

Climate change and mosquito-transmitted diseases: link or myth?

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My background



Veterinary Medicine
(Mexico)



MSc in Environmental
Sciences
(England)



PhD in Climate change and
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(England)

My background

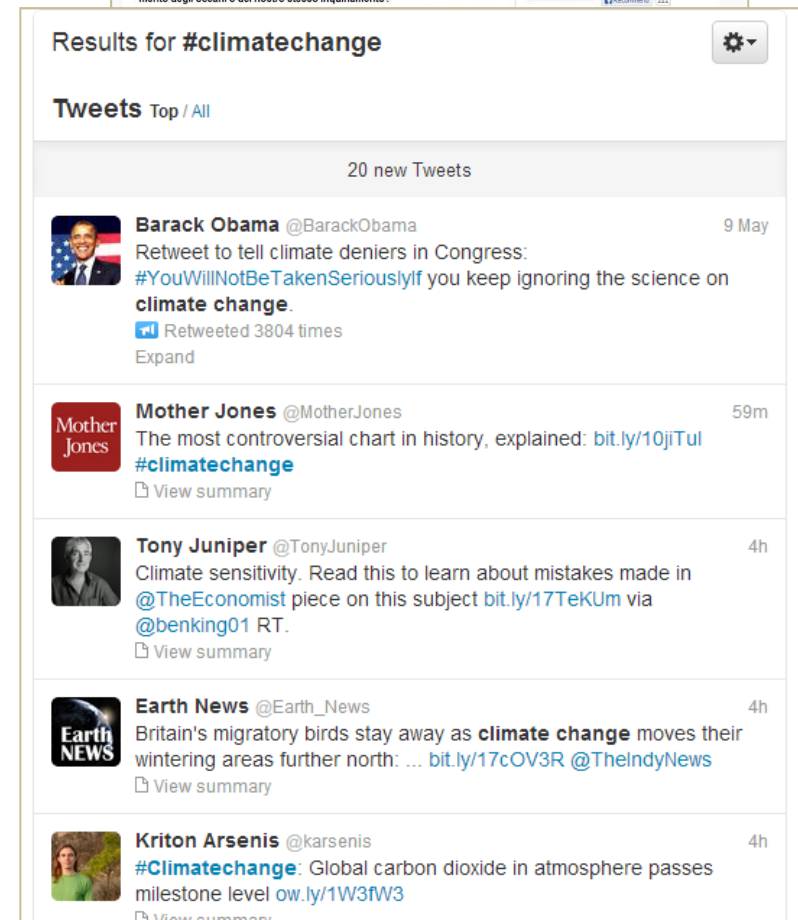
- During my PhD I studied how the climate influences the behaviour of dengue fever in Mexico.
- What I do now is very much related to what I studied.
- You can also do what me and my colleagues do here!



PhD in Climate change and
human health
(England)

Climate change

- Climate Change is a global trending topic ([#climatechange](#)).
- Many people talk and even fight about it, but not so many really understand it.
- People usually think of global warming (GW) as increases in air temperature.
- However, it is much more complex than that.



FOTOGALERÍA: Apagón mundial
contra el cambio climático



Climate change

- Sea surface temperature, ocean heat content, arctic ice sea, glaciers and ice caps, sea level rise, and other phenomena also play a role in the GW process.
- Water expands with heating and so we may observe sea level rise with rising temperatures.



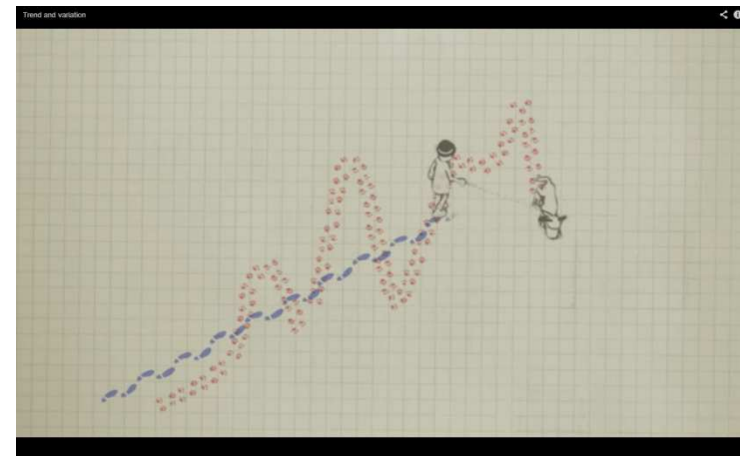
Picture from: www.fanpop.com



Picture from: ethicalocean.com

Climate change

- Long-term changes in climate that can be identified by changes in its behaviour or its properties.
- So, looking at how the climate has changed in the last year or two years is not enough to determine if the climate has changed. We need to check the ‘trends’.

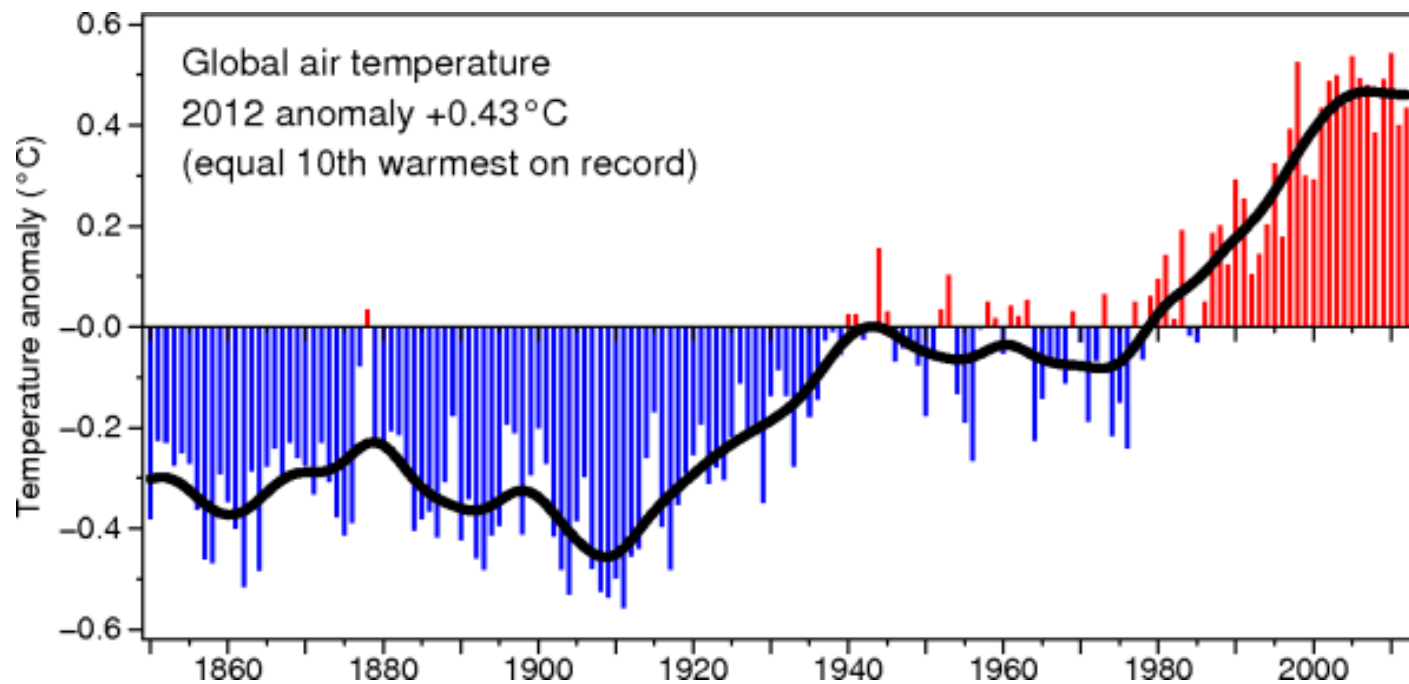


Watch video!

<http://www.youtube.com/watch?v=e0vj-0imOLw>

Climate change

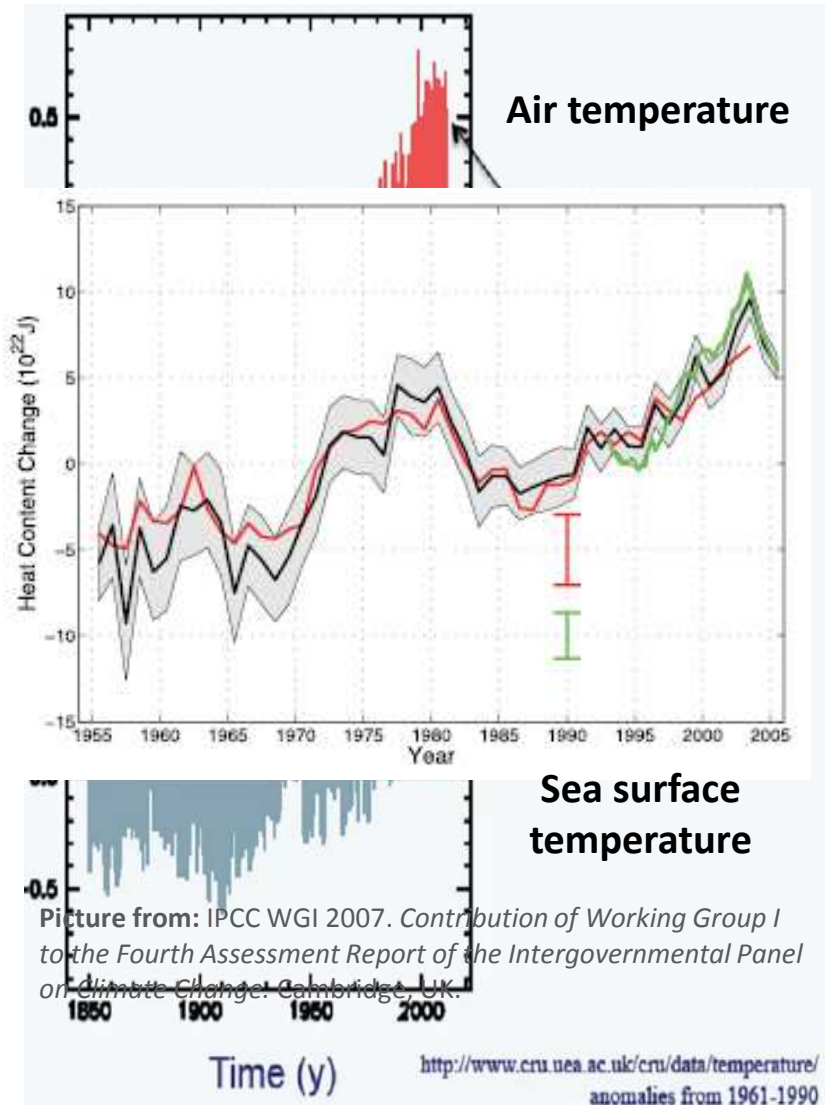
- Climate-change deniers say that there has been no warming since 1998.
- But look at the big picture!



Picture from: Climatic Research Unit, University of East Anglia, UK

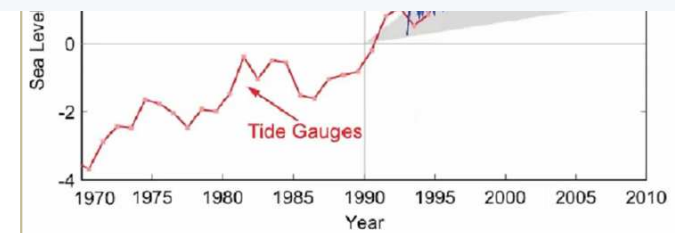
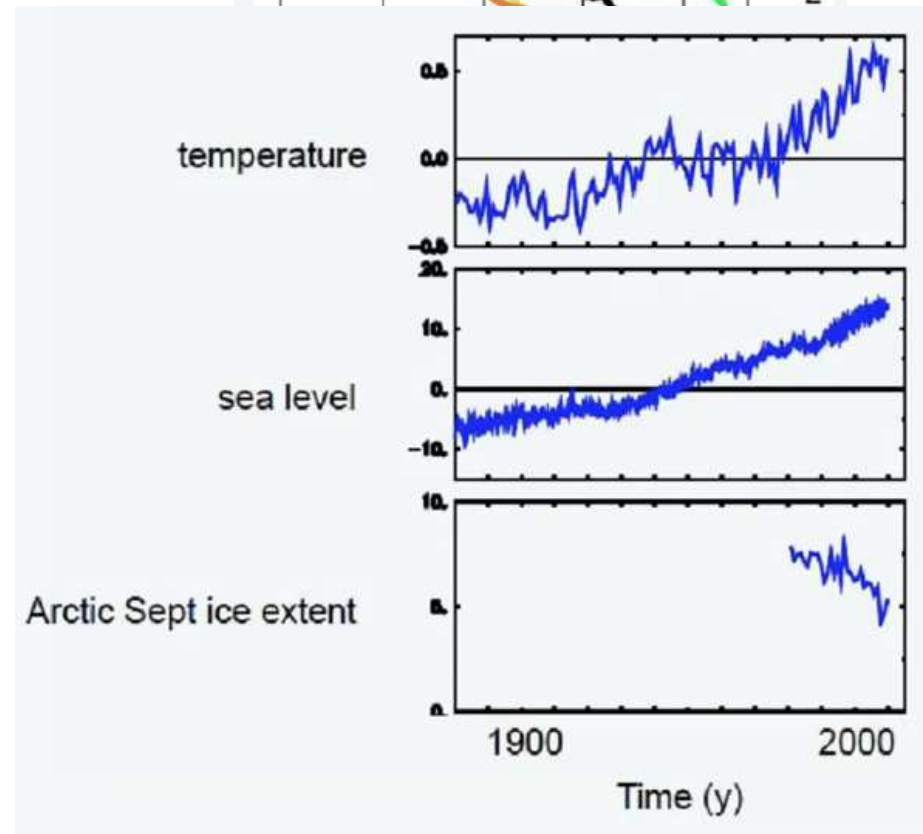
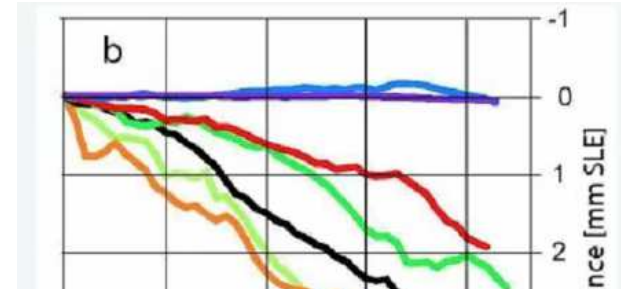
What about ocean temperatures?

- Similar changes in temperature are observed both in air and the ocean.
- These measurements provide evidence for climate change as a real phenomenon.
- Ocean heat records also show long-term increases in temperature.



Glaciers and sea level rise

- The size of glaciers has decreased considerably in many regions of the world.
- Sea level rise is consistent with the warming of the ocean and water expansion, in addition to the fresh water coming from ice melting.
- Warming of the climate is unequivocal when we add up all the available information.



Pictures from: LeQuere 2011 *The Physical Basis of Climate Change: Not for Experts Seminar Series*. Tyndall Centre for Climate Change Research, University of East Anglia, UK (Available at: <http://www.tyndall.ac.uk/tyndall-tv/2011>)

Climate change impacts

- The impacts of climate change are potentially severe (e.g. loss of species, fresh water scarcity, more extreme weather, damages in agriculture and food production...)
- The countries more likely to be severely affected are the poorest ones, which are the least responsible for climate change!

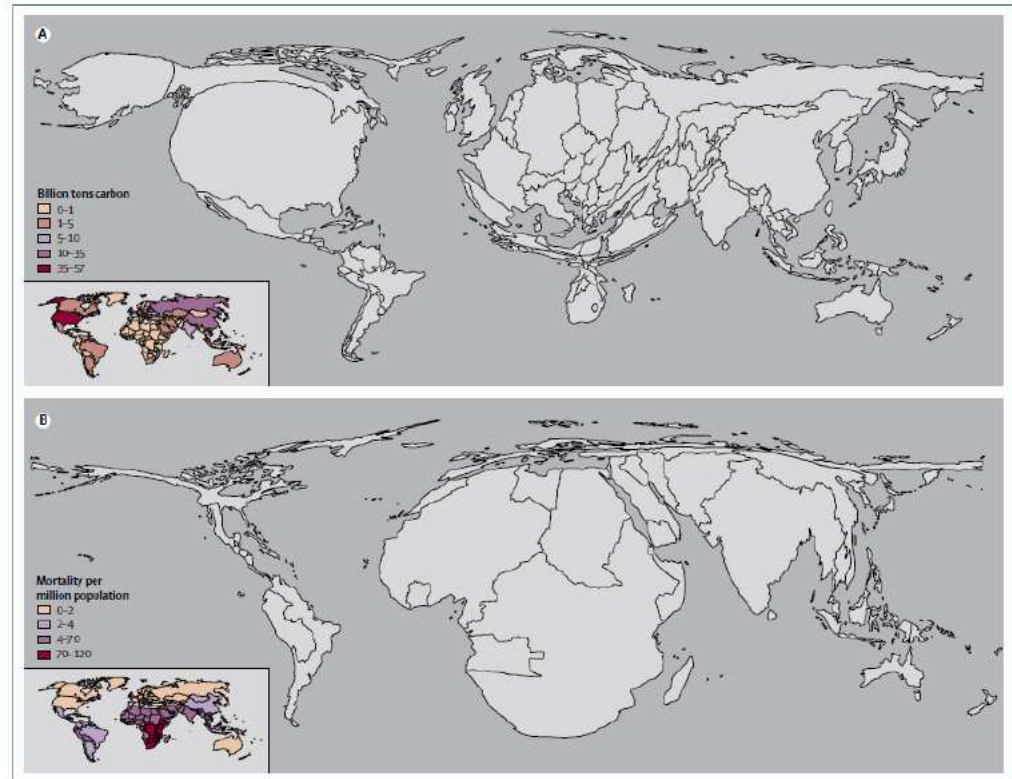
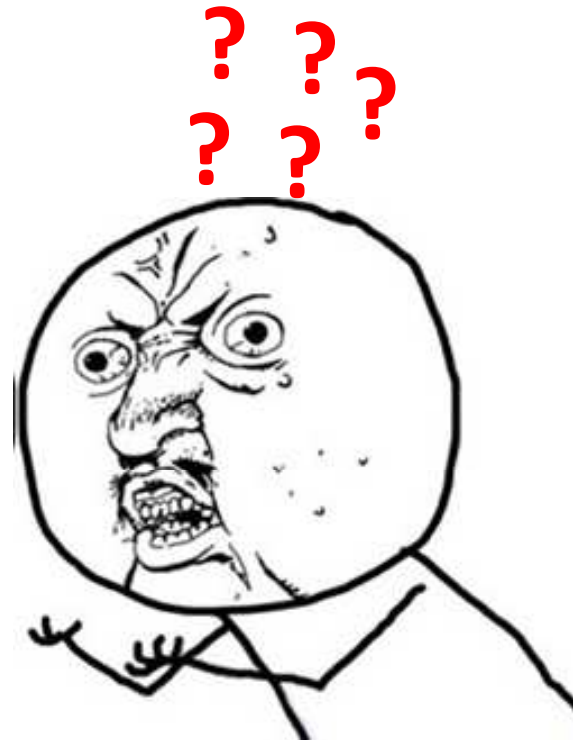


Figure 4: Density-equalising cartogram
Comparison of undepleted cumulative CO₂ emissions by country for 1950–2000 versus the regional distribution of four climate-sensitive health consequences (malaria, malnutrition, diarrhoea, and inland flood-related fatalities).²¹

Picture from: Lancet & UCL Institute for Global Health Commission, 2009

But...

What does all this have to do with mosquitoes?



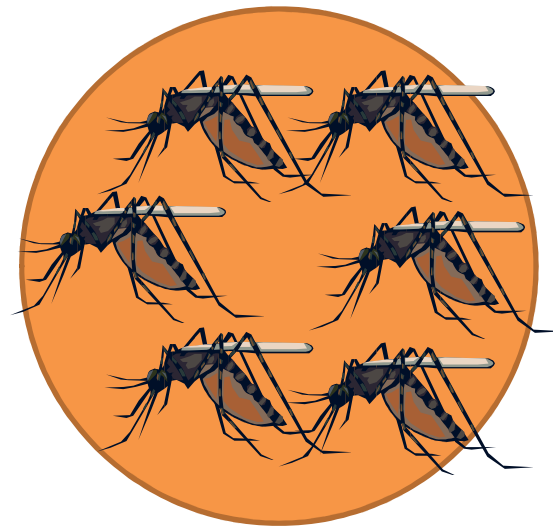
Well...

- Some mosquitoes transmit diseases.
- Happens that mosquitoes are very sensitive to climate.
- So, if the climate changes, their behaviour may change or their geographical location.

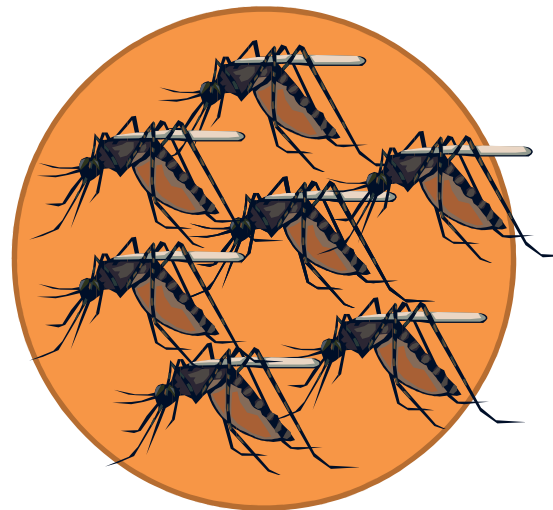


For example

- Some researchers suggest that because temperatures will increase in some cool regions these changes in temperature will create suitable environments for mosquitoes and the diseases they transmit.
- As a consequence, cool-climate areas may be affected with tropical diseases such as malaria and dengue.



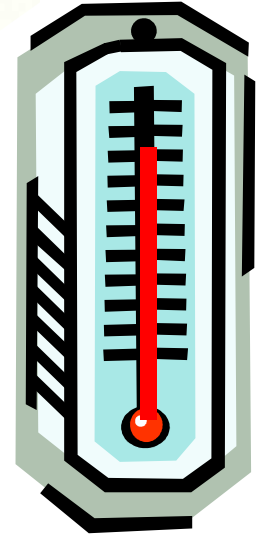
Cool
temperature



Warm
temperature

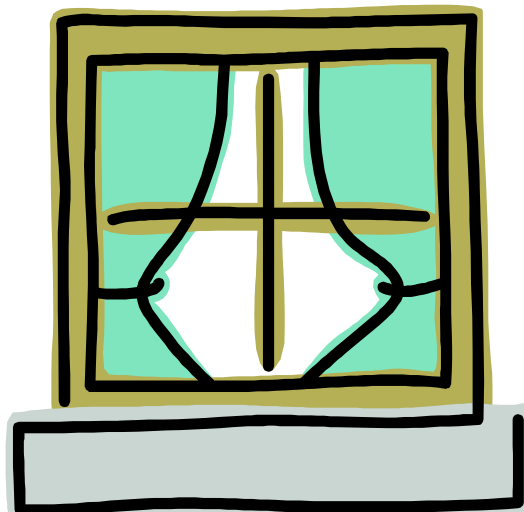
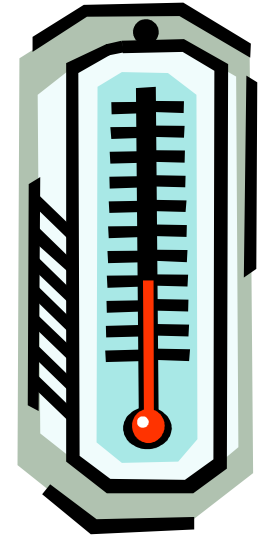
Temperature sensitivity

- Other researchers are not convinced about this theory because mosquitoes can adapt to the environmental conditions.



Temperature sensitivity

- Other researchers are not convinced about this theory because mosquitoes can adapt to the environmental conditions.
- Also, there are other factors not related to climate that can reduce the presence of the mosquitoes and their diseases.



The HEALTHY FUTURES and RESPONSES projects

- Both projects are investigating how the climate and other factors (e.g. population, poverty, and access to health services) influence mosquito-transmitted diseases.
- Once we calculate that, we can estimate the effects of climate change on these diseases.



Why do we want to know that?

- It is very important to be prepared for the possible effects of climate change on human health to prevent diseases and deaths.
- If you know where and/or when and where diseases may happen, you can allocate money and other resources (e.g. doctors, mosquito nets, insecticides) to prevent it.



What have we done?

- We collected all possible information about how the disease is associated with climate and socioeconomic status (e.g. education, poverty) in other countries, and used that information to develop a series of equations to create possible scenarios of what may happen in the future.
- These equations are called ‘models’ and they are like a puzzle... You see the whole picture only if you have all the tabs.



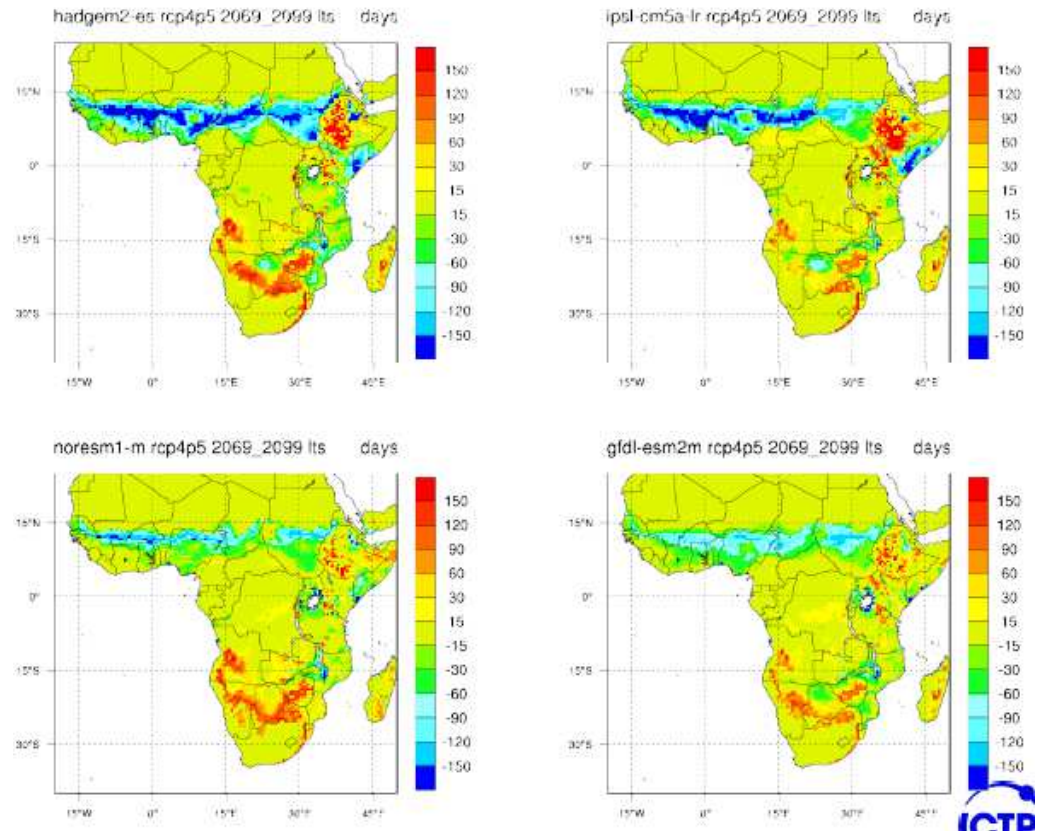
About the scenarios

- We cannot say that what we found WILL happen.
- Our results may be different from what will really happen.
- It is important to develop multiple scenarios using different assumptions.
- Our scenarios need to be updated as more or better information becomes available.



Here at ICTP

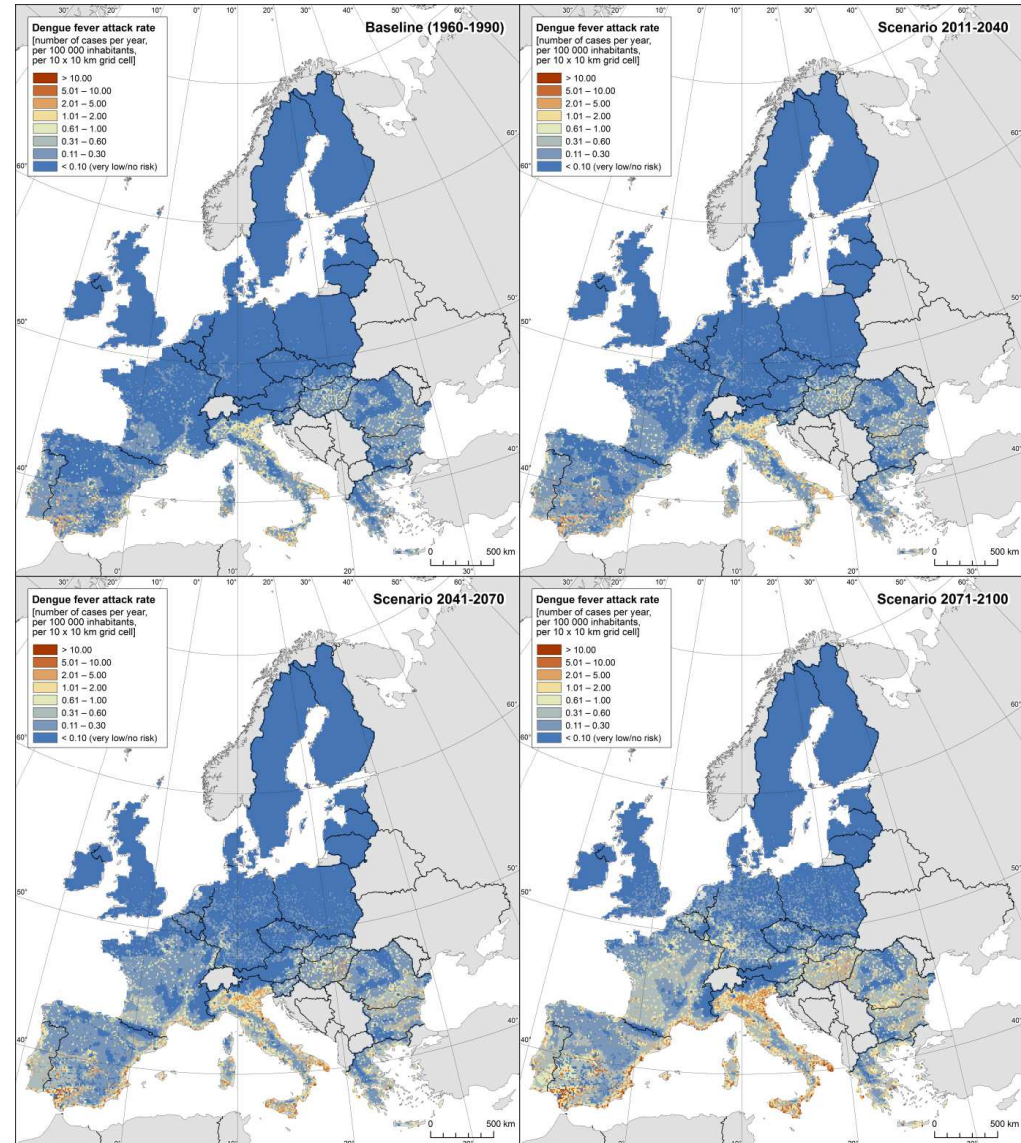
- We have developed a model (called VECTRI) to calculate when and where malaria can occur based on climate information.
- We are also using the VECTRI model to estimate the effects of climate change on malaria.



Pictures from: Adrian Tomkins (ICTP)

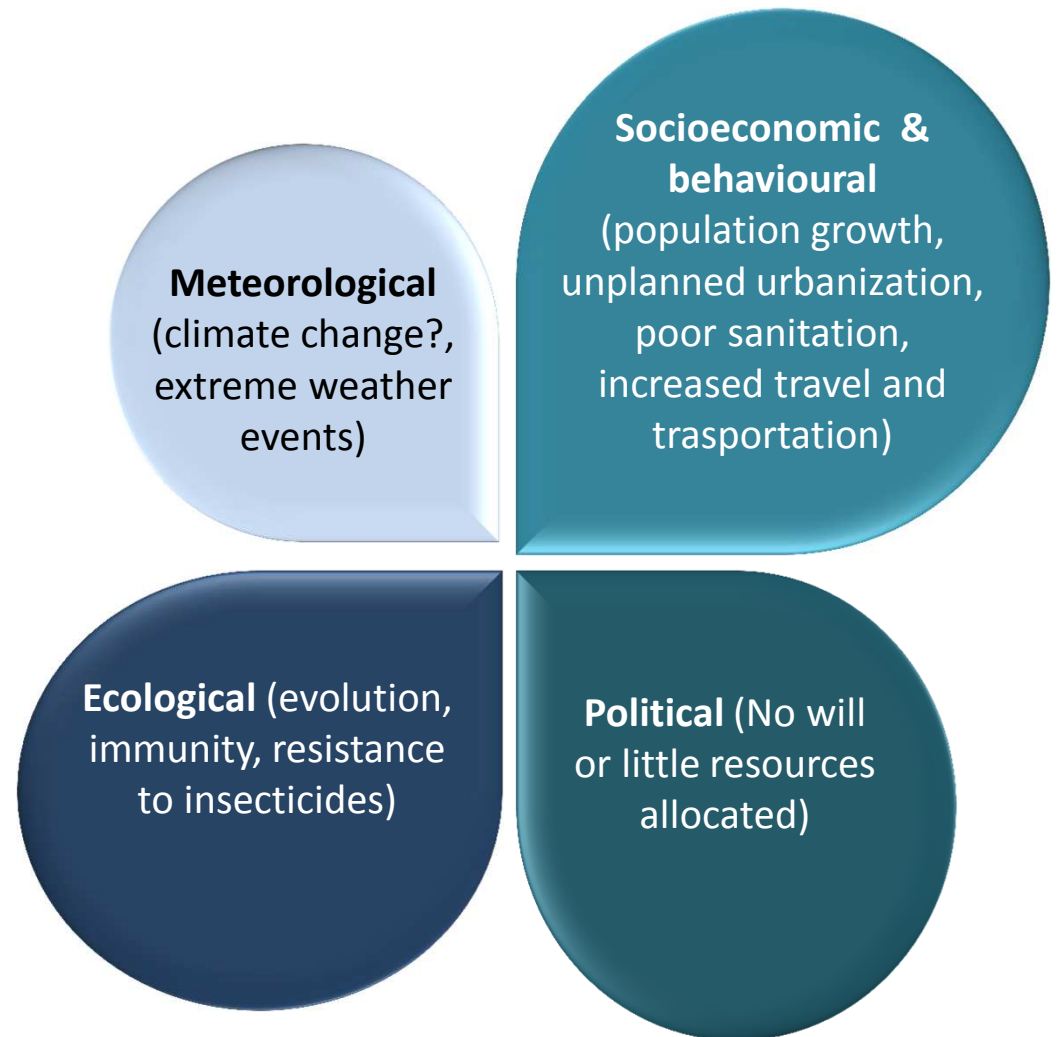
In the 'Responses' project

- We have estimated that dengue fever may appear more frequently in Europe.
- The number of dengue fever cases is likely to increase with climate change if people take no actions to prevent it.
- Italy is one country likely to be affected!



Are we sure this will happen?

- No, we are not!
- Models are not perfect.
- Diseases do not depend only on the climate.
- But we are confident that this can possibly happen if no action is taken.



Summing up

- Climate change is happening.
- Is there a link between climate and mosquito diseases? YES! But this link varies with many factors.
- Climate change is likely to help diseases to appear in some regions where they do not exist now. But this is still under study.
- We need to be prepared for preventing diseases and/or for adapting to the new conditions.
- Models help us to understand when and where diseases may take place so we can prevent them or define how we can adapt to the new conditions.



Thank you for your attention!

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To further discuss

- Il cambiamento climatico deriva prevalentemente dalle emissioni di gas serra dei paesi sviluppati.
- Dovrebbero forse i paesi sviluppati ripagare quelli in via di sviluppo per le conseguenze dei cambiamenti climatici sulla salute e su molti altri aspetti (per esempio sull'agricoltura e sulla biodiversita') a cui anche loro saranno sottoposti?



<http://www.esrl.noaa.gov/gmd/ccgg/trends/history.html>