulnerability of human and natural systems to weather-related natural disasters while simultaneously supporting both its own marker-based objectives and the objectives of sustainable development generally, and mitigation and adaptation measures in the context of global climate change in particular. The insurance sector has significant capacity and ability to spread the risks and manage the costs of weather-related events, more so today in industrialised countries but increasingly so in developing countries and economies in transition.	Mills, E., 2004: The insurance market place as a nexus for catalyzing synergisms between climate change mitigation and adaptation. *Mitigation and Adaptation Strategies for Global Change.*															
47	Water	Examining adaptation and mitigation opportunities in the context of the integrated watershed management programme of the Government of India.	Burhanpura watershed in Rajasthan After the implementation of the watershed development project, a post-evaluation highlighted the kind of multiple benefits that were generated from the project. Covering an area of 1175 hectares over 8 villages, the project now supports sustainable living of nearly 350 families. Immediate impacts observed included increase in water levels by 15 to 20 feet. Of relevance is the fact that water is now available for use even during the drought years. Apart from this, forest conservation contributing to increase in biomass, erosion control and topsoil conservation was promoted	Bhandari, P.M.	Reacting to climate events	Link suggested by authors	Strong link made by authors	Climate event	National	Small network	Win-win	Sustainable development	Operational	Medium cost to implement	Local	Multipliers could be significant	Near term	Threatened	Consistent with poverty reduction
48	Buildings	Climate change and the UK house building sector: perceptions, impacts and adaptive capacity	This paper explores how climate change could affect the UK house-building sector, focusing on the question of how companies can adapt to changing climatic conditions. It presents the results of in-depth interviews in five house-building companies in the UK. We start from the assumption that climate change is only one driver among many, including technological innovation, shifting consumer expectations and changing regulation that the industry faces. This approach draws on insights that are well-established in the management and innovation literatures, but have often been neglected in studies of climate change. We report research about the perceptions of house builders about future impacts of climate change, potential adaptation measures that may be open to them and their ability to carry out these measures. The paper draws conclusions about the challenges that climate change presents to the UK house building industry.	Hertin, J., F. Berkhout, D.M. Gann and J. Barlow, 2003: Climate change and the UK house building sector: perceptions, impacts and adaptive capacity. *Building Research and Information*, **31**, 278 -290.															

No.	Acronym	Title	Description	Citations	Driver	Link to CC (mitigation)	Link to CC (adaptation)	Extremes	Actors	Number	Conflict	Framework	Planning	Cost	Geography	Multiplier	Timing	Ecosystems	Poverty
49	Insurance	Climate change, insurance and the building sector: technological synergisms between adaptation and mitigation	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 act synergistically, by introducing adaptation which makes buildings more resilient to natural disasters. There is potential for insurance companies to become more involved in using energy efficiency and renewable energy as part of a strategy to make buildings more disaster-resilient. There is a risk that bad design and application of energy-related systems can increase insurance claims due to such problems as water damage, mould growth, and air quality. The impact on insurance companies of events associated with temperature extremes, rainfall, wind and other extremes are discussed. Some insurance companies are responding to the increased risk by increasing premiums, withdrawing cover and limiting payouts, which may adversely affect the construction industry.	Mills, E., 2003: Climate change, insurance and the building sector: technological synergisms between adaptation and mitigation. *Building Research and Information*, **31**, 257-277.															
50	Agric	Investigating options for attenuating methane emission from Indian rice fields	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 emission from paddy fields, which are thought to be a major source of methane emission in tropical Asia. Promising among the mitigating options may be water management, organic amendments, fertiliser application and selection of rice cultivars. 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, application of sulphate-containing chemical fertilisers, 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 best 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 stage may drastically affect the rice yields. Thus, care must be taken to mitigate methane emission without affecting rice yields.	Singh, S.N., A. Verma and L. Tyagi, 2003: Investigating options for attenuating methane emission from Indian rice fields. *Environment International*, **29**, 547 - 553.															
51	Trade-offs	Equitable cost-benefit analysis of climate change policies	The literature of welfare-maximising greenhouse gas emission reduction strategies pays remarkably little attention to equity. This paper introduces three ways to consider efficiency and equity simultaneously. 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 affected worst 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 aggregations of welfare (the utilitarian default is linear) in a co-operative setting. This method cannot distinguish between sources of inequity. The higher the aversion to inequity, the higher the optimal greenhouse gas emission reduction.	Tol, R.S.J., 2001: Equitable cost-benefit analysis of climate change policies. *Ecological Economics*, **36**, 71-85.															

No.	Acronym	Title	Description	Citations	Driver	Link to CC (mitigation)	Link to CC (adaptation)	Extremes	Actors	Number	Conflict	Framework	Planning	Cost	Geography	Multiplier	Timing	Ecosystems	Poverty
52	Tour	Mitigating GHG emissions from tourism	Tourism contributes directly and indirectly to climate change. Direct emissions of GHG of tourism mainly relate to transport, which can account for up to 95% of the total emissions released during a particular trip. Accordingly, emissions of transport within the destination are small in comparison to those to the destination, for example 1:14 for inbound tourism to Amsterdam, or 1:20 in the Seychelles. Overall, the carbon intensity of a trip will depend on the mode of transport, load factor, travel distance and the length of stay. Societal trends will influence the total amount of emissions caused in the future, as people tend to travel more often, for shorter periods, and to more distant destinations. In summary, tourism's role in generating GHG emissions is significant and likely to become more important given current trends. The discussion of mitigation strategies for tourism cannot ignore the absolute and relative economic importance of this sector. One strategy might thus be to evaluate tourism's eco-efficiency, that is, the revenue generated per unit of CO_2 emitted. There is evidence that some tourist trips cause up to 400 times more emissions per unit of financial value generated than others. For some destinations such as tropical islands, however, tourism might be of great economic importance, and, despite its less favourable eco-efficiency, there might be few alternative economic income alternatives. Thus, solutions need to be sought for these destinations, which, as should be noted, account only for a minority of the overall transport volume: 135,000 arrivals for the Seychelles in 2002 or 170,000 for Madagascar in 2001 compared to 77 million for France in 2002. Hence, the discussion of alternative economic opportunities for peripheral economies should not influence the overall debate on reducing transport volumes. Note that tourism, and particularly tourism in small developing islands, is also a potential victim of climate change, which might be an incentive to reduce its emissions, particularly of the rather minor share of tourists standing for a comparably large share of total emissions.	Becken, S. and D. Simmons, 2002: Understanding energy consumption patterns of tourist attractions and activities in New Zealand. *Tourism Management*, **23**, 343-354. Becken, S., 2002: Analysing international tourist flows to estimate energy use associated with air travel. *Journal of Sustainable Tourism,* **10**, 114-131. Becken, S., D. Simmons and C. Frampton, 2003: Energy use associated with different travel choices. *Tourism Management*, **24**, 267-278. Ceron, J.P. and G. Dubois, 2005: More mobility means more impact on climate change : prospects for household leisure mobility in France. *Belgeo*., **2005**, 103-120. Dubois, G. and J.P. Ceron, 2005: Greenhouse gas emissions from tourism under the light of equity issues. *Tourism, recreation and climate change*, C.M. Hall Ed., Channel View publications, Clevedon. Gössling, S., 2002: Global environmental consequences of tourism. *Global Environmental Change,* **12**, 283-302. Gössling, S., C. Borgström-Hansson, O. Hörstmeier and S. Saggel, 2002: Ecological footprint analysis as a tool to assess tourism sustainability. *Ecological Economics*, **43**, 199-211. Gössling, S., P. Peeters, J.-P. Ceron, G. Dubois, T. Patterrsson and R. Richardson, 2005: The eco-efficiency of															
53	EnergyAdapt	The impact of climate change uncertainties on the performance of energy efficiency measures applied to dwellings.	European Union and UK energy policy recognise 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 realising such potential. There is growing evidence that the global climate is changing. In the UK, projected climate changes could have a considerable impact on the thermal performance of the built environment and on measures implemented to improve such performance. Building simulations designed to investigate the potential impact of climate change uncertainties on the performance of insulation measures, applied retrospectively to an existing residential dwelling, suggest their effect could be considerable. Thermally, double glazing is the best option because although it is more sensitive than the others to climate change, it still delivers the highest savings in heating energy demand for the lowest induced cooling load. Loft insulation is the worst option in thermal terms. A case study has been developed to investigate the relative performance of energy efficiency measures applied retrospectively to an existing residential dwelling. It focuses on the impact of uncertainties associated with the nature of climate change, and considers how different climate scenarios influence both heating and cooling demand.	Gaterell, M.R. and M.E. McEvoy, 2005: The impact of climate change uncertainties on the performance of energy efficiency measures applied to dwellings. *Energy and Buildings*, **37**, 982-995.	Anticipating long term climate change	--	Strong link made by authors		National	Small network	Win-win		Strategic						
54	Hazards	Drought bumps up global thermostat	As the European drought continues, two research groups have warned that it will unleash large amounts of CO_2 into the environment. Estimates from CarboEurope, a European Union research team based in Jena, Germany, suggest that during July and August 2003, around 500 million tonnes of carbon escaped from western Europe's forests and fields as crops shrivelled, soils desiccated and trees burnt. The releases are equivalent to around twice the emissions from fossil-fuel burning in the region over the same period.	Pearce, F., 2005: Drought bumps up global thermostat. *New Scientist*, **2511**, 10.														
55	Geo-eng	Geoengineering Earth's radiation balance to mitigate climate change from a quadrupling of CO_2	It has been suggested that climate change induced by anthropogenic CO_2 could be counteracted with geoengineering schemes designed to diminish the solar radiation incident on the Earth's surface. Though the spatial and temporal pattern of radiative forcing from greenhouse gases differs from that of sunlight, it was shown in a recent study that these schemes would largely mitigate regional or seasonal climate change for a doubling of the atmospheric CO_2 content. Here, we examine the ability of reduced solar luminosity to cancel the effects of quadrupling of CO_2 content. In agreement with our previous study, geoengineering schemes could markedly diminish regional and seasonal climate change. However, there are some residual climate changes: in the geoengineered 4×CO_2 climate, a significant decrease in surface temperature and net water flux occurs in the tropics; warming in the high latitudes is not completely compensated; the cooling effect of greenhouse gases in the stratosphere persists and sea ice is not fully restored. However, these residual climate changes are much smaller than the change from quadrupling of CO_2 without reducing solar input. Caution should be exercised in interpretation because these results are from a single model with a number of simplifying assumptions. There are also many technical, environmental and political reasons not to implement geoengineering schemes. http://eed.llnl.gov/cccm/pdf/Govindasamy_etal_2003.pdf	Govindasamy, B., K. Caldeira and P.B. Duffy, 2003: Geoengineering Earth's radiation balance to mitigate climate change from a quadrupling of CO_2. *Global and Planetary Change*, **37**, 157-168.														

No.	Acronym	Title	Description	Citations	Driver	Link to CC (mitigation)	Link to CC (adaptation)	Extremes	Actors	Number	Conflict	Framework	Planning	Cost	Geography	Multiplier	Timing	Ecosystems	Poverty
56	Geo-eng	The effects of iron fertilisation on carbon sequestration in the Southern Ocean	An unresolved issue in ocean and climate sciences is whether changes to the surface ocean input of the micronutrient iron can alter the flux of carbon to the deep ocean. During the Southern Ocean Iron Experiment, we measured an increase in the flux of particulate carbon from the surface mixed layer, as well as changes in particle cycling below the iron-fertilised patch. The flux of carbon was similar in magnitude to that of natural blooms in the Southern Ocean and thus small relative to global carbon budgets and proposed geoengineering plans to sequester atmospheric carbon dioxide in the deep sea.	Busseler, K.O., J.E. Andrews, S.M. Pike and M.A. Charette, 2004: The effects of iron fertilisation on carbon sequestration in the Southern Ocean. *Science*, **304**, 414-417.															
57	Water	Do hydroelectric dams mitigate global warming? The case of Brazil's Curua-una Dam	Hydroelectric dams in tropical forest areas emit greenhouse gases, as illustrated by the Curuá-Una Dam in the Amazonian portion of Brazil. Emissions include carbon dioxide from decay of the above-water portions of trees that are left standing in the reservoir, and methane from soft vegetation that decays under anaerobic conditions on the bottom of the reservoir, especially macrophytes (water weeds) and vegetation that grows in the drawdown zone and is flooded when the reservoir water level rises. Some methane is released from the reservoir surface through bubbling and diffusion, but larger amounts are released from water passing through the turbines and spillway. Methane concentration in the water increases with depth, and the turbines and spillway draw water from sufficient depth to have substantial methane content. In 1990 (13 years after filling), the Curuá-Una Dam emitted 3.6 times more greenhouse gases than would have been emitted by generating the same amount of electricity from oil.	Fearnside, P.M., 200: Do hydroelectric dams mitigate global warming? The case of Brazil's Curua-una Dam. *Mitigation and Adaptation Strategies for Global Change*, **10**, 675-691.															
58	affor	Conflicts between biodiversity and carbon sequestration programmes: economic and legal implications	The economic and legal implications of the inter-relationship between carbon sequestration programmes and biodiversity are analysed. Firstly, the current treatment of this issue under the Framework Convention on Climate Change process is presented. Secondly, the implications of carbon incentives for existing forests are studied (basing the analysis on an extension of the Hartman model including carbon sequestration and biodiversity values). Then the expected influence of this policy on decisions about which type of forest to use for afforestation and reforestation is discussed. An optimal control model is used to analyse the choice between two types of forests: (i) one with high timber and carbon sequestration values but lower, or negative, biodiversity values; and (ii) one with lower timber and carbon sequestration benefits, but with high biodiversity values. Finally, the relationship between the Kyoto process and the Convention on Biological Diversity is investigated, to assess whether or not the latter is expected to have any influence on the outcomes obtained in the analysis above. Results show that creating economic incentives for carbon sequestration may have negative impacts on biodiversity, especially for afforestation and reforestation programmes.	Caparrós, A. and F. Jacquemont, 2003: Conflicts between biodiversity and carbon sequestration programs: economic and legal implications. *Ecological Economics*, **46**, 143-157.	Anticipating long-term climate change	Strong link made by authors	Likely link--assessment by LAs	--	National	Small network	Negotiated conflict	Indicators	Policy	--	Global	Potential large-scale effects	Medium term (5-20 years)	Managed resource	--
59	affor	From the mountain to the tap: how land use and water management can work for the rural poor	Research published by DFID's Forestry Research Programme (FRP) challenges the view that trees always improve water availability. Extensive research carried out by the University of Newcastle upon Tyne and the Free University of Amsterdam questions conventional wisdom that forested land always conserves and supplies more water than grasslands or other treeless areas. The research reveals that projects, which are designed to improve water conditions in developing countries, may be wasting money because they are pursuing solutions that are not supported by scientific evidence. Although trees can perform many vital environmental functions, their negative effects, such as in water-hungry areas of India, are either misunderstood or ignored. Meanwhile, in places like Costa Rica, landowners are compensated for conserving forests based, in part, on a belief that forests provide more water. http://www.frp.uk.com/assets/Water_book.pdf	UK Forestry Research Programme, 2005: From the mountain to the tap: how land use and water management can work for the rural poor. UK Forestry Research Programme, http://www.frp.uk.com.	Part of development planning	Likely link--assessment by LAs	Likely link--assessment by LAs	--	National	Large number	Long-standing conflict	Sustainable development	Policy	--	Global	Potential large-scale effects	Medium term (5-20 years)	Managed resource	Consistent with poverty reduction
60	affor	Forests and floods: drowning in fiction or thriving on facts?	Every year large-scale floods in the Asian lowlands affect the personal and economic fortunes of millions of people. To many people involved in developing disaster-reduction strategies and flood-mitigation management, it appears that the intensity of floods has increased in the region in recent decades. To a large extent, conventional wisdom — which is sometimes more fiction than fact — about the benefits of forests has clouded the perspectives of decision-makers, leading to an over-emphasis on reforestation and forest protection at the expense of more holistic watershed and river-basin management. The conventional wisdom is that forests act as giant 'sponges', soaking up water during heavy rainfall and releasing freshwater slowly when it is most needed, during the dry months of the year. The reality is far more complex. Although forested watersheds are exceptionally stable hydrological systems, the complexity of environmental factors should cause us to refrain from overselling the virtues of forests and from relying on simple solutions (e.g., removing people currently living in mountainous watersheds, imposing logging bans, or implementing massive reforestation programmes). Rather, the complexity of these processes should prompt us to reassess our current knowledge of the relationship between forests and water, and reconsider conventional responses to one of the most serious disaster threats in the Asia-Pacific region — i.e., large-scale floods. This booklet aims to brief policy-makers, development agencies and the media, and so constructively contribute to the development of sound watershed and river-basin management, and flood-mitigation policies, for the region. http://www.cifor.cgiar.org/publications/pdf_files/Books/BCIFOR0501.pdf	FAO and CIFOR, 2005: Forests and floods: drowning in fiction or thriving on facts? Bogor, Indonesia, CIFOR and FAO Regional Office for Asia and the Pacific. Forest Perspectives No. 2, 38 pp.	Other social, economic or political drivers	Likely link--assessment by LAs	--	Climate event	National	Large number	--	Others???	Policy	Requires large investment	Global	Potential large-scale effects	Near term	Threatened	Consistent with poverty reduction

No.	Acronym	Title	Description	Citations	Driver	Link to CC (mitigation)	Link to CC (adaptation)	Extremes	Actors	Number	Conflict	Framework	Planning	Cost	Geography	Multiplier	Timing	Ecosystems	Poverty
61	affor	Forests and hydrological services: reconciling public and science perceptions	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 develop financing mechanisms for the conservation and protection of indigenous forests. Examples are given of three 'interactive' forest hydrology research programmes: in the UK, South Africa and Panama. Through the involvement of stakeholder groups, often with representatives comprising both the science and public perceptions, interactive research programmes were designed not only to derive new research findings but also to achieve better 'ownership' and acceptance of research findings by the stakeholders. Following this approach, a new programme of research is outlined, aimed at improving our knowledge of forest impacts on seasonal flows, which represents DFID's contribution to the UN Year of Mountains, 2002. It is concluded that to move towards a reconciliation of the different perceptions and to connect policy with science will require further research to understand how the 'belief' systems underlying the science and public perceptions have evolved, and better dissemination of research findings. http://www.frp.uk.com/dissemination_documents/R7937_-_Forests_and_hydrological_services.pdf	Calder, I.R., 2002:, Forests and hydrological services: reconciling public and science perceptions. *Land Use and Water Resources Research*, **2**, 2.1-2.12.	Other social, economic or political drivers	--	--	--	National	Large number	--	Social consensus	Strategic	--	National	--	Near term	Managed resource	Consistent with poverty reduction
62	cultural values	Participatory conservation approaches for Satoyama, the traditional forest and agricultural landscape of Japan	The traditional agricultural landscape of Japan, known as satoyama, consists of a mixture of forests, wet rice paddy fields, grasslands and villages. This landscape supports a 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 Japan's expanding metropolitan areas, with the local loss of many species. Only 7% of the land in the Yokohama area remains as satoyama. City residents and older farmers have become key participants in programmes to protect examples of satoyama. Many urban 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 one particularly successful programme, conservation efforts and fund-raising are linked to 'Totoro', an imaginary forest animal featured in a popular animated film.	Kobori, H. and R.B. Primack, 2003: Participatory conservation approaches for Satoyama, the traditional forest and agricultural landscape of Japan. *Journal of the Human Environment*, **32**, 307-311.	Other social, economic or political drivers	Likely link--assessment by LAs	Likely link--assessment by LAs	--	Local	Small network	Win-win	Sustainable development	Operational	Low cost	Local	Local action only	Near term	Managed resource	Neutral or ambiguous effect
63	resilience	Governance and the capacity to manage resilience in regional socio-ecological systems	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 organization, critical factors for sustainability are resilience, the capacity to cope and adapt, and the conservation of sources of innovation and renewal. However, interventions in social-ecological systems with the aim of altering resilience immediately confront issues of governance. Who decides what should be made resilient to what? For whom is resilience to be managed, and for what purpose? In this paper we draw on the insights from a diverse set of case studies from around the world in which members of the Resilience Alliance have observed or engaged with sustainability problems at regional scales. Our central question is: How do certain attributes of governance function in society to enhance the 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) polycentric and multilayered institutions improve the fit between knowledge, action, and social-ecological contexts in ways that allow societies to respond more adaptively at appropriate levels; and (3) accountable authorities that also pursue just distributions of benefits and involuntary risks enhance the adaptive capacity of vulnerable groups and society as a whole. Some support was found for parts of all three propositions. In exploring the sustainability of regional social-ecological systems, we are usually faced with a set of ecosystem goods and services that interact with a collection of users with different technologies, interests, and levels of power. In this situation, in our roles as analysts, facilitators, change agents, or stakeholders, we not only need to ask: The resilience of what, to what? We must also ask: For whom? http://www.ecologyandsociety.org/vol11/iss1/art19/	Lebel, L., J.M. Anderies, B. Campbell, C. Folke, S. Hatfield-Dodds, T.P. Hughes and J. Wilson, 2006: Governance and the capacity to manage resilience in regional socio-ecological systems. *Ecology and Society*, **11**, 19.	Part of development planning	--	Likely link--assessment by LAs	--	Global	Large number	--	Sustainable development	Strategic	--	Global	--	--	--	--
64	resilience	Adapting to climate change: socio-ecological resilience in a Canadian western Arctic community	Human adaptation remains an insufficiently studied part of the subject of climate change. This paper examines the questions of adaptation and change in terms of social-ecological resilience using lessons from a place-specific case study. The Inuvialuit people of the small community of Sachs Harbour in Canada's western Arctic have been tracking climate change throughout the 1990s. We analyse the adaptive capacity of this community to deal with climate change. Short-term responses to changes in land-based activities, which are identified as coping mechanisms, are one component of this adaptive capacity. The second component is related to cultural and ecological adaptations of the Inuvialuit for life in a highly variable and uncertain environment; these represent long-term adaptive strategies. These two types of strategies are, in fact, on a continuum in space and time. This study suggests new ways in which theory and practice can be combined by showing how societies may adapt to climate change at multiple scales. Switching species and adjusting the 'where, when, and how' of hunting are examples of shorter-term responses. On the other hand, adaptations such as flexibility in seasonal hunting patterns, traditional knowledge that allows the community to diversify hunting activities, networks for sharing food and other resources, and intercommunity trade are longer-term, culturally ingrained mechanisms. Individuals, households, and the community as a whole also provide feedback on their responses to change. Newly developing co-management institutions create additional linkages for feedback across different levels, enhancing the capacity for learning and self-organisation of local inhabitants and making it possible for them to transmit community concerns to regional, national and international levels. http://www.consecol.org/vol5/iss2/art18	Berkes, F. and D. Jolly, 2001: Adapting to climate change: socio-ecological resilience in a Canadian western Arctic community. *Conservation Ecology*, **5**, 18.	Reacting to climate events	--	Strong link made by authors	Climatic episode	Local	Few	--	Indicators	--	Low cost	Local	Local action only	Near term	Unique	Consistent with poverty reduction

No.	Acronym	Title	Description	Citations	Driver	Link to CC (mitigation)	Link to CC (adaptation)	Extremes	Actors	Number	Conflict	Framework	Planning	Cost	Geography	Multiplier	Timing	Ecosystems	Poverty
65	Policy	Linking Adaptation and Mitigation in Climate Change Policy	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 actual policy making. Herein we use the economic theory of endogenous risk to address this optimal mix of mitigation and adaptation strategies, and examine how increased variability in climate change threats affects this mix. We stress that a better understanding of the cross-links between mitigation and adaptation would potentially make it possible to provide more risk reduction with less wealth. Policies that are formulated without considering the cross-links can unintentionally undermine the effectiveness of public-sector policies and programmes because of unaddressed conflicts between the strategies. We also discuss the cross-disciplinary lessons to be learned from this literature, and identify important research questions to spur discussion in the next round of inquiry.	Kane, S. and J.F. Shogren, 2000: Linking adaptation and mitigation in climate change policy. *Climatic Change*, **45**, 75-102.	Anticipating long-term climate change	Strong link made by authors	Strong link made by authors	--	National	Large number	Negotiated conflict	Cost-benefit or cost-effectiveness	Policy	--	National	Potential large-scale effects	Medium term (5-20 years)	--	--
66	Synergies	Synergy of adaptation and mitigation strategies in the context of sustainable development: the case of Vietnam	An emerging topic in current climate negotiations is the political momentum for recognising adaptation to climate change as a crucial part of a comprehensive climate policy. However, there are a number of arguments and doubts raised by politicians, negotiators and environmentalists alike with regard to the necessity of implementing adaptation in parallel with mitigation. The first aim of this article is to analyse possible contradictions and synergies between these two strategies and analyse 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 welfare. This empirical analysis provides a basic understanding of how to address thorny questions in a nascent process of designing public climate policy in Vietnam. Lessons drawn from this research should be replicable in other developing countries with similar circumstances.	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. *Climate Policy*, **3**, 81-96.	Part of development planning	Strong link made by authors	Strong link made by authors	--	National	Large number	--	Sustainable development	Strategic	--	National	--	Medium term (5-20 years)	--	--
67	Synergies	Mitigation versus adaptation: the political economy of competition between climate policy strategies and the consequences for developing countries	So far, the dominant paradigm in international climate policy has been mitigation, while adaptation has been a low-key issue. However, with LDCs starting to push for adaptation side payments it has recently gained importance. The allocation of funds and the definition of adaptation activities are currently being discussed. The most outstanding difference between mitigation and adaptation is that mitigation activities contribute to a global public good whereas most forms of adaptation are club goods. Technical adaptation such as building seawalls can be distinguished from societal adaptation, e.g. different land-use patterns. Generally, there is a trade-off between mitigation and adaptation strategies, as resources for climate policy, are limited. The choice between mitigation and adaptation strategies depends on the decision-making context. While mitigation will be preferred by societies with a strong climate protection industry and low mitigation costs, the voters' quest for adaptation is linked to the occurrence of extreme whether events. The policy choice in industrialised countries feeds back on the situation in developing countries. Adaptation in industrialised countries enhances the adaptation need in developing countries through declining mitigation activities. Unless this adaptation is financed by industrialised countries, developing countries will be worse off than in a mitigation–only strategy. http://www.hwwa.de/Projekte/Forsch_Schwerpunkte/FS/Klimapolitik/PDFDokumente/Michaelowa%20(2001l).pdf	Michaelowa, A., 2001: Mitigation versus adaptation: the political economy of competition between climate policy strategies and the consequences for developing countries. HWWA Discussion Paper 153, Hamburg Institute of International Economics, Hamburg, 34 pp.	Anticipating long-term climate change	Strong link made by authors	Strong link made by authors	--	Global	Large number	Long-standing conflict	Social consensus	Policy	--	Global	Potential large-scale effects	Medium term (5-20 years)	--	Increased inequality or poverty
68	corporate	Corporate governance and climate change: making the connection	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 Protocol1 in 2005, managing greenhouse gas emissions is now a routine part of doing business in key global trading markets. As the United States moves to join the international effort to combat global warming, climate governance practices will assume an increasingly central role in corporate and investment planning. Eventually, nothing short of an energy and technology revolution will be needed to stem rising greenhouse gas emissions across the globe. Faced with record warmth, unprecedented hurricane activity and rapid shrinking of polar ice caps, industry opposition to confronting climate change is diminishing. Sceptics no longer question whether human activity is warming the globe, but how fast. Companies at the vanguard no longer question how much it will cost to reduce greenhouse gas emissions, but how much money they can make doing it. Financial markets are starting to reward companies that are moving ahead on climate change, while those lagging behind are being assigned more risk. Ultimately, effective corporate responses to climate change must be built on well-functioning environmental management systems and properly focused governance practices. Shareholders and financial analysts will increasingly assign value to companies that prepare for and capitalise on business opportunities posed by climate change—whether from greenhouse gas regulations, direct physical impacts or changes in corporate reputation. This report is designed to be used as a benchmarking tool by institutional investors and corporations that are ready to seize on these trends. It employs a 'Climate Change Governance Checklist' to evaluate how 76 U.S. companies and 24 non-U.S. companies are addressing climate change through board oversight, management execution, public disclosure, emissions accounting and strategic planning. Information was gathered and synthesised over the past nine months from securities filings, company reports, company websites and third-party questionnaires. Each of the 100 companies in this report was given an opportunity to comment on the draft profiles, 84 companies returned comments. http://www.ceres.org/pub/docs/Ceres_corp_gov_and_climate_change_0306.pdf	Cogan, D.G., 2006: Corporate governance and climate change: making the connection. Ceres and Investor Responsibility Research Centre, 300 pp.	Anticipating long-term climate change	Strong link made by authors	Strong link made by authors	Climatic episode	Global	Large number	Win-win	Cost-benefit or cost-effectiveness	Operational	--	Global	Multipliers could be significant	Near term	Managed resource	Neutral or ambiguous effect

No.	Acronym	Title	Description	Citations	Driver	Link to CC (mitigation)	Link to CC (adaptation)	Extremes	Actors	Number	Conflict	Framework	Planning	Cost	Geography	Multiplier	Timing	Ecosystems	Poverty
69	Budgets	Adaptation to climate change: a paper for the International Climate Change Taskforce	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 UK's presidencies of the EU and G8 in 2005, which present a major opportunity to give new momentum to this issue. It is critical that the leaders of the G8 accept responsibility for assisting poor countries in adapting to climate change. http://www.ippr.org.uk/ecomm/files/adaptation.pdf	Huq, S., 2005: Adaptation to climate change: a paper for the International Climate Change Taskforce. Institute for Public Policy Research, 20 pp.	Anticipating long-term climate change	Link suggested by authors	Strong link made by authors	--	Global	Small network	Win-win	--	Strategic	Requires large investment	Global	Potential large-scale effects	Near term	--	Consistent with poverty reduction
70	Policy	Integrated strategies to reduce vulnerability and advance adaptation, mitigation and sustainable development	Determinants of adaptive and mitigative capacities (e.g., 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 themselves indicators of sustainable development (e.g., per capita income and various public health, education and research indices). Moreover, climate change could exacerbate existing climate-sensitive hurdles to sustainable development (e.g., hunger, malaria, water shortage, coastal flooding and threats to biodiversity) faced specifically by many developing countries. Based on these commonalities, the paper identifies integrated approaches to formulating strategies and measures to concurrently advance adaptation, mitigation and sustainable development. These approaches range from broadly moving sustainable development forward (by developing and/or 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 and would worsen with climate change. The resulting sustainable economic development would also help reduce birth rates, which could mitigate climate change and reduce the population exposed to climate change and climate-sensitive risks, thereby reducing impacts, and the demand for adaptation. The paper also offers a portfolio of pro-active strategies and measures consistent with the above approaches, including example measures that would simultaneously reduce pressures on biodiversity, hunger, and carbon sinks. Finally it addresses some common misconceptions that could hamper fuller integration of adaptation and mitigation, including the notions that adaptation may be unsuitable for natural systems, and mitigation should necessarily have primacy over adaptation. http://members.cox.net/igoklany/Goklany-Integrating_A&M_preprint.pdf	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.	Anticipating long-term climate change	Strong link made by authors	Strong link made by authors	Climatic episode	National	Large number	Win-win	Sustainable development	Strategic	--	National	Potential large-scale effects	Medium term (5-20 years)	Managed resource	Consistent with poverty reduction