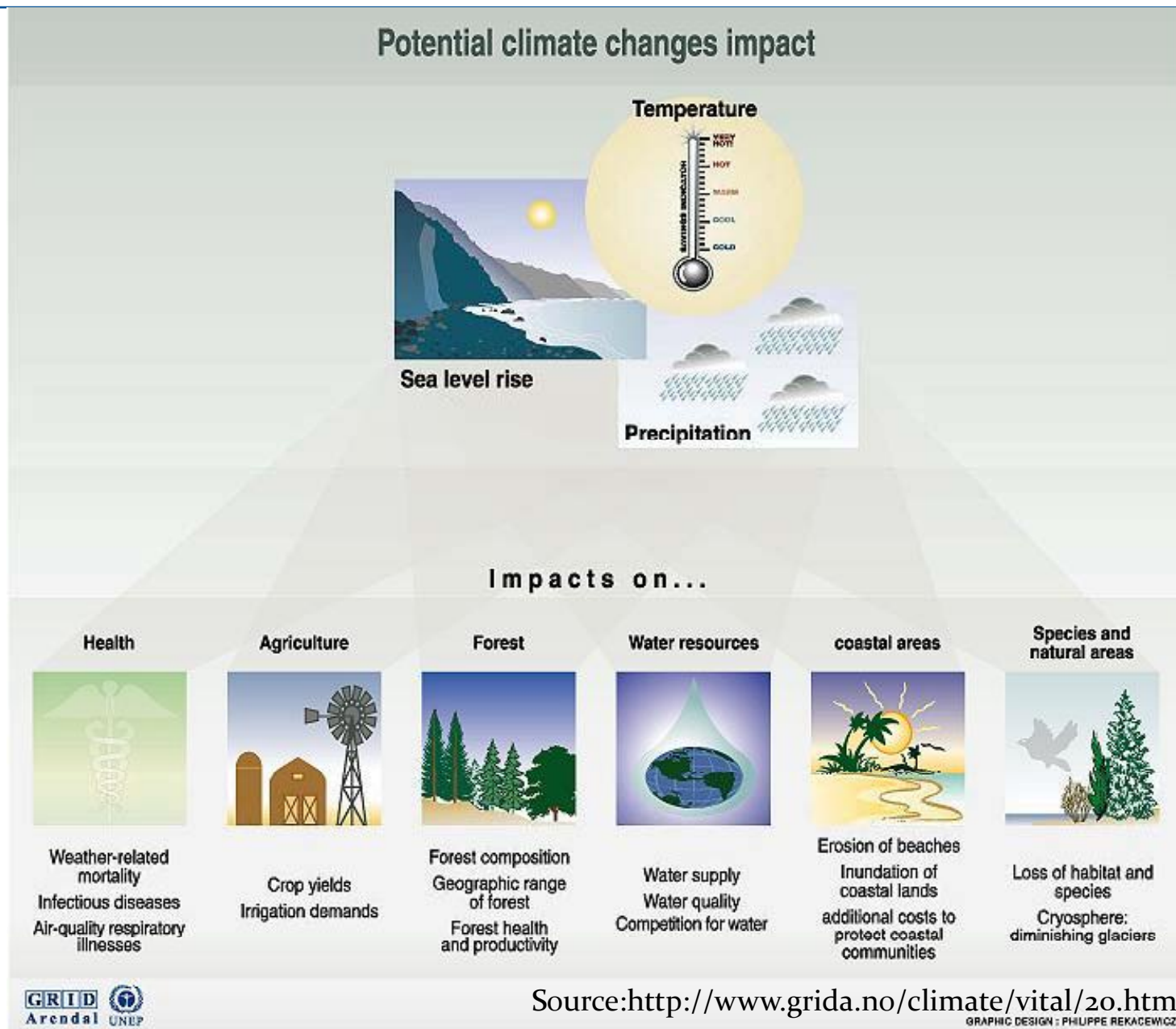


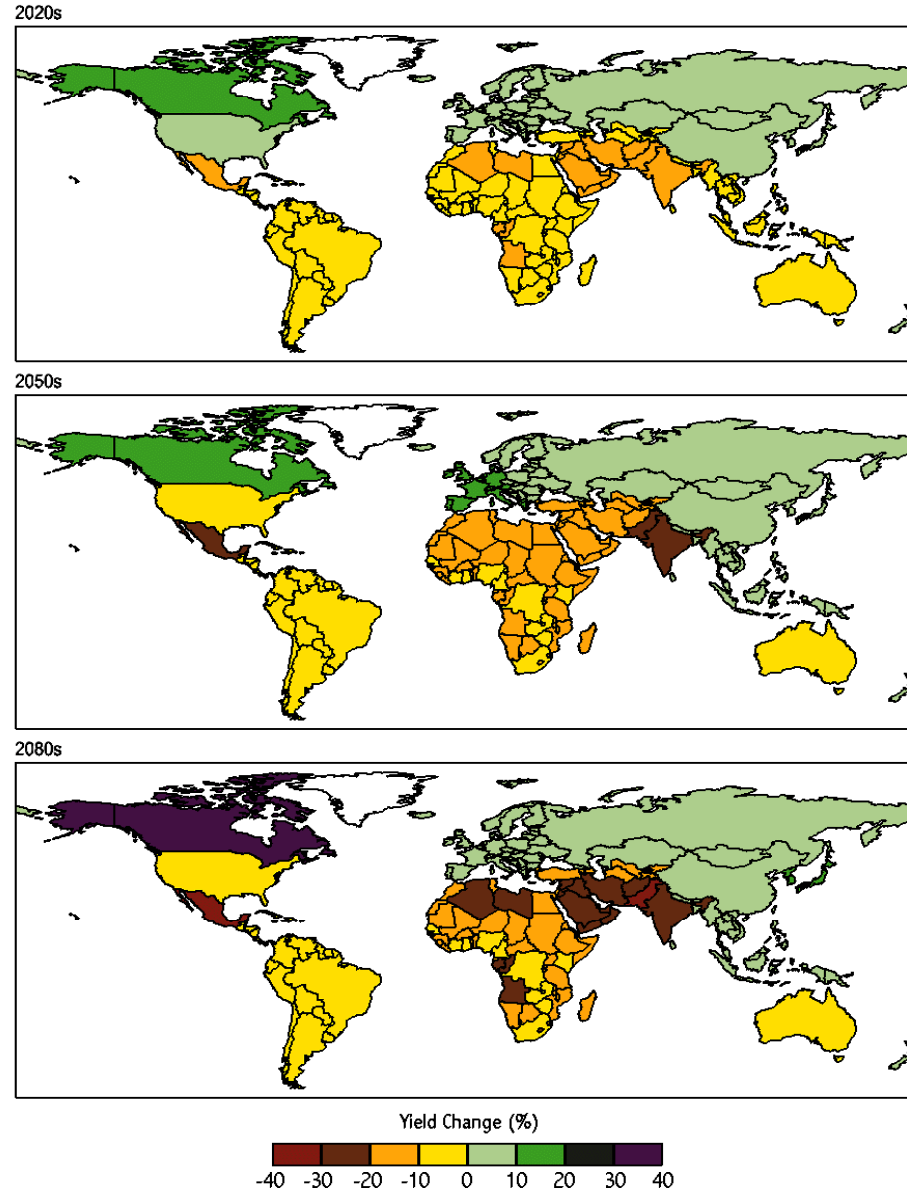
Climate Change

Impacts



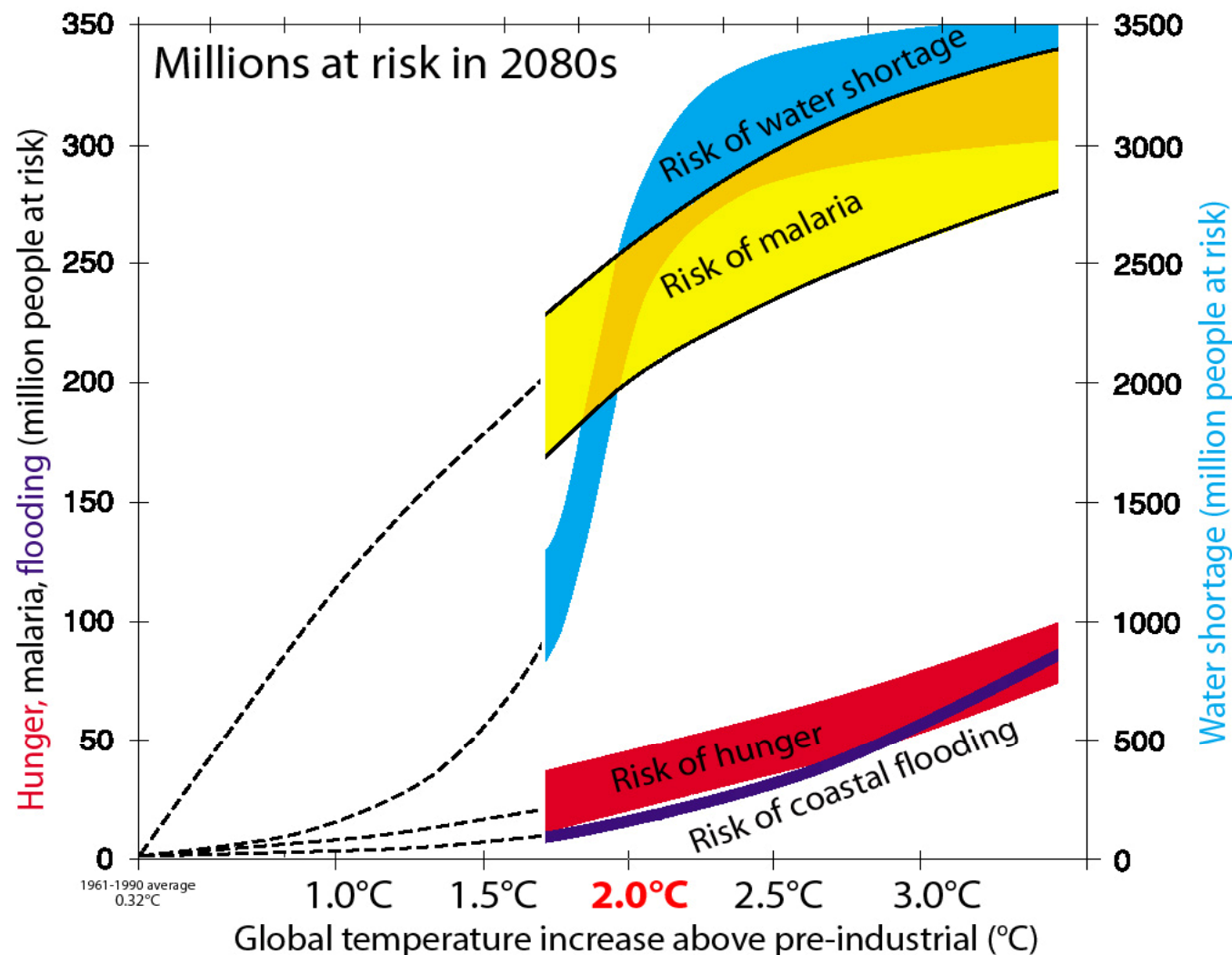
Source: United States environmental protection agency (EPA).

Crop Yields

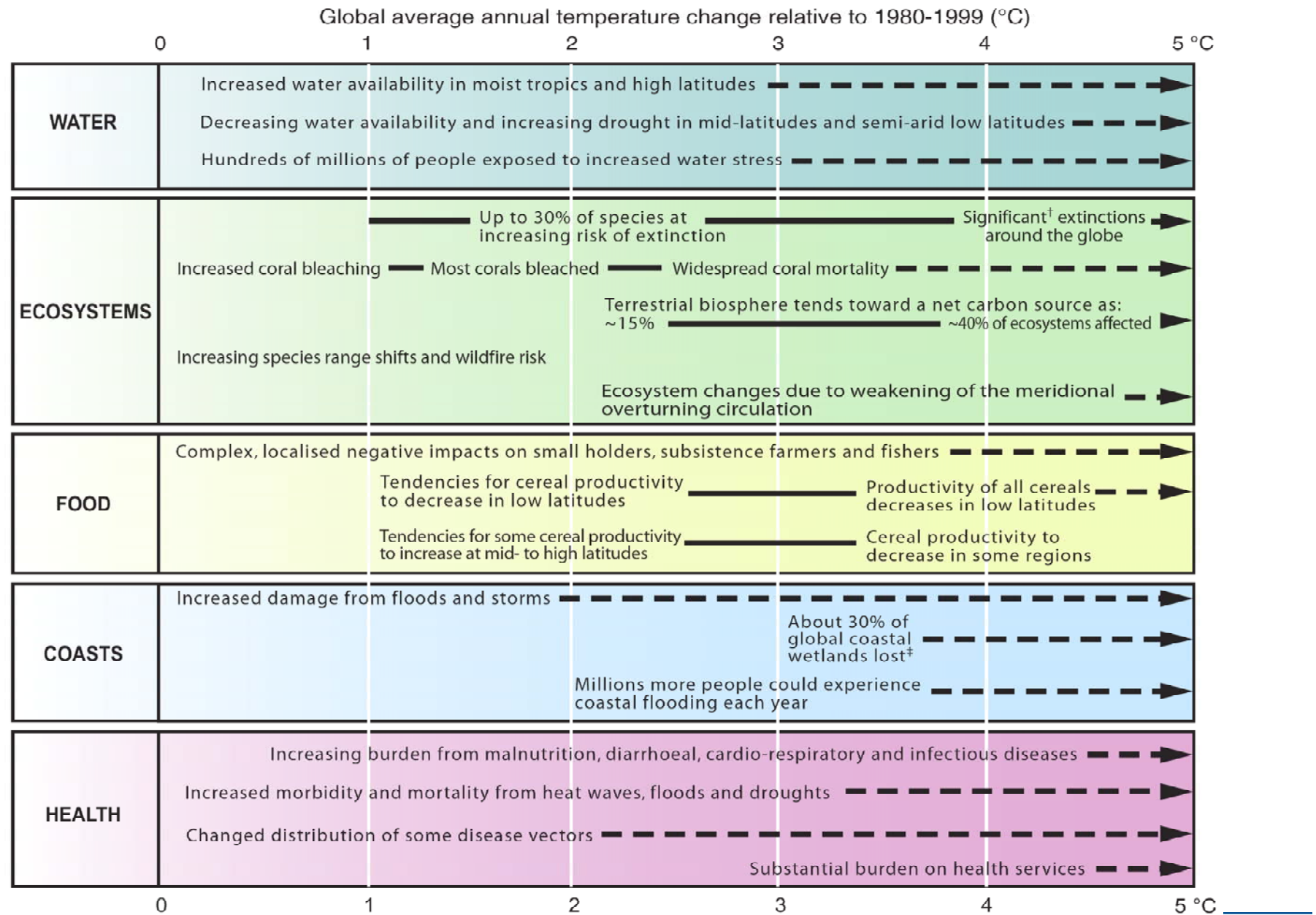


Source: IPCC TAR

Risks Associated With Global Warming

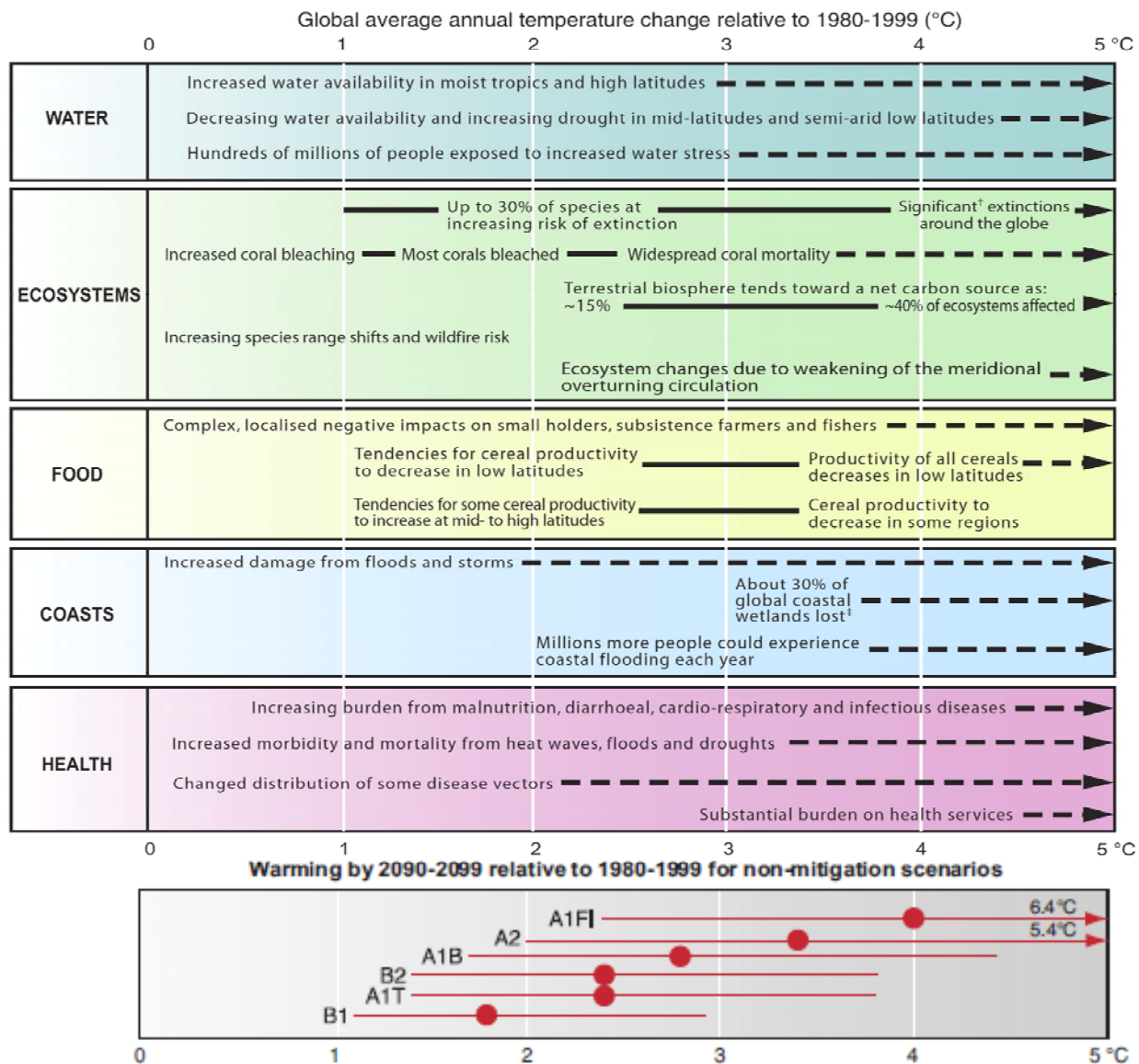


Source: Parry (2001)

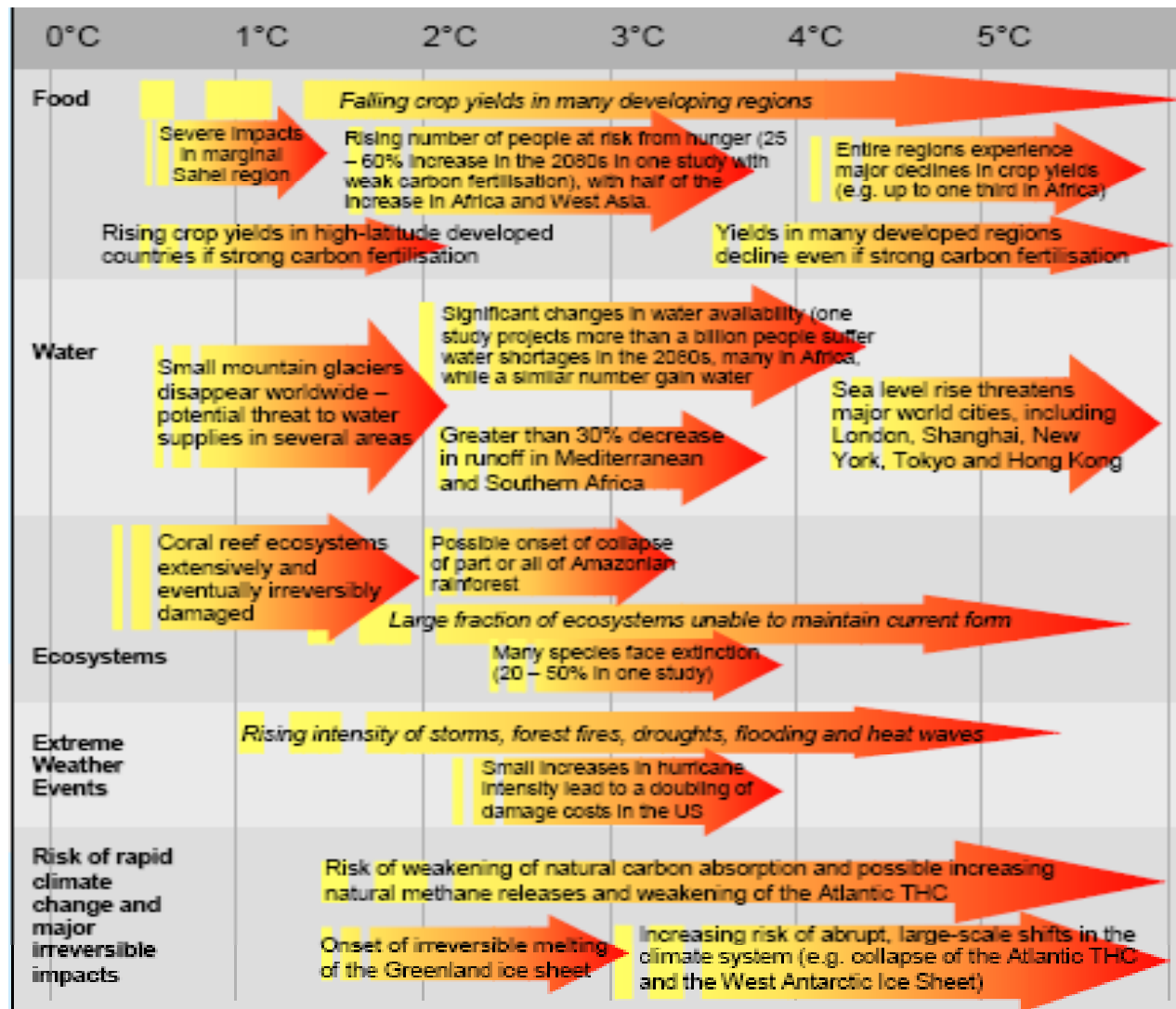


Sources: IPCC (2008)

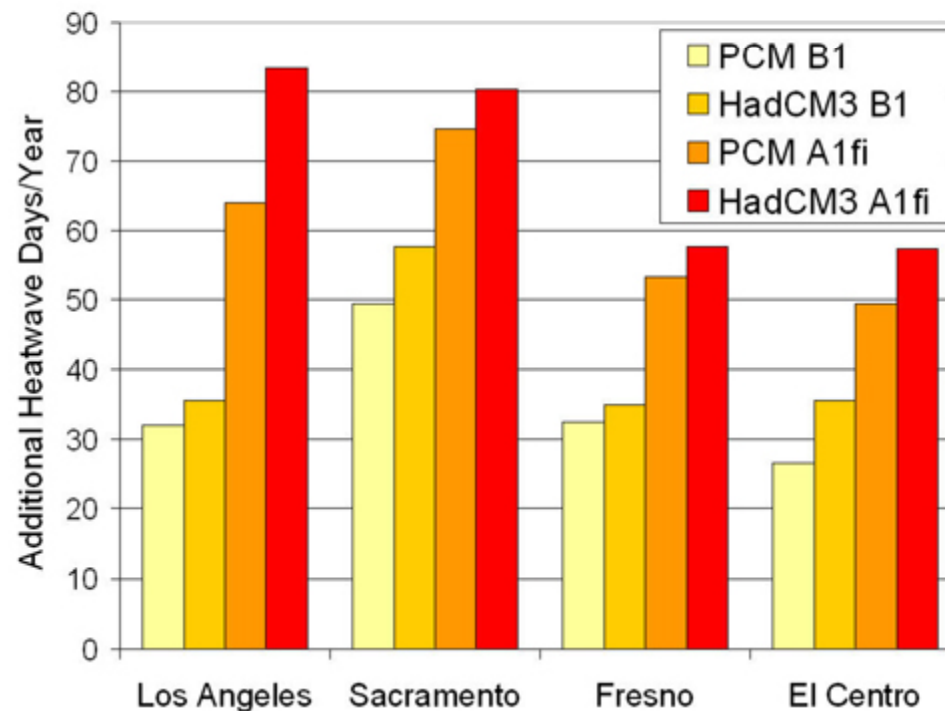
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Stern Review (2006) Forecast:



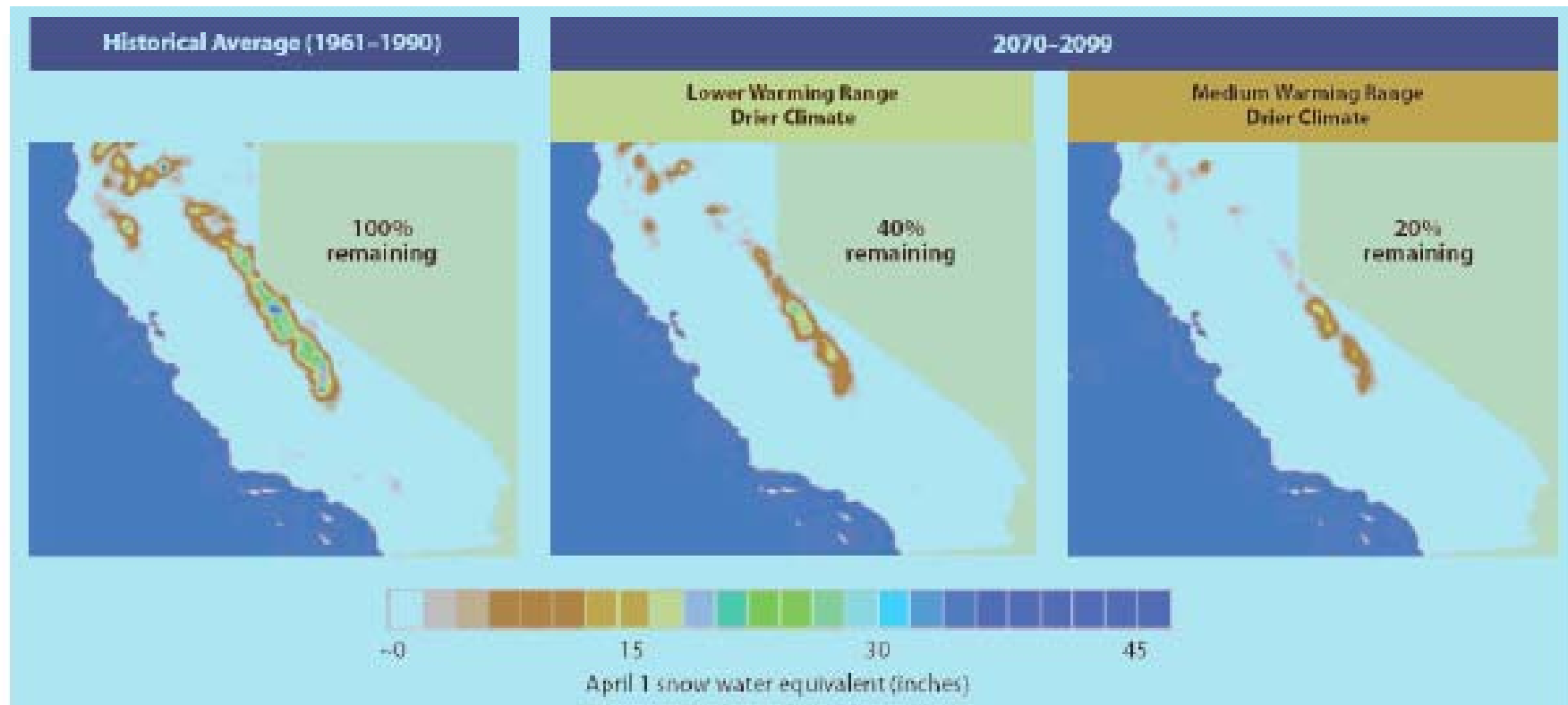
So what about California?



Change in number of days with heatwave conditions occurring in Los Angeles, Sacramento, Fresno and El Centro in 2070-2099 relative to the 1961-1990 average.

And Skiing ??

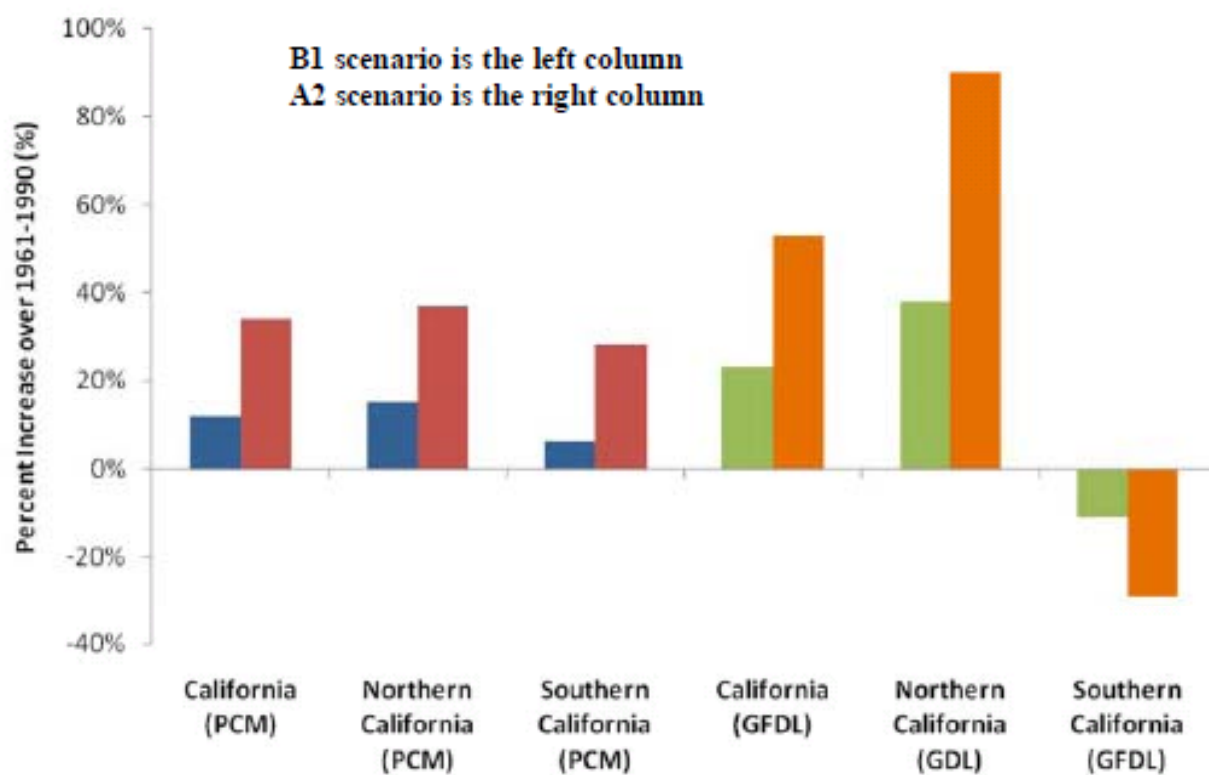
Figure 1.1: Reduction in the Sierra Snowpack by 2070-2099 under Lower and Higher Warming Scenarios



Notes and Source: "Lower Warming Range Drier Climate" is based on an GFDL B1 scenario; "Medium Warming Range Drier Climate" is based on a GFDL A2 scenario. Luers et al., 2006.

On fires and uncertainty...

Figure 5.4: Increased Risk of Large Fire under Different Climate Scenarios (Percent Increase over 1961-1990 by 2070-2099), California Statewide, Northern California, and Southern California



Source: Based on Westerling and Bryant (2008).

On precipitation and uncertainty...

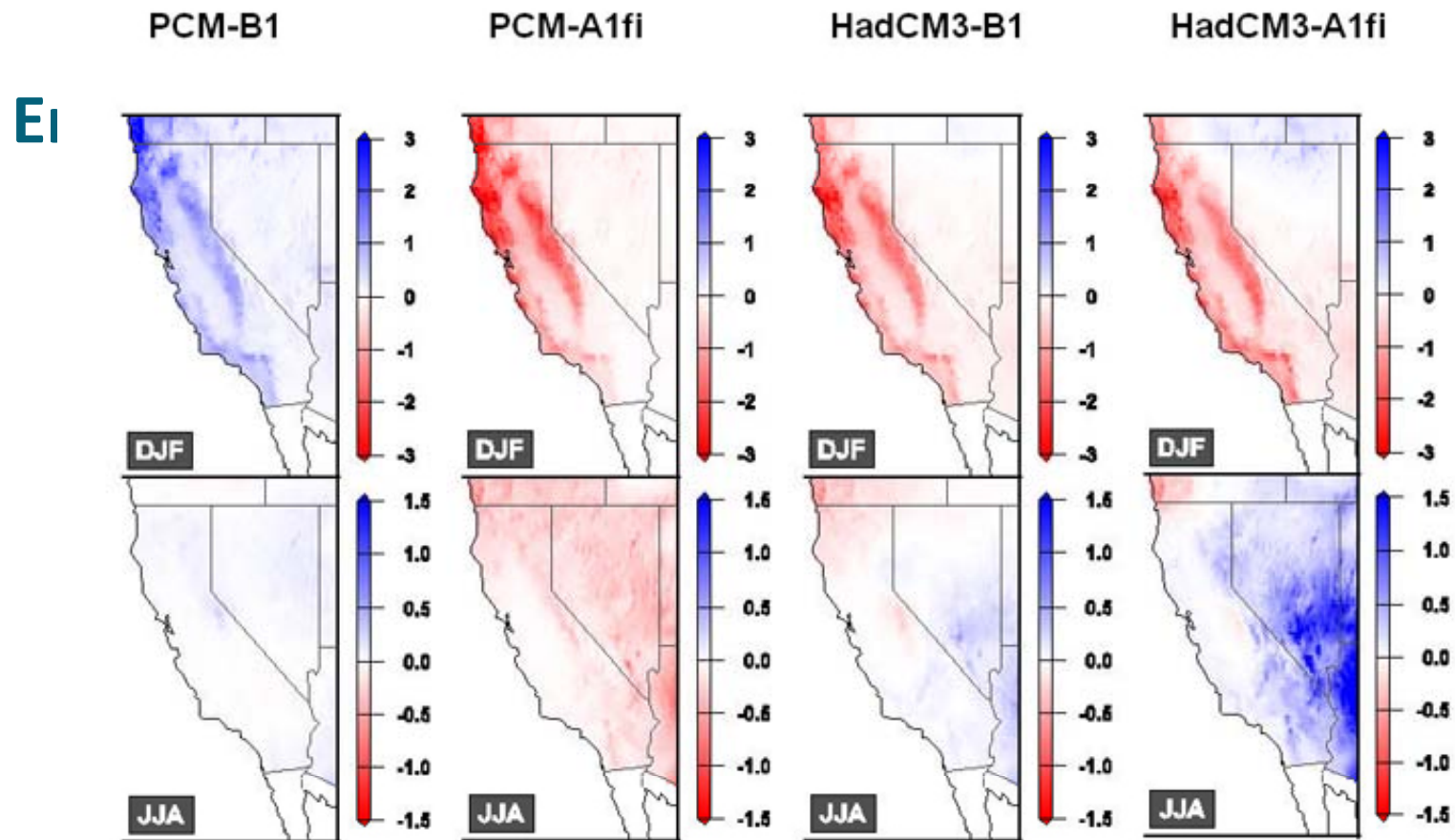


Fig. 6. Winter (DJF) and summer (JJA) precip. change for 2070-2099, relative to 1961-1990. Geographical patterns of precipitation change are consistent across models and scenarios, with the greatest decreases occurring on the northwest coast and along the eastern Central Valley and western Sierras

Table 6.1: Positive and Negative Effects of Climate Change on California Agriculture

	Positive Effect	Negative Effect
Higher Temperature	Earlier growing season, earlier spring flowing, expanding range of certain plants	Higher maximum temperatures means more summer heat stress on plants
	Increased rate of photosynthesis at lower temperature windows	Reduction in winter chill needed by fruit and nut crops
	Acclimation of respiration and photosynthesis	More evaporation increases plant water needs
	Reduced frost	Increased pest damage
Higher CO₂ Levels	Increased biomass production	Greater plant respiration
	Increased water use efficiency	Greater need for nitrogen or other fertilizers

Source: Baldocchi et al., 2005.

Californian biodiversity:

The number of threatened and endangered species in the state, already the largest in the contiguous 48 states, could rise significantly due these combined stresses. Extreme events, such as floods, droughts, and wildfires may become more frequent and intense.

Source: Excerpts from Preparing for Change: Sept. 2002 Report by the California Regional Assessment Group for the US Global Change Research Program.

California Climate Risk and Response

Table ES1: Economic Damage and Asset Risk Estimates for California

2006 USD Billions	Damage Cost/Year		Assets at Risk
	Low	High	
Water	NA	0.6	5
Energy	2.7	6.3	21
Tourism and Recreation	0.2	7.5	98
Real Estate	0.2	1.4	900 Water
	0.1	2.5	1,600 Fire
Agriculture, Forestry, Fisheries	0.3	4.3	113
Transportation	NA	NA	500
Public Health	3.8	24.0	NA
Total	7.3	46.6	

Note: These costs and assets at risk values are intended to be indicative. Annual averages do not represent the actual adjustment process, which will probably be non-linear and dependent on timing of adaptation measures. The absence of a value in this table does not imply that its expected value is zero, but rather that its value might be negative (water in a B1 scenario) or we are not confident of available data needed to estimate it (e.g. costs for transportation). All of the values in this table are drawn from tables and text in the sections on individual sectors in the full report. Finally, the total for assets at risk is omitted to avoid double counting.

Five reasons for concern (IPCC 2007)

Increased Evidence: *Risks to Unique and Threatened Systems*

*There is new and stronger evidence of observed **impacts of climate change on unique and vulnerable systems** (such as polar and high mountain communities and ecosystems), with increasing levels of adverse impacts as temperatures increase further. An increasing **risk of species extinction and coral reef damage** is projected with higher confidence than in the TAR (Third Assessment Report) as warming proceeds...*

Increased Evidence: *Risks of Extreme Weather Events*

*Responses to some recent extreme events reveal higher levels of vulnerability than the TAR. There is now higher confidence in the projected increases in **droughts, heat waves and floods**, as well as their adverse impacts.*

Increased Evidence: *Distribution Of Impacts and Vulnerabilities*

*There are **sharp differences across regions** and those in the weakest economic position are often the most vulnerable to climate change. There is increasing evidence of greater vulnerability of specific groups such as the **poor and elderly not only in developing but also in developed countries**. Moreover, there is increased evidence that low-latitude and less developed areas generally face greater risk, for example in dry areas and megadeltas.*

Increased Evidence: *Aggregate Impacts*

*Compared to the TAR, initial net market-based **benefits** from climate change are projected to peak at a lower magnitude of warming, while **damages** would be higher for larger magnitudes of warming. The net **costs** of impacts of increased warming are projected to increase over time.*

Increased Evidence on: *Risks of Large-Scale Singularities*

*There is high confidence that global warming over many centuries would lead to a **sea level rise** contribution from thermal expansion alone that is projected to be much larger than observed over the 20th century, with loss of coastal area and associated impacts. There is better understanding than in the TAR that the risk of additional contributions to sea level rise from both the Greenland and possibly Antarctic ice sheets may be larger than projected by ice sheet models and could occur on century time scales ...*