

## Emerging Viruses & Climate Change

The earth is warming ( ).

The controversy is whether or not it is natural or manmade.

The scientific consensus is that it is manmade.

97% of all published papers on climate change agree that the warming is the result of human activity ( )

Certain political groups and the energy industry have launched effective campaigns of “disinformation”.

### Public Divided over Scientific Consensus on Warming

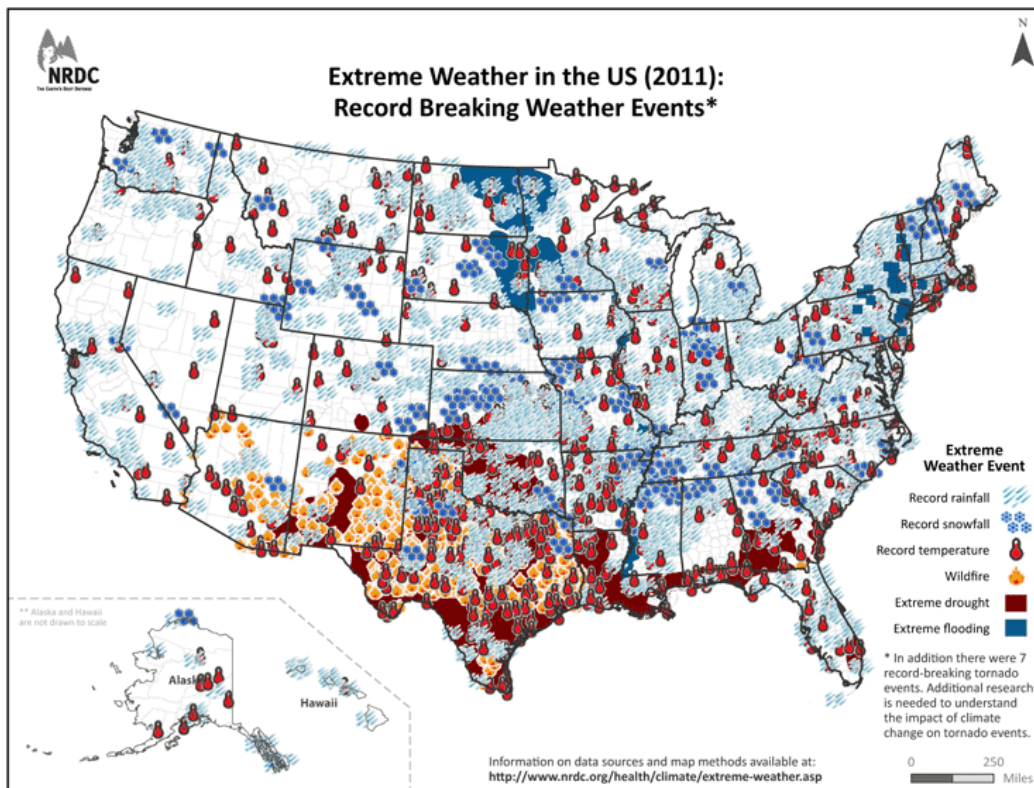
Do scientists agree earth is getting warmer because of human activity?	Total %	Rep %	Dem %	Ind %
Yes	45	30	58	45
No	43	57	32	45
Don't know	<u>12</u>	<u>13</u>	<u>10</u>	<u>10</u>
	100	100	100	100

PEW RESEARCH CENTER Oct. 4-7, 2012. Figures may not add to 100% because of rounding.

### Climate is changing

Overall the earth is getting warmer.

This causes more extremes of weather ( ).



Our concern: How will climate change affect the incidence and transmission of diseases especially viral diseases?

Tropical viral diseases such as dengue and yellow fever will migrate northward as the climate warms.

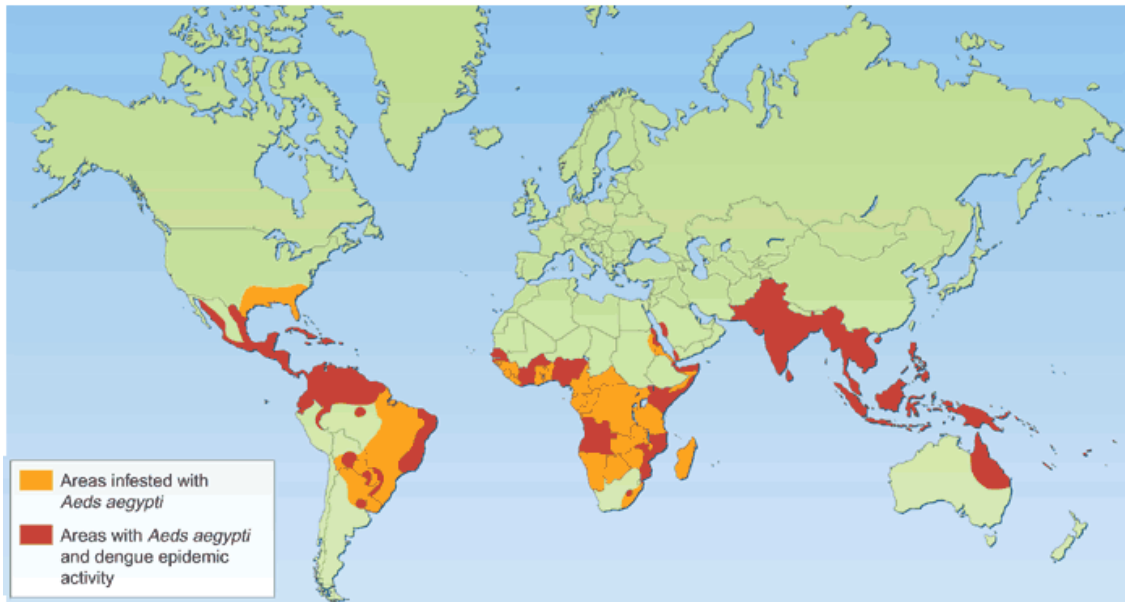
**Dengue fever** - hemorrhagic fever/dengue shock syndrome if untreated ~50% mortality rate

Uncomplicated infections only 1-5% mortality without treatment ( )

It is endemic in many countries ( )

- 1/3 of world population lives with endemic dengue

- Southeast Asia, India, Western/sub-Saharan Africa, northern South America



**Yellow fever** - A viral disease of primates transmitted by the bite of infected mosquitoes. Symptoms in humans include high fever, jaundice, and spontaneous bleeding. The severity of illness is quite variable, but 20–50% of jaundice cases are fatal. (Climate Change and Mosquito-Borne Disease Paul Reiter)

The existence of a safe and effective vaccine against yellow fever should prevent the return of the virus to temperate regions. (Climate Change and Mosquito-Borne Disease Paul Reiter)

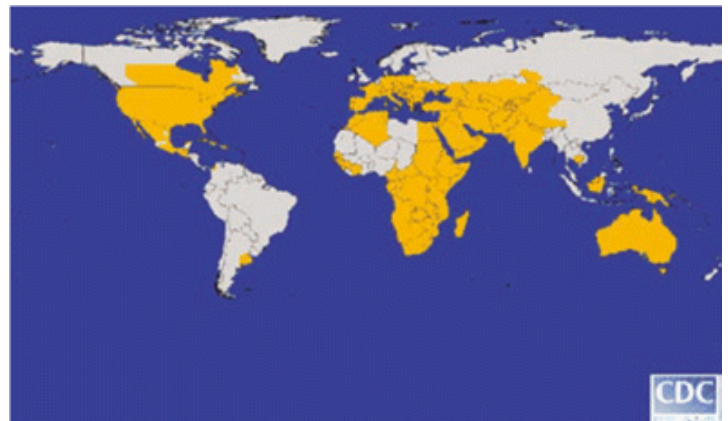
**West Nile virus** has already adapted and established itself in the US from Africa.

( )  
There were ~2000 cases in 2014 but there have been as many as ~10,000 cases ( )

Mortality rates so far from 3-15%.

\_\_\_\_\_ )  
~20% have flu like symptoms

~1% have serious neuroinvasive disease ( )



All of these viral diseases are mosquito-borne ( )

Mosquitoes need warm, humid climates to reproduce in large numbers.  
Standing water is needed to lay eggs.

Female mosquitoes need blood for egg development ( )

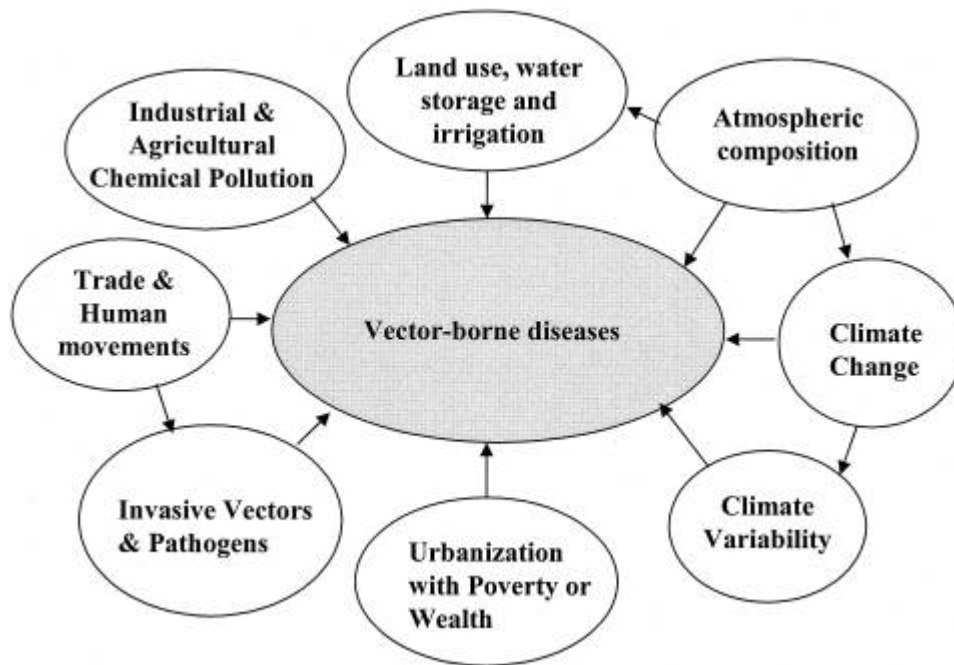
Birds are common hosts to mosquitoes and these viruses.

Birds fly from one country to another. If already infected and bitten by local mosquitoes, these viruses can adapt to those local mosquito species and spread disease.

Control disease with vaccines (if available) and/or control mosquitoes (eliminate standing water; add fish or toxins to water to kill larvae).



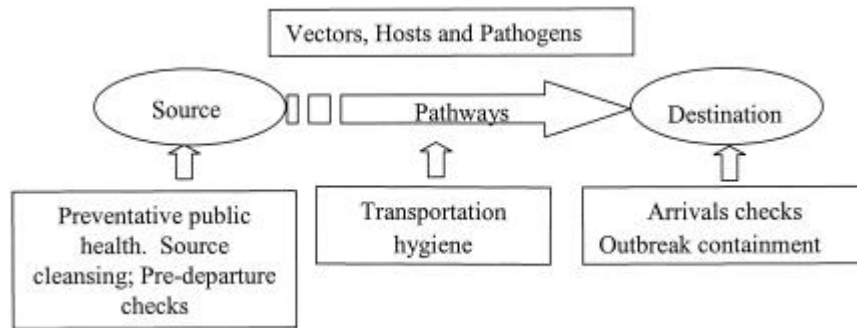
The interaction of humans, pathogens, climate, and the environment is complex and hard to predict. There are many factors.



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People travel, immigrate, and emigrate.

Food and diverse imports may carry pathogens and their vectors to other countries.



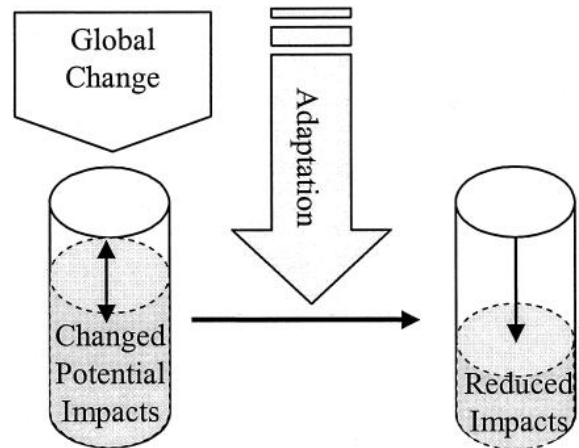
The plant and animal protection concept of sources, pathways, and destinations with adaptation measures to manage the changes arising from global change drivers.

Pathogens adapt! So too must humans adapt.

Can our technology save us?

“Adaptation” reduces potential impacts by applying technology.

Diagrams from: Global Change and Human Vulnerability to Vector-Borne Diseases Robert W. Sutherst



### Study Objectives

1. **What is the controversy about global warming?**
2. **Why does the public not understand that there is consensus about global warming?**
3. **Describe the characteristics of dengue fever.**
4. **What does endemic mean?**
5. **Where is dengue fever endemic?**
6. **Describe the characteristics of yellow fever.**
7. **Describe the characteristics and distribution of West Nile virus.**
8. **What is a vector?**
9. **Which sex of mosquito bites and why?**
10. **Describe how a viral disease can be spread by mosquitoes.**
11. **Describe how diseases can spread from country to country.**