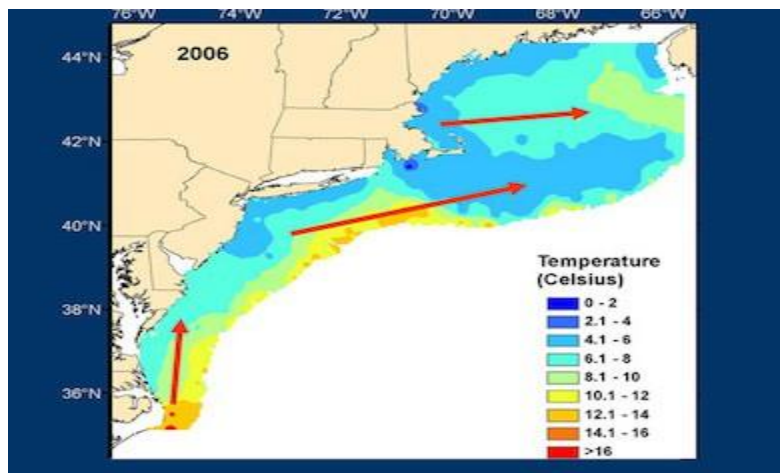


Farmers in temperate zones are finding drier conditions difficult for crops such as corn and wheat, and once prime growing zones are now threatened.

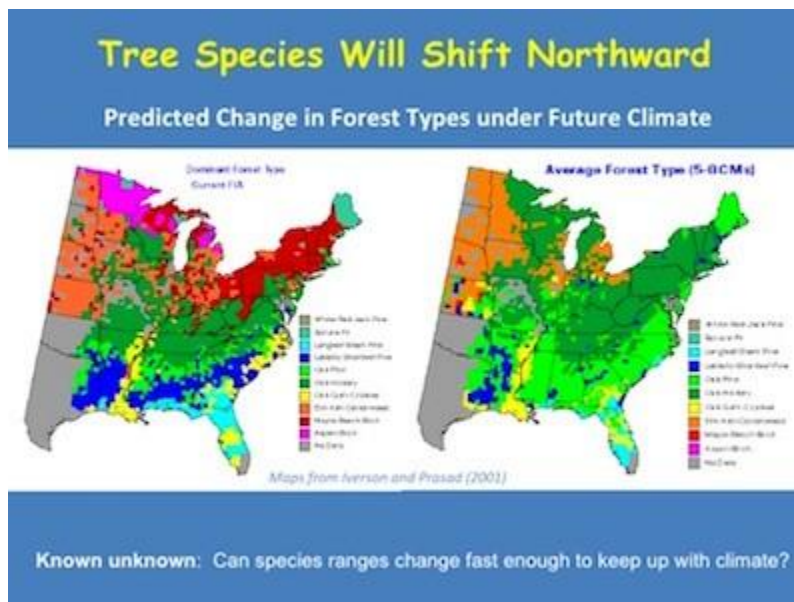
Some areas may see complete ecological change.

In California and on the East Coast, for example, climate change impacts and warming will soon fundamentally change the forests; in Europe, hundreds of plants species will disappear and hundreds more will move thousands of miles.

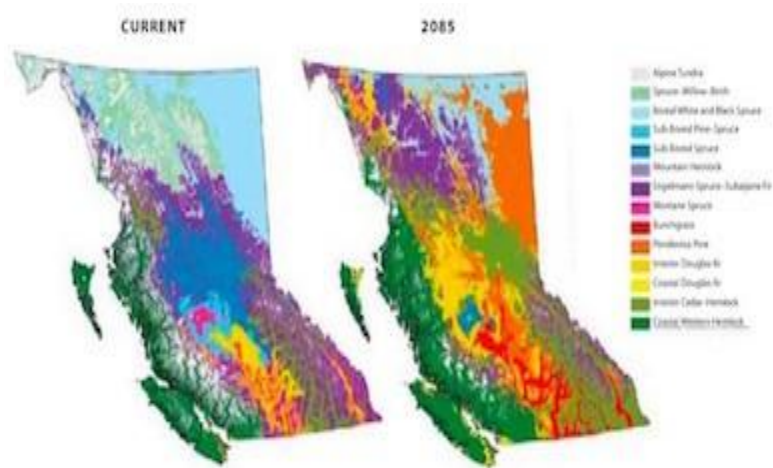
## Changing Fisheries



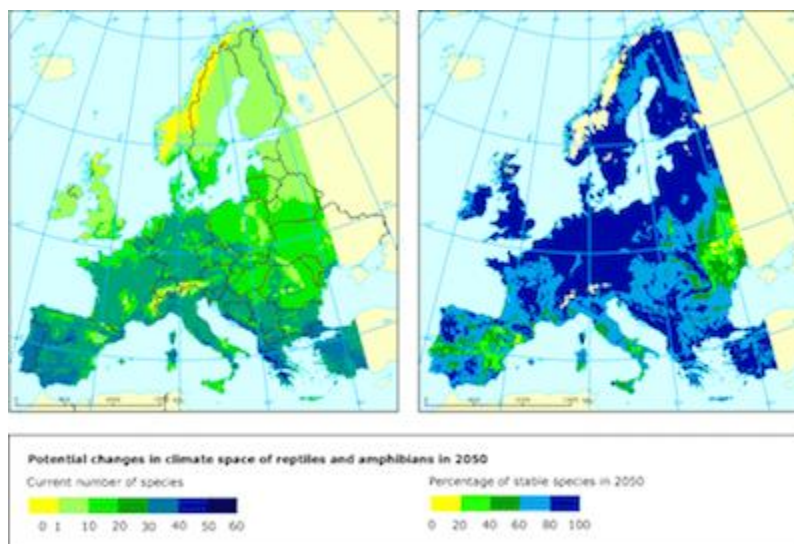
## Shift in Forest Types



## California Tree Species Changes



## European Species Changes



## Reduced food security

One of the most striking impacts of rising temperatures is felt in global agriculture, although these impacts are felt very differently in the largely temperate developed world and in the more tropical developing world. Different crops grow best at quite specific temperatures and when those temperatures change, their productivity changes significantly.

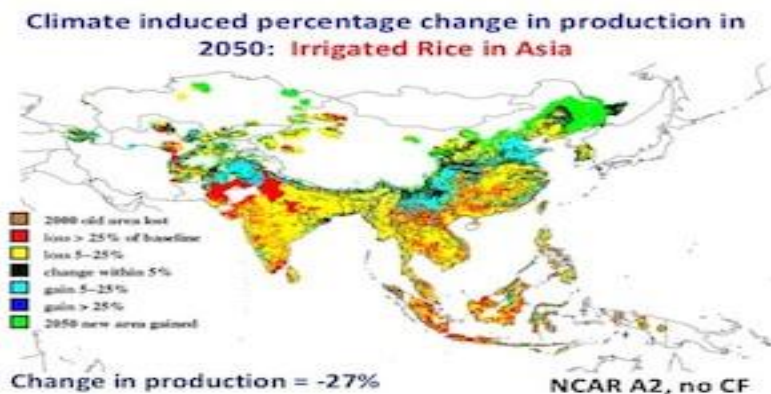
In North America, for example, rising temperatures may reduce corn and wheat productivity in the US mid-west, but expand production and productivity north of the border in Canada.

The productivity of rice, the staple food of more than one third of the world's population, declines 10% with every 1<sup>0</sup> C increase in temperature.

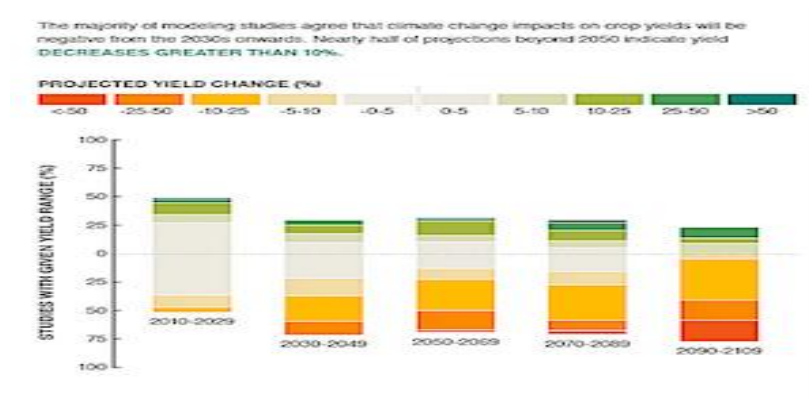
Past climate induced problems have been offset by major advances in rice technology and ever larger applications of fertilizer; expectations are that in Thailand, the world's largest exporter of rice, however, future increases in temperatures may reduce production 25% by 2050.

At the same time, global population models suggest that developing world will add 3 billion people by 2050 and that developing world food producers must double staple food crop production by then simply to maintain current levels of food consumption.

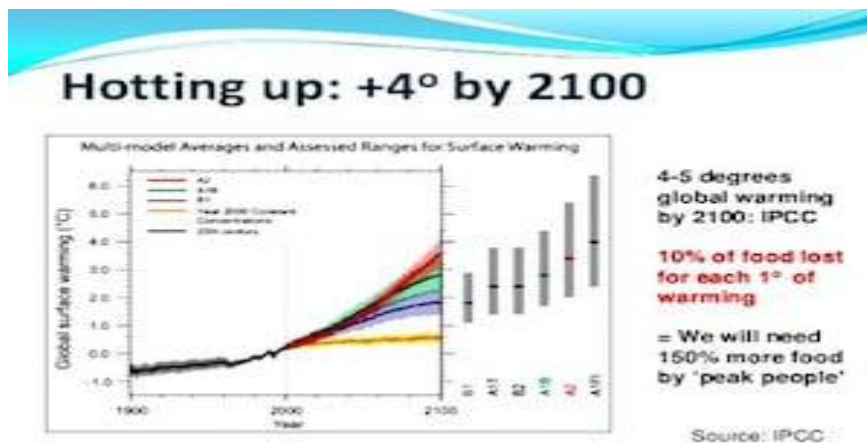
### Climate Change and Food Security



### Climate Change Impacts on Production



## Temperatures and Food Production

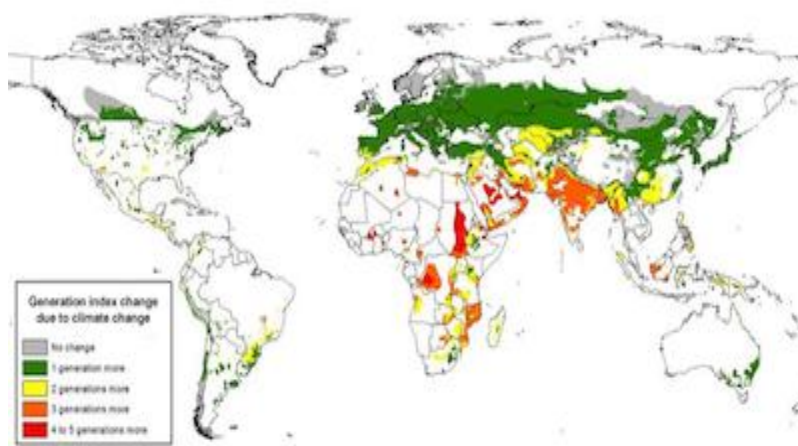


## Pests and Disease

Rising temperatures favor agricultural pests, diseases and disease vectors.

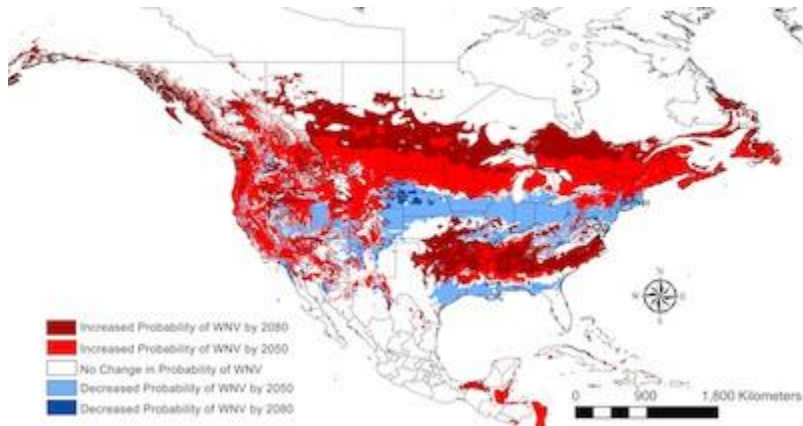
Pest populations are on the rise and illnesses once found only in limited, tropical areas are now becoming endemic in much wider zones. In Southeast Asia, for example, where malaria had been reduced to a wet season only disease in most areas, it is again endemic almost everywhere year around. Likewise, dengue fever, once largely confined to tropical areas, has become endemic to the entire region. Increased temperatures also increase the reproduction rates of microbes and insects, speeding up the rate at which they develop resistance to control measures and drugs (a problem already observed with malaria in Southeast Asia).

## Pest Generations present to 2050

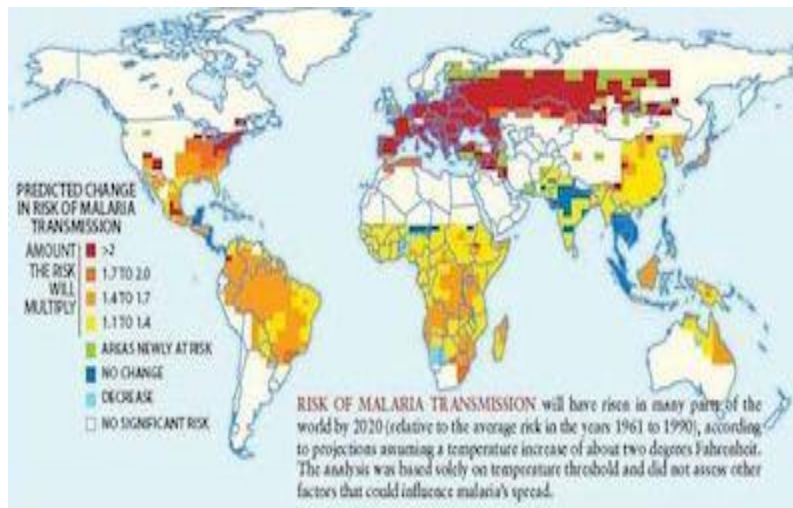




### West Nile virus risk



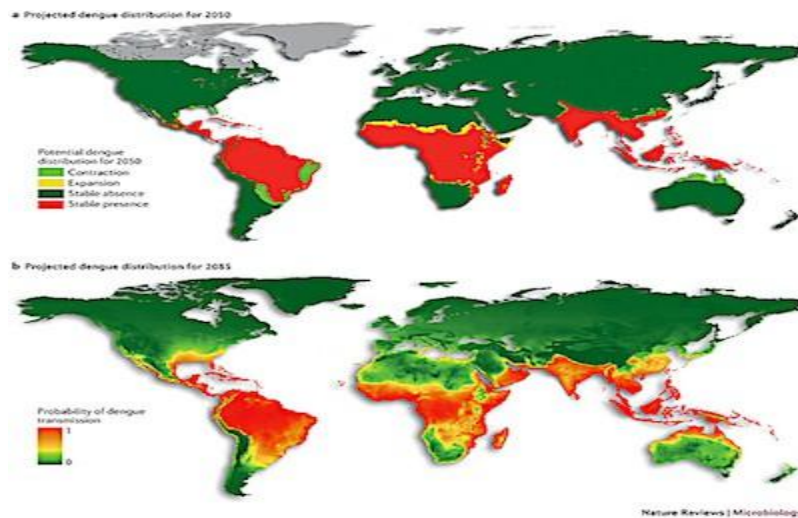
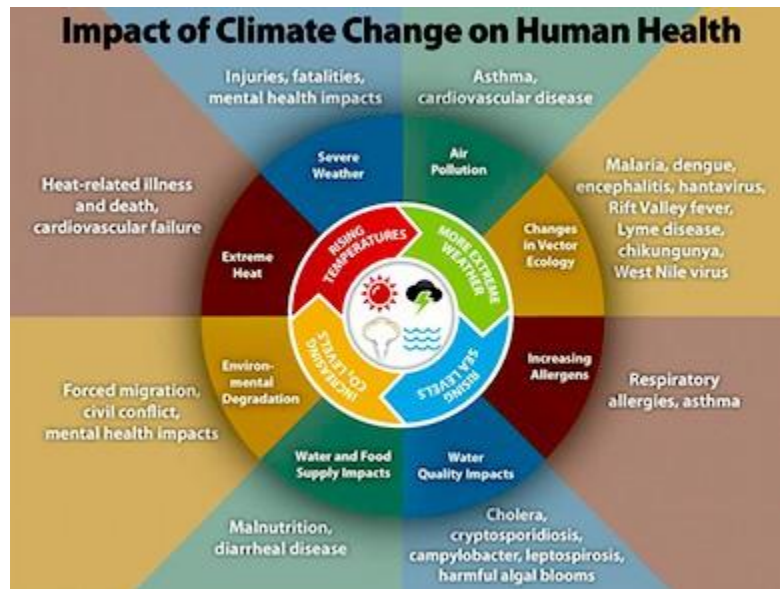
### Projected change in risk of Malaria



### Why the Zika virus flourishes in hot weather



## Dengue distribution by 2050



## **Climate change in Iraq**

Iraq is grappling with significant and interconnected environmental, security, political, and economic challenges, with the effects of climate change likely increasing the extent of these challenges. Rising temperatures, intense droughts, declining precipitation, desertification, salinization, and the increasing prevalence of dust storms have undermined Iraq's agricultural sector. Additionally, Iraq's water security is based on two declining rivers, the Tigris and Euphrates. National and regional political uncertainty will make mitigating the effects of climate change and addressing transnational water management very difficult. Climatic changes such as increasing temperatures, reduced precipitation, and increasing water scarcity will likely have serious implications for the state of Iraq for years to come.

## **Excessive heat and limited air conditioning**

In Iraq, climate change has resulted in "prolonged heat waves, erratic precipitation, higher than average temperatures and increased disaster intensity," according to a 2018 report by the Expert Working Group on Climate-related Security Risk.

Baghdad is experiencing an earlier onset of 48C days. In 2019, air conditioning has become unaffordable or impossible to maintain for lower income residents, due to erratic electricity supplies.

## **Drought and erratic precipitation**

Drought between 2007 and 2009 was followed by very heavy rains which contributed to flooding and soil loss.

Iraq's years of drought became especially acute in 2018, at which time its land under cultivation was reduced by half. Cultivation of irrigated crops such as rice, corn and other cereals was suspended by the government; losses in rice production were estimated at 39 million dollars.

In 2019, an unusually wet winter "restored freshwater marshes of southern Iraq," and also caused widespread flooding on the Tigris and Euphrates rivers.

## **Water supply**

As water levels fall, increasing salinity of the water supply has become a concern in southern Iraq, especially in Basra.