Table 2a. Impacts on human systems due to temperature rise, precipitation change and increases in extreme events

Temp-erature rise above Pre-ind-ustrial	Year in which this occurs	Population scenario	Impact to human systems m.a.r. = additional millions of people at risk than would be the case in absence of climate change	GCM used	Region affected	Source
			OBSERVED IMPACTS			
<= 0.6	1967 onwards		Abrupt change in regional rainfall pattern causing food insecurity, water stress (not attributed)		Sahel	Dore 2005
0.6	2004		Extreme weather is causing substantial and increasing damage partly due to climatic factors (not attributed)			IPCC 2001
0.6	2004		Increase in severity and frequency of extreme events in tropical small island states (not attributed)			Krishna et al 2000; Trotz 2002; Hay et al 2003
0.6	2000	-	Climate change has been MODELLED (not observed) to have caused the loss of 150,000 lives and 5.5 million DALY/yr since 1970		Globe	McMichael et al 2004
0.6	2004		Changes in streamflows, flood and drought observed (e.g. earlier peak runoff) (not attributed)		Europe, Russia, N America, Sahel, Peru, Brazil, Colombia	
0.6	2004	-	High temperatures of 2004 summer in Europe attributed to anthropogenic cause with greater than … confidence		Europe	Stott 2004
0.6	2004		Heatwave associated with unusual 2004 summer caused 14802 deaths in France, and approximately 25000 in Europe			WHO 2004
0.6	2000		Since 1970, number people affected by drought increased from		Southern Africa	ECF 2004

		0 to 35 million (not attributed)		
0.6		Increased frequency and intensity of drought (not attributed)	Africa, Asia, SW Australia	IPCC 2001, ECF 2004
0.6		Increased cloud amount, annual precipitation, and heavy precipitation events (not attributed)	Mid- and high-latitudes N henisphere	IPCC 2001, Dore 2005
0.6		Lake and river ice duration reduced by 2 weeks (not attributed)	Mid and high latitudes N hemisphere	Dore 2005
0.6	2004	Water stress increase associated with drying & warming (not attributed)	Australia	ECF 2004
0.6		Rainfall decline in W hemisphere, subtropics, E equatorial region observed, consistent with more frequent El Nino-like conditions	S hemisphere, especially 5 Andean countries	ECF 2004
		PREDICTED CHANGES		
From 0.6 C upward. rising with T		Very likely more heatwaves, causing elevated mortality rates in elderly/urban poor, risk crop damage, stress to livestock, increased cooling demand	All land areas	IPCC TAR
From 0.6C upward rising with T		Decreased cold days in twentieth century. Higher minimum temperatures, reducing cold-related mortality. Increased risk to some crops, decreased to others, reduced heating demand. Extended range of some pests and disease vectors.	Almost all land areas	IPCC TAR; Tol 2002
From 0.6C upward rising with T		Increased summer drying over continents likely, decreasing crop yields, damaging buildings, decreasing water resources	Continental interiors	IPCC TAR

		and increasing forest fire		
From 0.6C upward rising with T		Increase in magnitude/frequency of precipitation events, very likely: causing floods, landslides, avalanche, increased soil erosion (not attributed)		IPCC TAR
From 0.6C upward rising with T		More intense El Nino, increasing strength of associated droughts/floods likely, decreasing agricultural productivity and hydro-power potential, causing water stress	S America, Australia	IPCC TAR
From 0.6C upward rising with T	2025	Water quality degraded	Some regions	IPCC TAR
From 0.6C upward rising with T		Melting permafrost disrupts built infrastructure and destabilises slopes causing landslides	Arctic	IPCC TAR
From 0.6C upward rising with T	2025	Increased energy demand for summer cooling demand and decreased winter heating demand very likely	Europe, N America	IPCC TAR
From 0.6C upward rising with T	2025	Market sector losses likely in many developing countries, mixture of gains and losses in developed countries	Globe	IPCC TAR
From 0.6C upward rising with T		Large scale damage to infrastructure and threat to human lives	Caribbean & tropical small island states due to increased magnitude and frequency of extreme weather events	IPCC TAR

From 0.6C upward rising with T			As above	Himalayas: glacier lake outbursts	
From 0.6C upward rising with T			As above	Andes: rainfall decline/ massive glacier melt eliminating hydropower and water supplies; outburst floods	
From 0.6C and upwards			As predator-prey and plant-pollinator relationships disconnect in shifting ecosystems, leading to extinctions of pollinators and pest-predators, agricultural crops lose key pollinators and pests increase in many areas, reducing yields considerably	Globe	ref
Observed and predicted to worsen			Rainfall decline, loss of glaciers predicted; *serious drinking water, energy generation and agriculture problems, adaptation may not be economically feasible*. In 20 years glaciers below 5500m will have disappeared causing hydropower problems	Peru	ECF 2004
0.8	2030	S550	Malarial risk increased by factor 1.27, dengue by 1.3	N America	McMichael et al 2004
0.8	2030	S550	Risk of death due to flooding increased by 1.44	W Africa	McMichael et al 2004
0.8	2030	S550	Risk of death due to flooding increased by 3.58	C/S America	McMichael et al 2004
0.8-2.6	2050		Higher market impact likely in developing countries, more losses and fewer gains in developed countries	Globe	IPCC 2001
0.8-2.6	2050		Increased insurance prices	Globe	IPCC 2001

			and reduced availability of insurance very likely			
1	2020	IS92a + S750	240 mar from water stress	HadCM2	Globe	Arnell 02
1			10% decrease barley yield		Uruguay	IPCC 2001
1			6-10% decrease rice yield		S Asia	ECF 2004
1	2020	-	Disbenefit to agriculture		Less developed	HBare
1	2020	-	Benefit to agriculture		Developed	Hare 03
1.1	2025	B1:2882 or 37% population under water stress if no cc	400 additional mar from water stress under climate change; 1819 m with decrease in water stress*	HadCM3	Globe	*Arnell 04
1.2	2025	A2: 3320 or 39% population under water stress if no cc	615-1660 or 500 – 915 (5 GCMs) mar from water stress 1385-1893 or 1140-2423 (5 GCMs) m with decrease in water stress*	5 GCMs	Globe	*Arnell 04
1.2	2025	B2: 2883 (36%) population under water stress if no cc	508-592 (HadCM3) or 374 – 1183 (5GCMs) mar from water stress 1651-1937 or 1261-2202 (5 GCMs) m with decrease in water stress*	5 GCMs	Globe	*Arnell 04
1.3	2025	A1F1: 2882 (37%) population under water stress if no cc	829 mar from water stress 649 m with decrease in water stress*	HadCM3	Globe	*Arnell 04
1.3	-	-	Food price rise begins		Globe	Hare 03
1.3	2060	-	21% rise in timber production for 2045-2095; 30% rise by 2095-2145 (Temp assumed to be stable in 2060)	Hamburg GCM	Globe	Sohngen et al 2001
1.3	2050	S550	Risk of death due to flooding increased by 1.48		W Africa	McMichael et al 2004
1.3	2050	S550	Risk of death due to flooding increased by 3.76		C/S America	McMichael et al 2004

1.3	2030	S750	Malarial risk increased by factor 1.33, dengue by 1.33		N America	McMichael et al 2004
1.3	2050	IS92a + S550	160-220 mar from malaria	HadCM2	Globe	Parry 01
1.3	2050	IS92a + S550	5 mar from hunger	HadCM2	Less developed	Parry 01/Hare 03
1.3	2080	IS92a + S450	400 mar from water stress	HadCM2	Globe	Parry 01
1.3	2080	IS92a + S450	150 mar from malaria	HadCM2	Globe	Parry 01
1.4	2050		Shorelines behind bleached coral reefs now vulnerable to storm damage; damage and tourism loss could lead to 140-420million$ loss in Caribbean alone.		Caribbean, Indian Ocean, small island states	ECF 2004
1.4	2020		Irrigation requirements increase in 11 out of 17 world regions as result of climate change	HadCM2	Globe	Doll 2002
1.4-5.8	2100		High market impacts likely in developing countries, net losses in developed countries			IPCC 2001
1.5	2080	IS92a + S450	165 mar from malaria	HadCM2	Globe	Parry 01/Hare 03
1.5 with 8% increase in precipitation			Farm values increase by between 188-311 bn $		USA	Mendelsohn et al 1996 [1]
1.5	2025		Increase in water stress in Africa & S America; decrease in Europe and N America			Vorosmarty et al 2000
2-4	2055 -		Increase in water stress in Mediterranean, C & S Africa,			*Arnell 2004

[1] This result is based on the hedonic method, which uses the spatial difference in bio-economics of agriculture between warm and cold regions to predict the consequences of increasing temperatures in present-day cold regions to those of present-day warm regions, thus assuming that changes in time and space are equivalent, that systems immediately just to a new stable state so that there is no consideration of time-dependence, and only annual average regional temperatures are considered, so changes and seasonal variability in temperature or rainfall are not considered (Schneider 1997). The author does not think that these assumptions are credible. It also assumes that precipitation measures the water supply for crops and that future changes in production costs will be capitalised in land values in the same way that past production costs were capitalised in past land values, both of which are problematic assumptions for the area of study, the USA, where large areas of cropland are irrigated, and construction of new water systems would be very much more costly than continued operations of exitsing ones. Using a hedonic model tied to a national data set of farmland values that combines both dryland and irrigated farming counties is likely to be questionable both on econometric grounds, because it combines what we expect to be two heterogeneous equations with different variables and different coefficients into a single regression, and also on economic grounds, since we expect it to understate future capital costs, especially those borne by farmers, in the areas that will need additional surface water irrigation due to the effects of climate change. (Schlenker et al 2004).

	2085		Europe, C & S America. Decreases in SE Asia.			
1.5 with 8% increase in precipitation	Any		$5.3-5.4 billion losses in dryland agriculture		USA	Schlenker et al 2004
1.5-2C	-	-	Poor farmers' income declines in this range		Less developed	Hare 03
1.6	2030		Malarial risk increased by factor 1.51		N America	McMichael et al 2004
1.6	2030	S550	Risk of death due to flooding increased by 1.64		W Africa	McMichael et al 2004
1.6	2030	S550	Risk of death due to flooding increased by 4.64		C/S America	McMichael et al 2004
1.7	2030		Winter yield increases by % or decreases by 30-40% depending on GCM used to model precip changes		USA	Tubiello et al 2002
1.7	2030		Maize yield changes by -30% to +20% depending on degree to which CO2 fertilisation is realised[2]		USA Gt Plains	Tubiello et al 2002
1.7	2055	B2: 3988 (42%) population under water stress if no cc	1020-1057 (HadCM3) or 670-1538 (5 GCMs) mar from water sress *2407-2623 or 1788-3138 (5 GCMs) m with decrease in water stress	5 GCMs	Globe	*Arnell 04
1.75	2055	B1: 3400 (39%) population under water stress if no cc	988 mar (HadCM3) from water stress *2359 m with decrease in water stress	HadCM3	Globe	*Arnell 04
1.8	2025	A2	0.05 diarrhoeal incidence per capita per year		Globe	Hijioka et al 2002
1.8	1200	S550	International tourism flows negatively impacted		S Europe, Caribbean, SE Asia	Viner 2005, IPCC 2001
1.8 – 2.6	2050		Large scale displacement of		Mahgreb	ECF 2004

[2] Full CO2 fertilisation effects assume no yield reductions due to potential changes in soil nutrients, pollinator scarcity, pest outbreaks and food quality that are associated with climate change

combined with rainfall decrease up to 40%			people (climate refugees from low food security, poverty and water stress)		(N Africa) and Sahel	
1.8-.2.6	2050s		40% rainfall decline from 1961-1990 average (in all GCMs)		Africa Mahgreb	ECF 2004
1.9	2050	A2: 3320 (39%) population under water stress if no cc	1620-1973 (HadCM3) or 1092-2761 (5 GCMs) mar from water stress 2804-3813 or 1805-4286 (5 GCMs) m with decrease in water stress*	5 GCMs	Globe	*Arnell 04
Any			Increase in magnitude of cyclones likely, increasing risks to human life, infectious disease epidemics, coastal erosion and damaging coastal infrastructure, coral reefs and mangroves		Tropical & sub-tropical regions	IPCC 2001
Any	Any		River flood hazard increase		Europe	IPCC 2001
Any			Drought, reduced water supplies for irritation, and increases in crop pests/diseases		All regions	IPCC 2001; Rosegrant & Cline 2003
Any	Any		Sea level rise and cyclones displace several million people from coasts		Tropical Asia	
Any	Any		Runoff increase in N but decrease in arid areas; however in N may not be in useful season	5 GCMs	Asia	IPCC 2001; *Arnell 2004
Any	Any		Vector borne disease expands poleward		Latin America and Asia	IPCC 2001
Not known			Loss of sovereignty of small island states and countries with large low lying deltaic regions			ECF 2004
Not known			Regional conflict over water supplies or food supplies		Nile, parts of Russia	ECF 2004
Not specified			Deglaciation of Himalayan region affects hydrology of Indian region, disrupting		Nepal, India	ECF 2004

			agriculture			
2	-	-	Threshold above which agricultural yields fall		EU, Canada, USA, Australia	Hare 03
2			Double/triple frequency of bad harvests leading to inter-regional political tension		Russia	ECF 2004
2			Destruction of Inuit hunting culture		Arctic	ECF 2004
2			Wheat yield decrease		S Asia	ECF 2004
2			Maize yield 15% decrease		Uruguay	IPCC 2001
2 – 2.5			Food production threatened		Southern Africa, S Asia, parts of Russia	ECF 2004
2 – 2.5			Fisheries impacted		NW Africa, E African lakes	ECF 2004
2 – 2.5			Fishery damage removes primary protein source for 50% of population		Malawi	ECF 2004
2 – 2.5			Combined effects of precipitation changes, floods, droughts, reducing crop yields leading to significant risk commercial & subsistence of up to 80% crop failure		Southern Africa	ECF 2004
1-3 (not known)	2050 - 2100		Dry season water security loss & complete loss glaciers		W China	ECF 2004
2 - 3	2050 - 2100	A1B:	Increase in magnitude/frequency of precipitation: causing high flood damage		Japan	Emori 2005
2.1	2080	IS92a + S750	2.3-3.0 bar from water stress	HadCM2	Globe	Parry 01
2.3	2050	IS92a	26 mar from coastal flood (ie a doubling of the 26 mar in absence of climate change)	HadCM2	Globe especially S & SE Asia	Parry 2001, IPCC 2001, Nicholls & Lowe 2004
2.3	2050	IS92a	180-230 mar from malaria	HadCM2	Globe	Parry 01
2.3	2050	IS92a	10% loss in maize production equivalent to losses of		Africa & Latin	Jones & Thornton

			$2bn/yr		America	2003
2.3	2100		30-70% loss snowpack losing 13-30% water supply		California	Hayhoe 2005
2.3			13-30% loss water supply due to snowpack loss		California	Hayhoe 2004
2.3	2080	IS92a >S1000	230-270 mar from malaria	HadCM2	Globe	Parry 01
2.3	2080	IS92a, >S1000	33 mar from hunger	HadCM2	Less developed	Parry 01/Hare 03
2.3	2080	B1	4-8% increase in millions at risk of hunger (4 – 8 million)	HadCM3 CSIRO NCAR CGCM2	Globe	Fischer et al 2001
2.3-2.7	2080	B1/B2	5% fall in cereal production yield	HadCM3		Parry 04
2.36	2080	B1	2-3 mar from coastal flood	HadCM3	Globe	Parry 04
2.36	2080	B1	10-20 mar from hunger	HadCM3		Parry 04
2.36	2050	IS92a, unmit	7 mar of hunger	HadCM2	Less developed	Parry 01/Hare 03
2.36	2085	B1:2860 (37%) population under water stress if no cc	1135 mar water stress increase 1732 m with decrease in water stress	HadCM3	Globe	*Arnell 04
2.36	2085	B2:4530 (45%) population under water stress if no cc	1196-1535 (HadCM3) or 867-2015 (5 GCMs) mar water stress 2791-3099 or 2317-3460 (5 GCMs) m with decrease in water stress	5 GCMs	Globe	*Arnell 04
2.5 - 3			Rice yields reduced 10-20% (no CO2 fertilisation) (or change by -10% to 20% assuming total CO2 fertilisation)		China	ECF 2004
2.5 to 4	-	-	Crop failure rise from 50 to 75%		S Africa	ECF
2.56	2055	A1F1:3400 (39%) populatio	1136 mar (HadCM3) from water stress	HadCM3	Globe	*Arnell 04

		n under water stress if no cc	2364 m with decrease in water stress			
2.6	2100	-	30-70% snowpack loss ie 13-30% water supply lost		California	ECF
2.6	-	-	Rapid increase in flooding damaging agriculture and endangering life		Bangladesh	ECF 2004
2.6 and 20% precip			5 to 30% loss rice/wheat yields putting food security at risk		Indian subcontinent	ECF 2004
2.7	2060		Increase of 265 million or decrease of 84 million from reference level of 641 million in 1960, at risk of hunger in developing countries as cereal production falls by 4 to 9%, whilst production increases by 2 to 11% in developed countries	GISS	Globe	Rosenzweig et al 1995
2.7	2080	B2	15% increase in millions at risk of hunger, includes CO2 fertilisation (40 mar)	HadCM3	Globe	Fischer et al 2001
2.7	2080	B2	16-27 mar from coastal flood	HadCM3	Globe	Parry 04
2.7	2080	B2	150 to (-12) mar from hunger (range due to CO2 fertilisation inclusion or not)	HadCM3		Parry 04
3	-	-	65 countries lose 16% agricultural GDP, includes CO2 fertilisation	HadCM3 CSIRO CGCM2 NCAR	Less developed	Fischer 2001
3		2070	Irrigation requirements increase in 12 of world's 17 regions	HadCM3 (also ECHAM 4)	Globe	Doll 2002
3			17-18% increase in seasonal AND perennial potential malarial transmission zones; overall increase for all zones 10%	HadCM2/3	Globe	Martin & Lefevre 1995
3 – 4			Loss in farm income between 9 and 25%		Indian subcontinent	ECF 2004

3 – 4			Wheat yield decline of up to 34%		Indian subcontin ent	ECF 2004
3.1	2090	No evolving baseline: fixed at 1990 world	19% fall in cereal supply without farm level adaptation, 4% with; falls to zero allowing for trade, changes in demand and land use changes to provide new cropland	OSU	Globe	Darwin et al 1995[5]
3 with 25% less rain			Maize and potato yields increase		Chile	Downing 92
3 with - 25% less rain			Wheat and grape yields fall		Norte Chico, Chile	Downing 92
3 with 8% higher precipitation			Farm values increase by between 227-403 bn $		USA	Mendelsohn et al 1996 [3]
3.3	2070 - 2100	IS92a 710 ppm	Increase in cropland suitability of estimated 16% average 4 GCMs if three agree		N Hemisph ere	Ramankutt y et al 2002
3.3	2070 - 2100	IS92a 710 ppm	Small decrease in cropland suitability Average 4 GCMs if 3 agree		Tropics	Ramankutt y et al 2002
3.3	2080	IS92a	75-100 mar from hunger		Globe	Parry 01
3.3	2080	IS92a	80 mar from coastal flooding (only 14 million at risk in absence of climate change)	HadC M2	Globe	Parry 01, Nicholls & Lowe 2004
3.3	2080	IS92a unmit	280-330 mar from malaria	HadC M2	Globe	Parry 01
3.3	2080	-	560-1350 thousand at risk from coastal flooding	HadC M2	Caribbea n	Parry 99
3.3	2080	IS92a, unmit	3.1-3.5 bar from water stress	HadC M2	Globe	Parry 01

[3] This result is based on the hedonic method, which uses the spatial difference in bio-economics of agriculture between warm and cold regions to predict the consequences of increasing temperatures in present-day cold regions to those of present-day warm regions, thus assuming that changes in time and space are equivalent, that systems immediately just to a new stable state so that there is no consideration of time-dependence, and only annual average regional temperatures are considered, so changes and seasonal variability in temperature or rainfall are not considered (Schneider 1997). The author does not think that these assumptions are credible. It also assumes that precipitation measures the water supply for crops and that future changes in production costs will be capitalised in land values in the same way that past production costs were capitalised in past land values, both of which are problematic assumptions for the area of study, the USA, where large areas of cropland are irrigated, and construction of new water systems would be very much more costly than continued operations of exitsing ones. Using a hedonic model tied to a national data set of farmland values that combines both dryland and irrigated farming counties is likely to be questionable both on econometric grounds, because it combines what we expect to be two heterogeneous equations with different variables and different coefficients into a single regression, and also on economic grounds, since we expect it to understate future capital costs, especially those borne by farmers, in the areas that will need additional surface water irrigation due to the effects of climate change. (Schlenker et al 2004).

3.3	2080	IS92a unmit	Coastal flooding several times worse than in 1990		Globe	Arnell 02
3.3-6.3			5-12% drop in country's production;14-41% in agricultural regions		Russia	ECF 2004
3.55	2085	A2:8065 (57%) population under water stress if no cc	2583-3210 (HadCM3) or 1560-4518 (5 GCMs) water stress 4688-5375 or 3372-5375 (5 GCMs) m with decrease in water stress	5 GCMs	Globe	*Arnell 04
3.55	2080	A2	29-50 mar from coastal flood	HadCM3	Globe, especially S/SE Asia, Africa, Mediterranean, and small islands o Indian & Pacific Oceans	Parry 04
3.55	2080	A2	600 mar from hunger (-30 CO2 ff)			Parry 04
3.55	2080	A2	15% increase in number at risk from hunger (120 million), includes CO2 fertilisation	HadCM3 CSIRO	Globe	Fischer et al 2001
3.7	2055	A2	0.1 diarrhoeal incidence per capita per year		Globe	Hijioka et al 2002
3.7	2060	-	Global timber production increases by 17% (2045-2095) and 28% (2095-2145). Temperature is at equilibrium in 2060.	UIUC	Globe	Sohngen et al 2001
4.3	2060	10.2 billion people (UN medium population estimates, similar to IS92a)	+11 to -33% change in wheat yields (depending on CO2 fertilisation included/not) ; +16 to -57% change in soy -15 to -31% change in maize -2 to -12% change in rice cereal price rise of -17 to 145% -13 to 58% increase in numbers at risk of hunger	GISS GFDL HadCM2	Globe, if no adaptation	Rosenzweig et al 1995
4.3	2090	No evolving	23% fall in cereal supply without farm level adaptation,	GFDL	Globe	Darwin et al 1995[5]

		baseline: fixed at 1990 world	4.4% with; falls to zero allowing for trade, changes in demand and land use changes to provide new cropland			
4.3	2060	10.2 billion people	-2 -19% increase in numbers at risk of hunger	GISS GFDL HadCM2	Globe, with farm-level adaptation	Rosenzweig et al 1995
4.3	2080	A1F1	Increase of 26% in millions at risk of hunger (28 million), includes CO2 fertilisation	HadCM3 NCAR CSIRO CCCma	Globe	Fischer et al 2001[4]
4.3	2085	A1:2860 (37%) population under water stress if no cc	1256 mar water stress 1818 m with decrease in water stress	HadCM3	Globe	*Arnell 04
4.3	2080	A1F1	7-10 mar from coastal flood	HadCM3	Globe	Parry 04
4.3	2080	A1F1	300 mar from hunger (30 CO2 ff)	HadCM3		Parry 04
4.3	-	-	Entire regions out of production			Hare 03
4.3/3.6	2080	A1/A2	10% fall in cereal production	HadCM3		Parry 04
4.5	2090	No evolving	30% fall in cereal supply without farm level adaptation,	GISS	Globe	Darwin et al 1995[5]

[4] Fischer et al highlight the fundamental role of SRES scenario choice in influencing additional millions at risk. Under the A2 scenario, the increase in millions at risk due to climate change is very significant, whilst the increase risk is smaller under the other three scenarios. However, note that full benefits of CO2 fertilisation are assumed in this study. Without this assumed benefit, more significant risks would be found for the other scenarios, as found by Parry et al 2001. None of the agricultural studies consider the impacts of extreme weather events on crop production, and only the Parry study provides any insight on the effects of rates of change of climate. All studies consider farm level adaptation.

[5] The Darwin et al study predicts large impacts of climate change, but puts forward the view that adaptations and economic processes, together with land use change can largely offset these impacts. It also does not consider impacts of extreme events or rates of change of climate. To offset the impacts in the UKMO model in 2090, a 15% increase in world cropland is considered necessary, including a doubling of the area farmed in Canada. Such large scale conversion of previously uncultivated land would increase the stresses on ecosystems.

* Arnell 2004 show that although under climate change more watersheds move out of the water stressed category than into it, *the increases in runoff generally occur in high flow seasons, and thus will*

		baseline: fixed at 1990 world	6% with; falls to zero allowing for trade, changes in demand and land use changes to provide new cropland			
4.5			25% increase in potential malarious zones; 40% increase in seasonal zones and 20% decrease in perennial	HadCM2/3	Globe	Martin & Lefevre 1995
5.5			30% increase in potential malarial transmission zones; 55% increase in seasonally affected zones and 40% reduction in perennially affected zones	HadCM2/3	Globe	Martin & Lefevre 1995
5.5	2090	No evolving baseline: fixed at 1990 world	23% fall in cereal supply without farm level adaptation, 2.4% with; falls to zero allowing for trade, changes in demand and land use changes to provide new cropland	UKMO	Globe	Darwin et al 1995[5]

	IS92a	A1	B1	A2	B2
2025	~8200	7926	7926	8714	8036
2050	~9800	8709	8709	11778	9541
2075	~15200	7914	7914	14220	10235

not alleviate water stress unless this water is stored, and indeed, increased flooding in the wet season, rather than reduced water stress, may result. Secondly the *watersheds where rainfall increases are in limited areas of the world only, but these happen to be populous, that is mainly SE Asia*.

Table 2b. Impacts on human systems due to sea level rise

Sea-level rise above 1961-1990 average (m)	Year in which this occurs	Population scenario	Impacts to human systems	Region affected	Source
0.0	Present day	Present day	46 million people are exposed to storm surge flooding at present		Hoozemans et al 1993, Baarse 1995
0.3	2050	IS92a	26 mar from coastal flood (ie a doubling of the 26 million in absence of climate change)	HadCM2	Parry 2001, Nicholls & Lowe 2004
0.4	2140	S550 (stabilisation) in IS92a	45 mar coastal flooding (compared to 3 million in absence of climate change)	HadCM2	Nicholls & Lowe 2004
0.46	2140	S750 (stabilisation) in IS92a	60 mar coastal flooding (compared to 3 million in absence of climate change)	HadCM2	Nicholls & Lowe 2004
0.5	If occurred present day	Present day	Sea level rise causes number of people exposed to storm surge flooding to 92 million per year		Hoozemans et al 1993, Baarse 1995
0.5	2080	IS92a	80 mar from coastal flooding (only 14 million at risk in absence of climate change)	HadCM2	Parry 01, Nicholls & Lowe 2004
0.58	2110	IS92a	Additional 140 mar coastal flooding (only 3 million at risk in absence of climate change)	HadCM2	Nicholls & Lowe 2004
0.75	2140	IS92a	Additional 160 mar coastal flooding (only 1 million at risk in absence of climate change)	HadCM2	Nicholls & Lowe 2004

1.0	If occurred present day	Present day	Sea level rise causes number of people exposed to storm surge flooding to almost triple to 118 million per year		Hoozemans et al 1993, Baarse 1995
1.0			$1000 billion damage due to sea level rise	Global	Fankhauser 1995
1		-	Additional 2m people and additional 55 trillion yen of assets exposed to tides, requiring protection barriers of between 2.8 and 3.5m high	Japan	**Harasawa 2005**
1.0	2100		Damages due to the 1:1000 year flood increase from zero to £25bn (we are currently protected by the Thames barrier against the 1:1000 year flood) for constant population	London if Thames Barrier not upgraded	**Hall 2005**
Any	Any		Population displaced	Nile delta	IPCC 2001
Any	Any		Population displacement & livelihood impacts due to inundation and coastal erosion	Banjul, Gambia Lagos, Nigeria, Gulf of Guinea, Senegal	IPCC 2001
2.0			$2000 billion damage due to sea level rise	Globe	Fankhauser 1995
3-5m	2300		Widespread loss of many of the world's largest cities, widespread loss coastal and deltaic areas including Bangladesh, Nile, Yangtze, Mekong	Globe	ECF 2004; Oppenheimer & Alley 2004