Global health and climate change

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Responding to climate change:
Sustaining health and wellbeing
PHSS, University of Otago, Wellington
February 2014

Outline

- Causals pathways of global change and human health: climate change is THE issue

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- Causals pathways of global change and human health: climate change is AN issue

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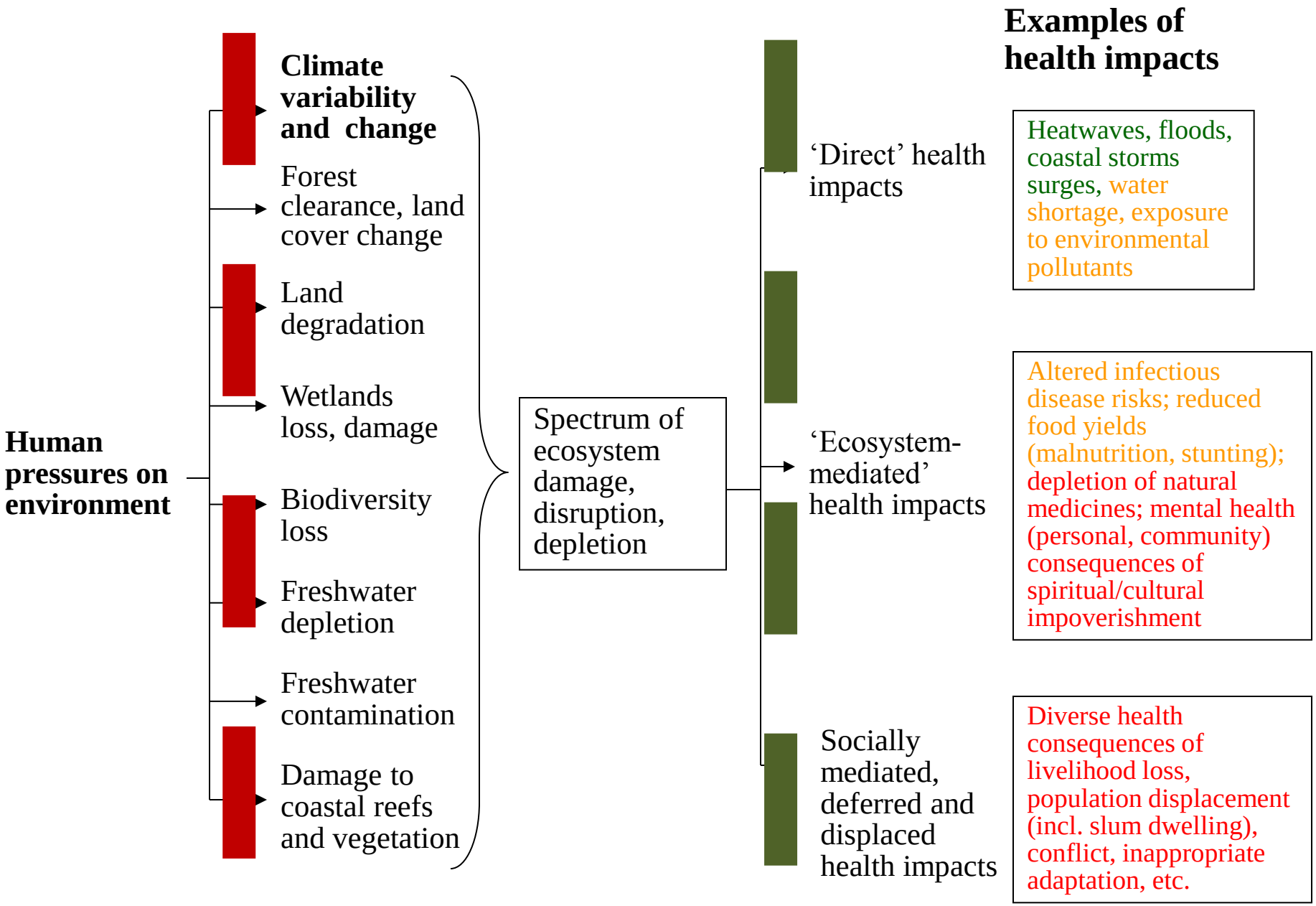
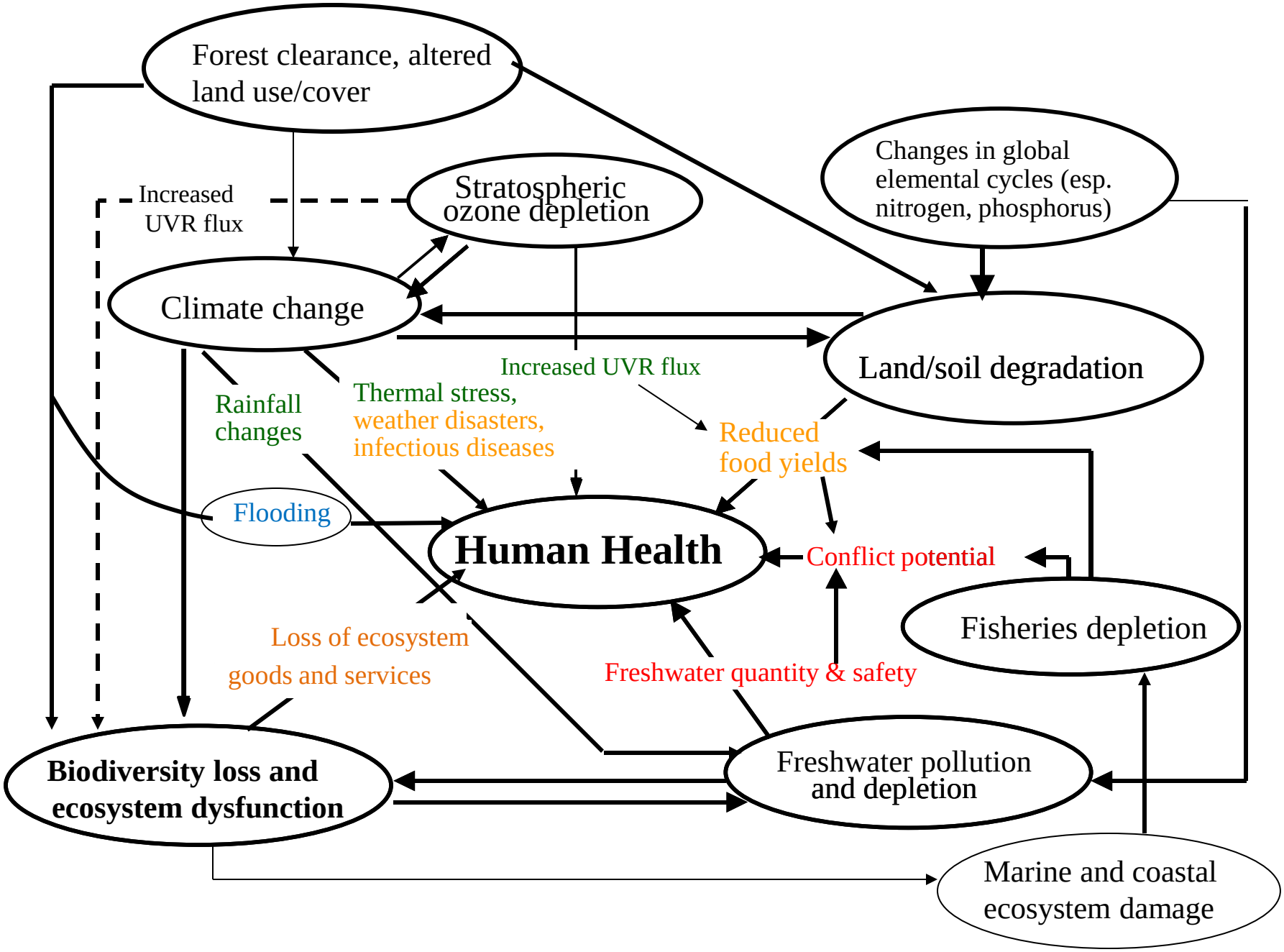
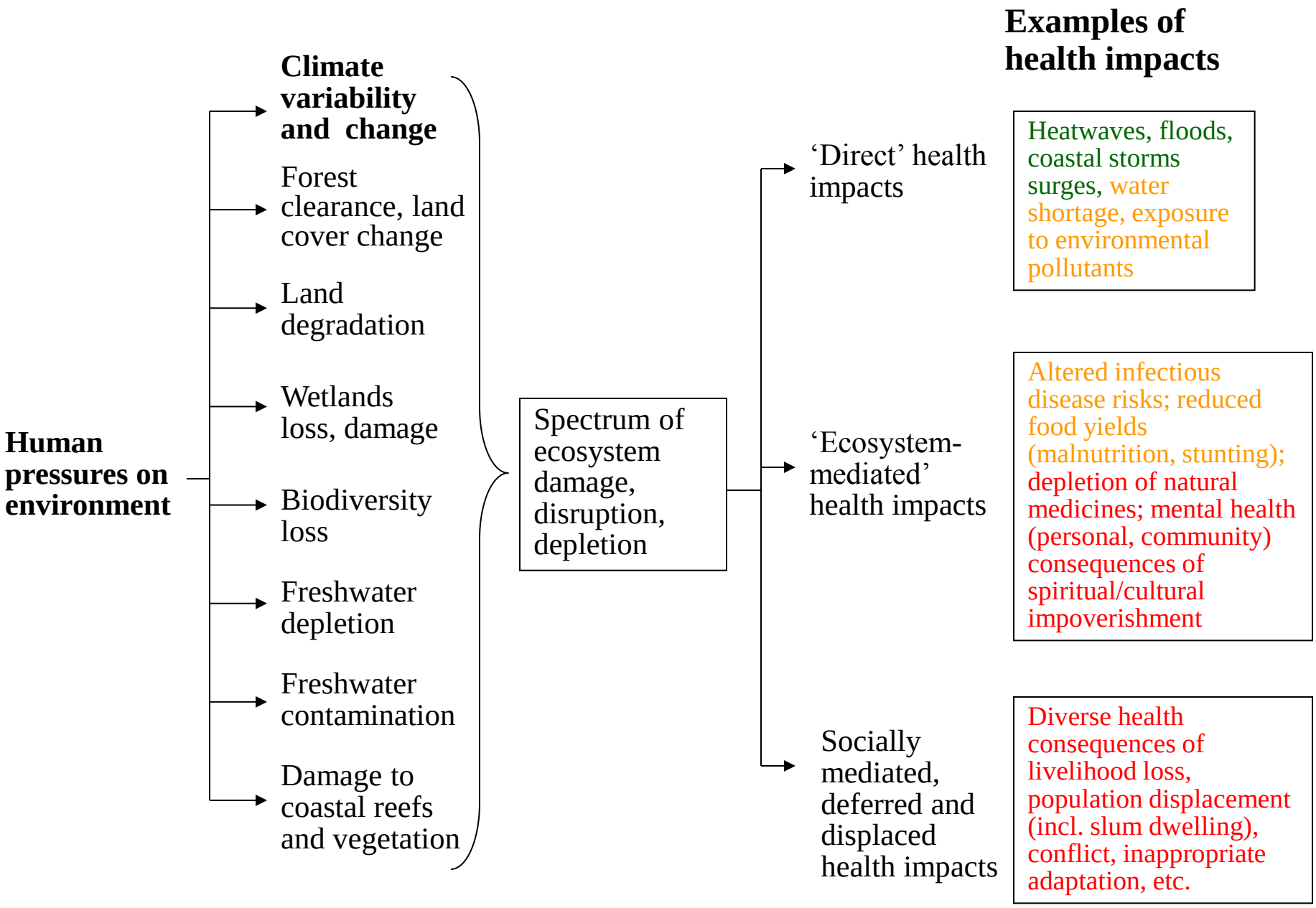
- Causals pathways of global change and human health: climate change is just one of the issues
- But policy relevant
- What is our current ability to quantify current and projected health impacts of climate change?
- Example: dengue


Examples of health impacts
Climate variability and change
Forest clearance, land cover change
Land degradation
Wetlands loss, damage
Biodiversity loss
Freshwater depletion
Freshwater contamination
Damage to coastal reefs and vegetation
Human pressures on environment
Spectrum of ecosystem damage, disruption, depletion
'Direct' health impacts
'Ecosystem-mediated' health impacts
Socially mediated, deferred and displaced health impacts
Heatwaves, floods, coastal storms surges, water shortage, exposure to environmental pollutants
Altered infectious disease risks; reduced food yields (malnutrition, stunting); depletion of natural medicines; mental health (personal, community) consequences of spiritual/cultural impoverishment
Diverse health consequences of livelihood loss, population displacement (incl. slum dwelling), conflict, inappropriate adaptation, etc.


Forest clearance, altered land use/cover
Changes in global elemental cycles (esp. nitrogen, phosphorus)
Increased UVR flux
Stratospheric ozone depletion
Climate change
Land/soil degradation
Increased UVR flux
Rainfall changes
Thermal stress, weather disasters, infectious diseases
Reduced food yields
Flooding
Human Health
Conflict potential
Fisheries depletion
Loss of ecosystem goods and services
Freshwater quantity & safety
Biodiversity loss and ecosystem dysfunction
Freshwater pollution and depletion
Marine and coastal ecosystem damage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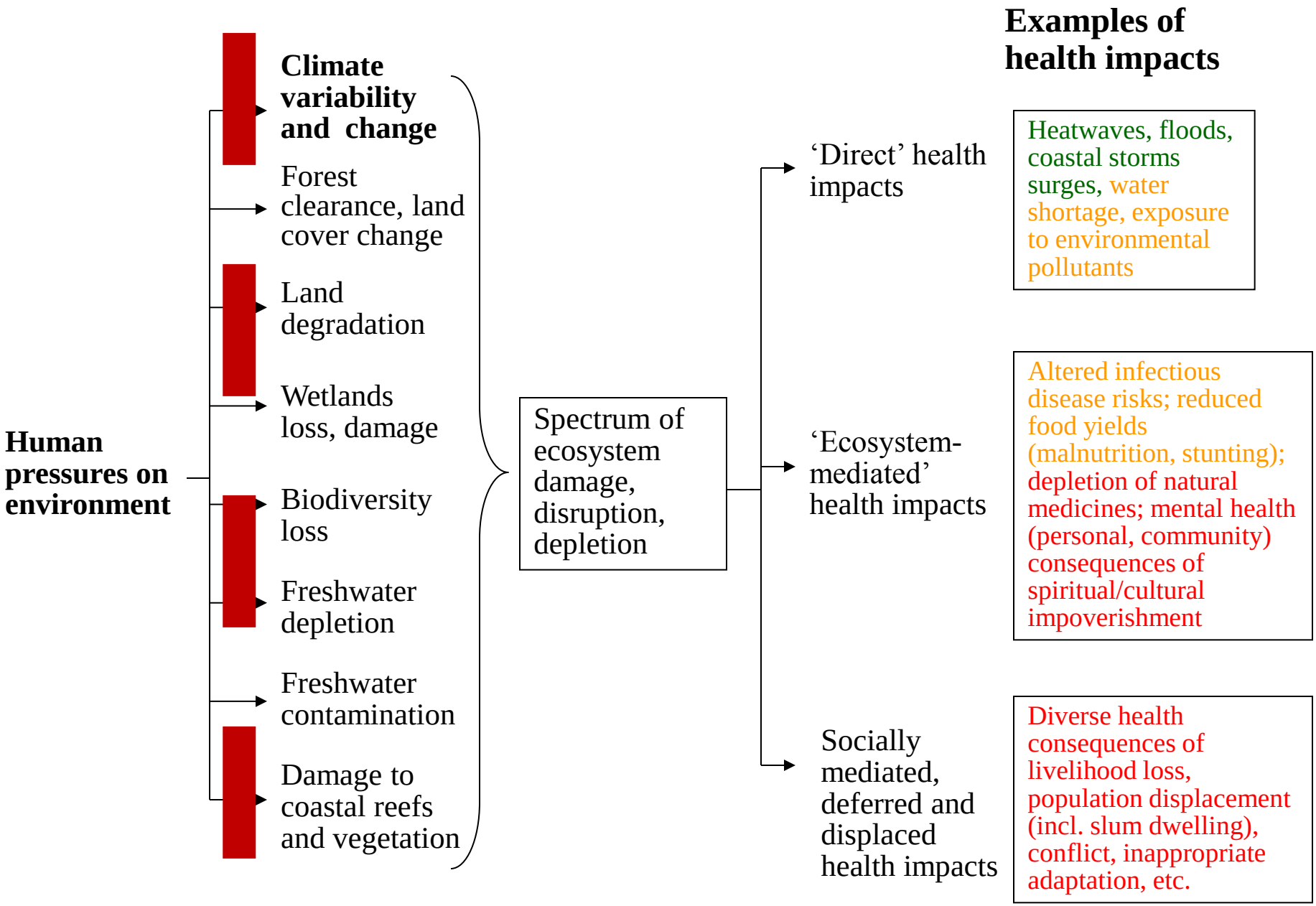
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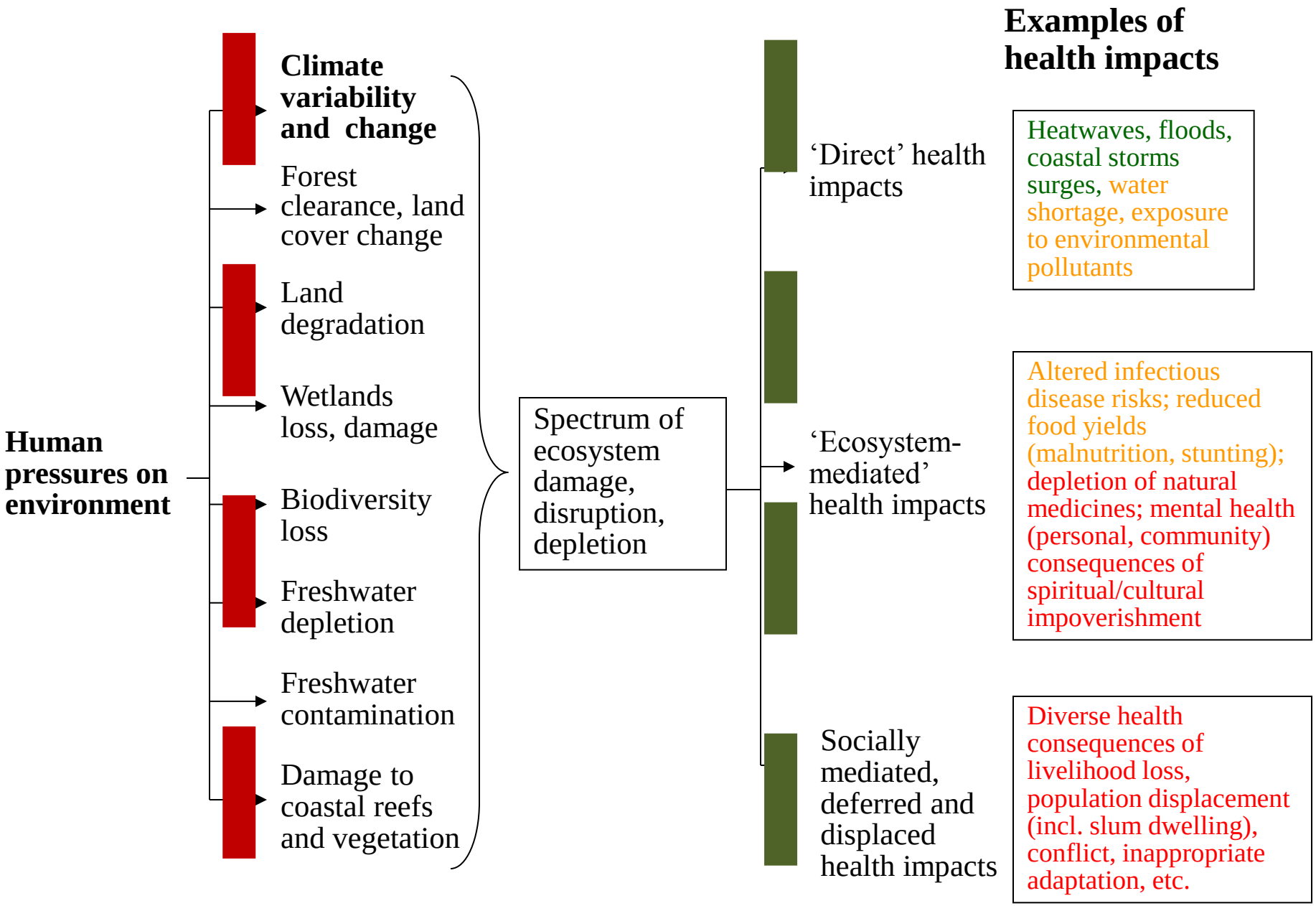
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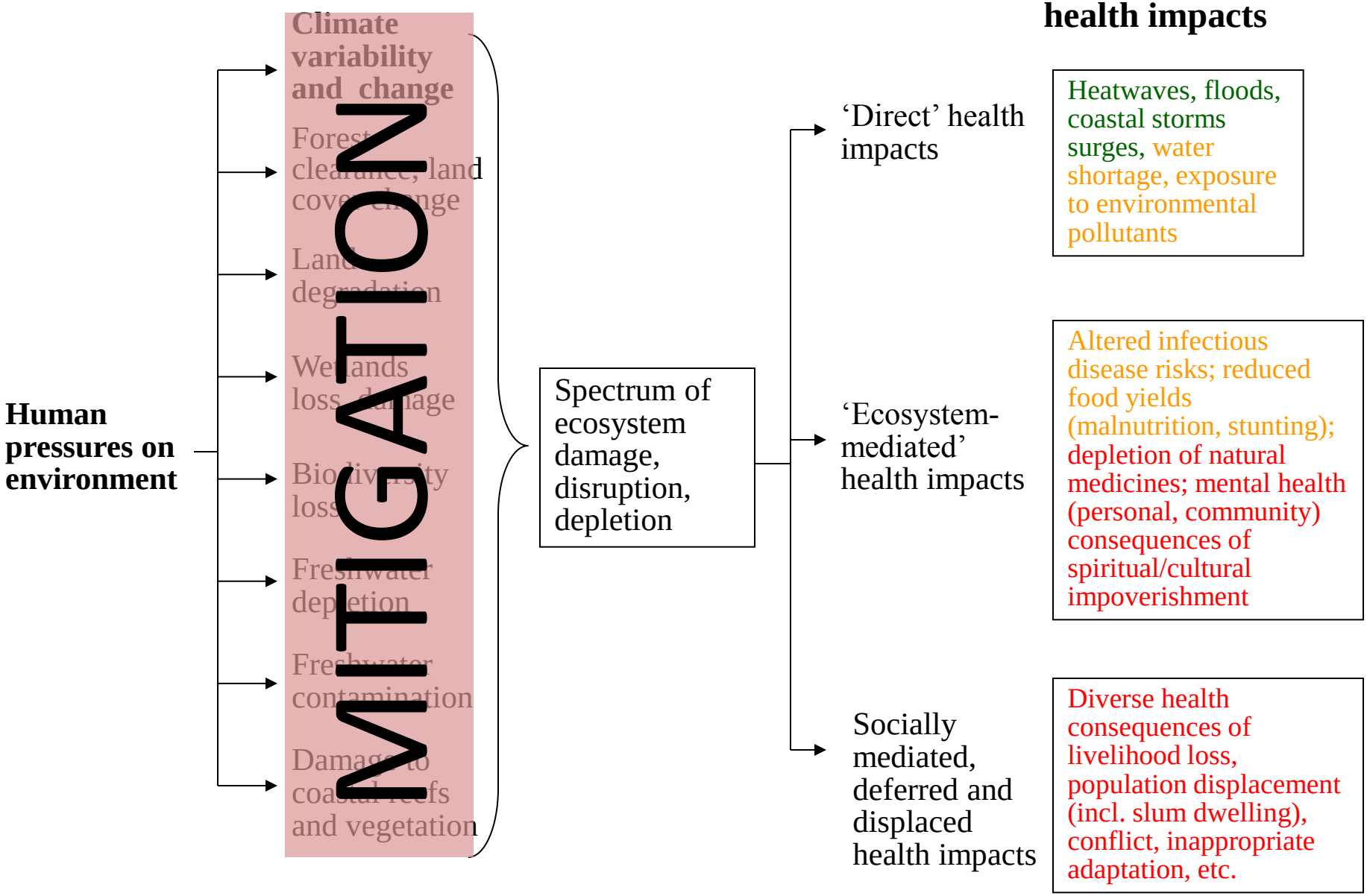
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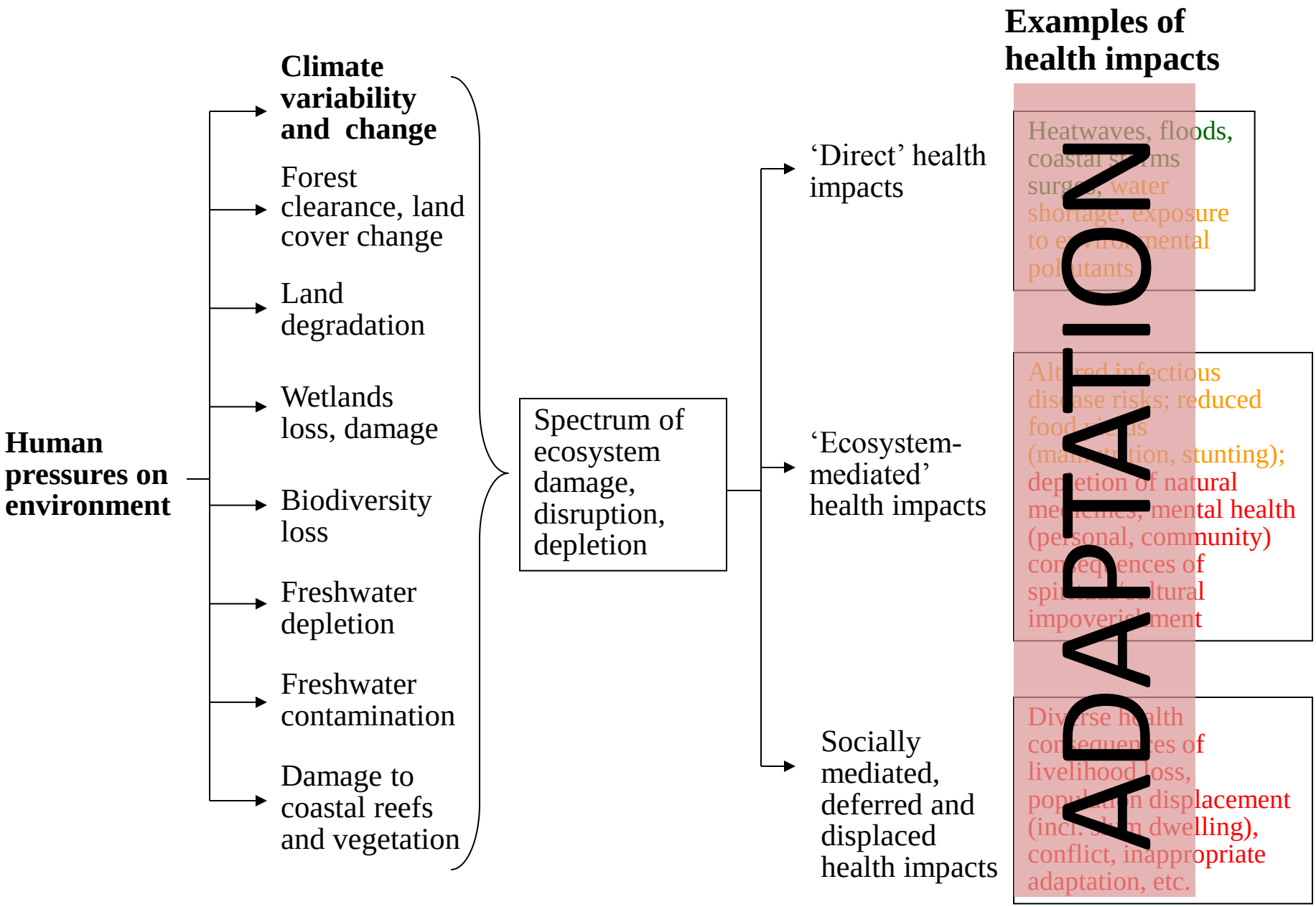
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ADAPTATION

Health and climate variability: relative importance

1. Direct, often local, short term impacts of flooding, heatwaves: (+)
2. Ecosystem mediated: communicable disease, malnutrition (++)
3. Complex deferred/displaced hazards: assessment of health impacts not yet attempted, but (+++)?

Quantifying climate change impacts on health

Health Impact	Empirical studies of climate change effects
Extreme weather events	**Heatwaves, flood models + (droughts, cyclones not well modelled)**
Vector borne disease	**Spatial patterns of malaria, dengue +**
Diarrhoea	**Several time series studies ++**
Malnutrition	**Improved crop models ++**
Complex effects, population displacement	**Not yet attempted (+++?)**

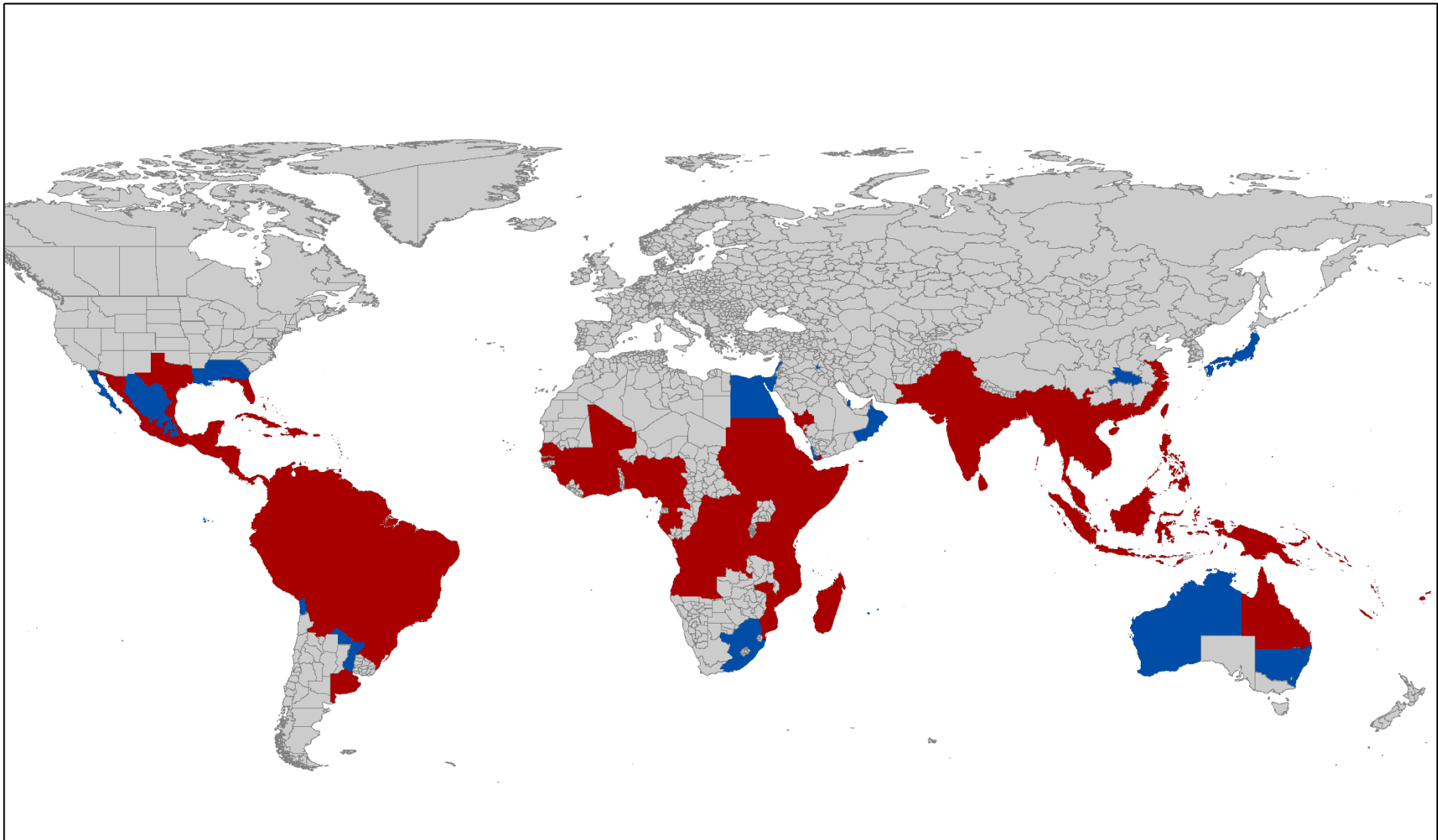
Accounting for different possible futures

- Mitigation effects: different scenarios of greenhouse gas emissions
- Adaptation effects: very limited ability to incorporate potential quantitative effects

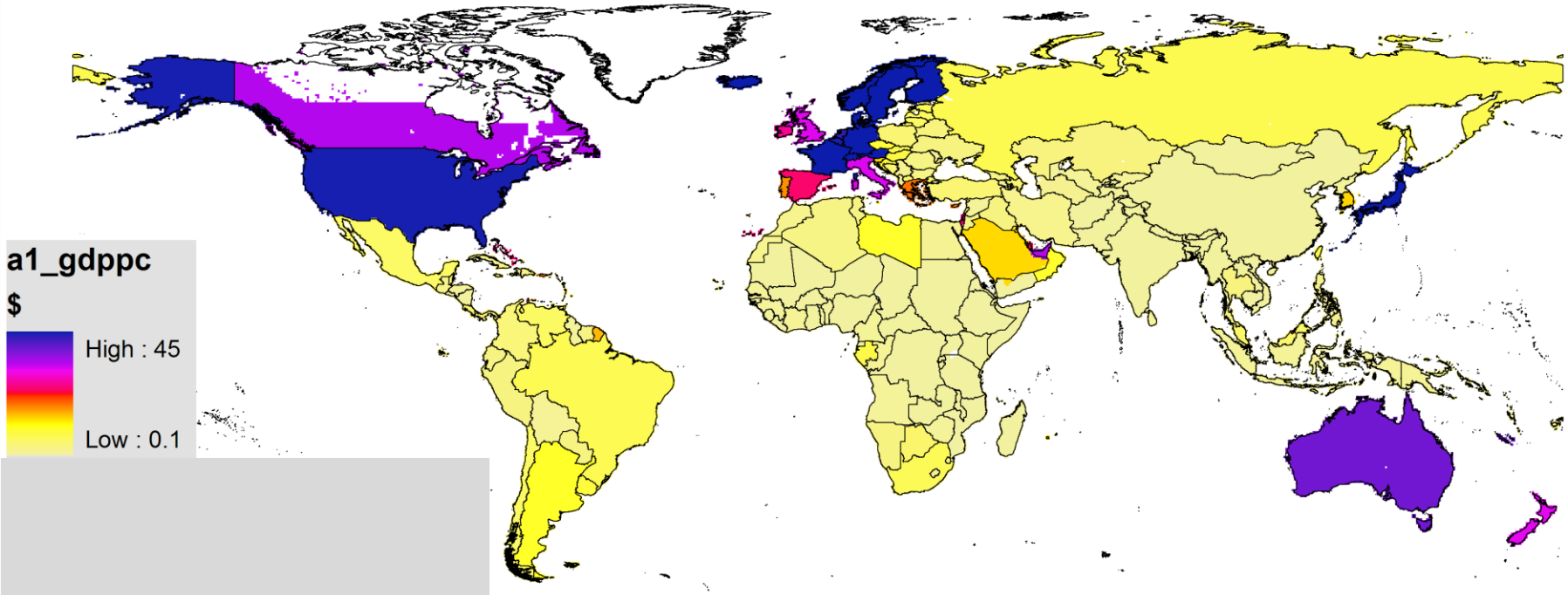
Example: Dengue

- Method: spatial patterns of presence/absence of local transmission, based on climate and GDP
- Ability to model local transmission potential, but not numbers of cases, using this method

Geographic distribution of dengue: recent years (red) ca1900 (blue)

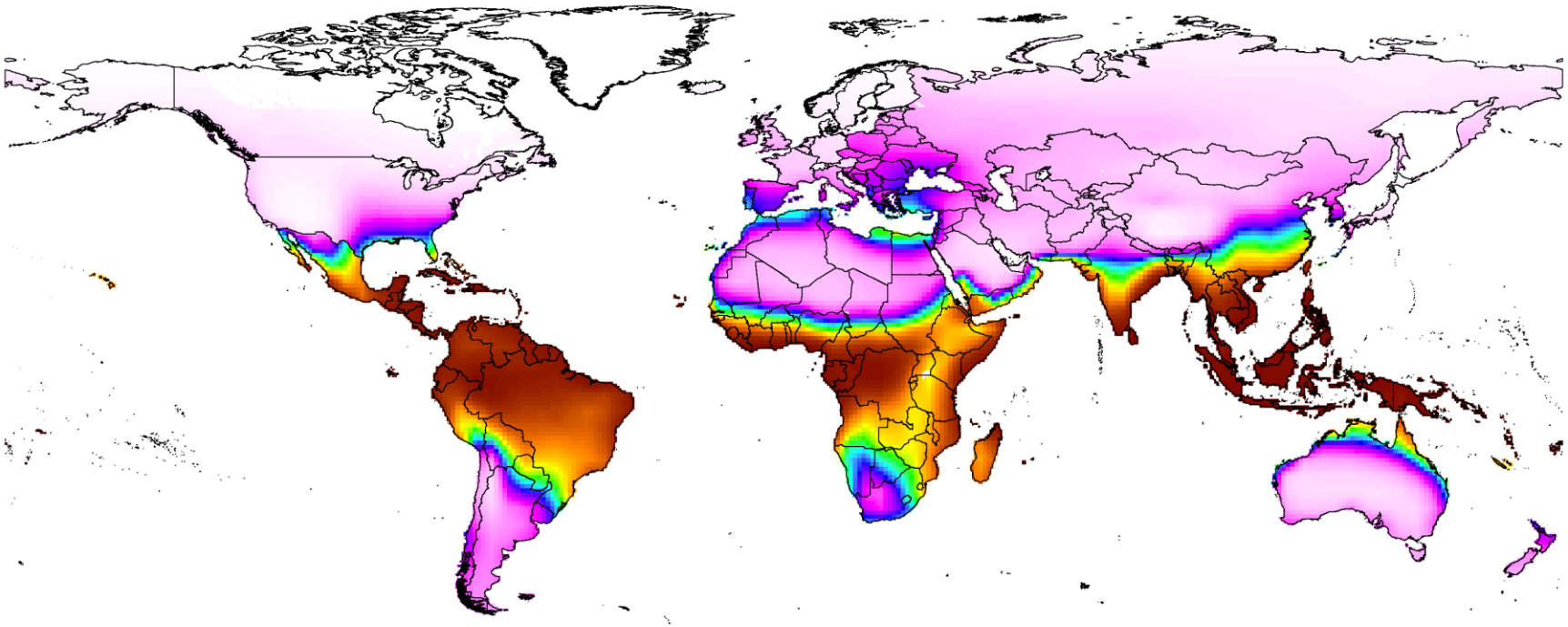


Interest in understanding possible influence of social factors (GDP per capita shown here)



GDPpc 1990 US$ (1,000s)

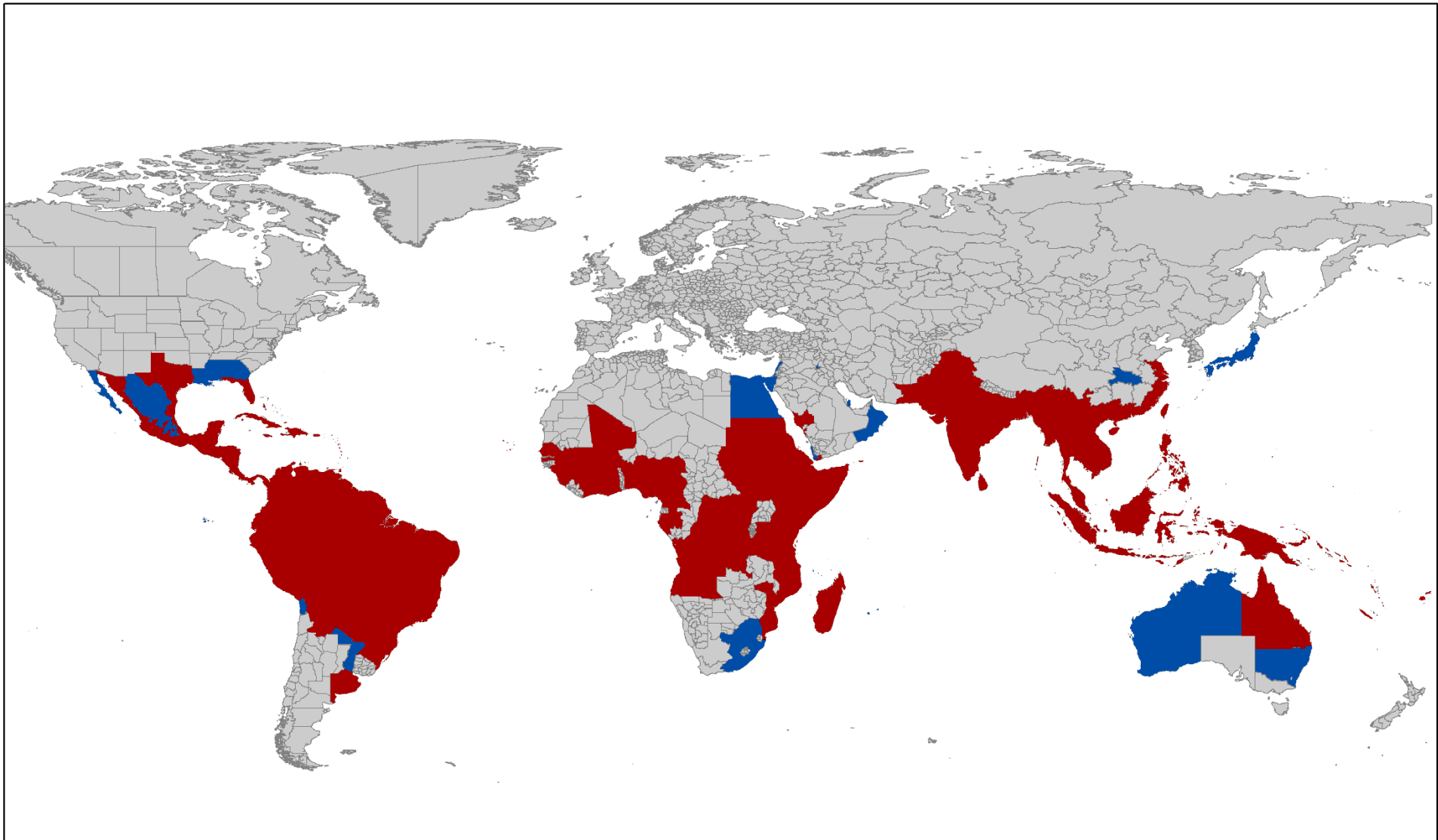
Dengue base model with GDPpc and specific humidity (year 2000)

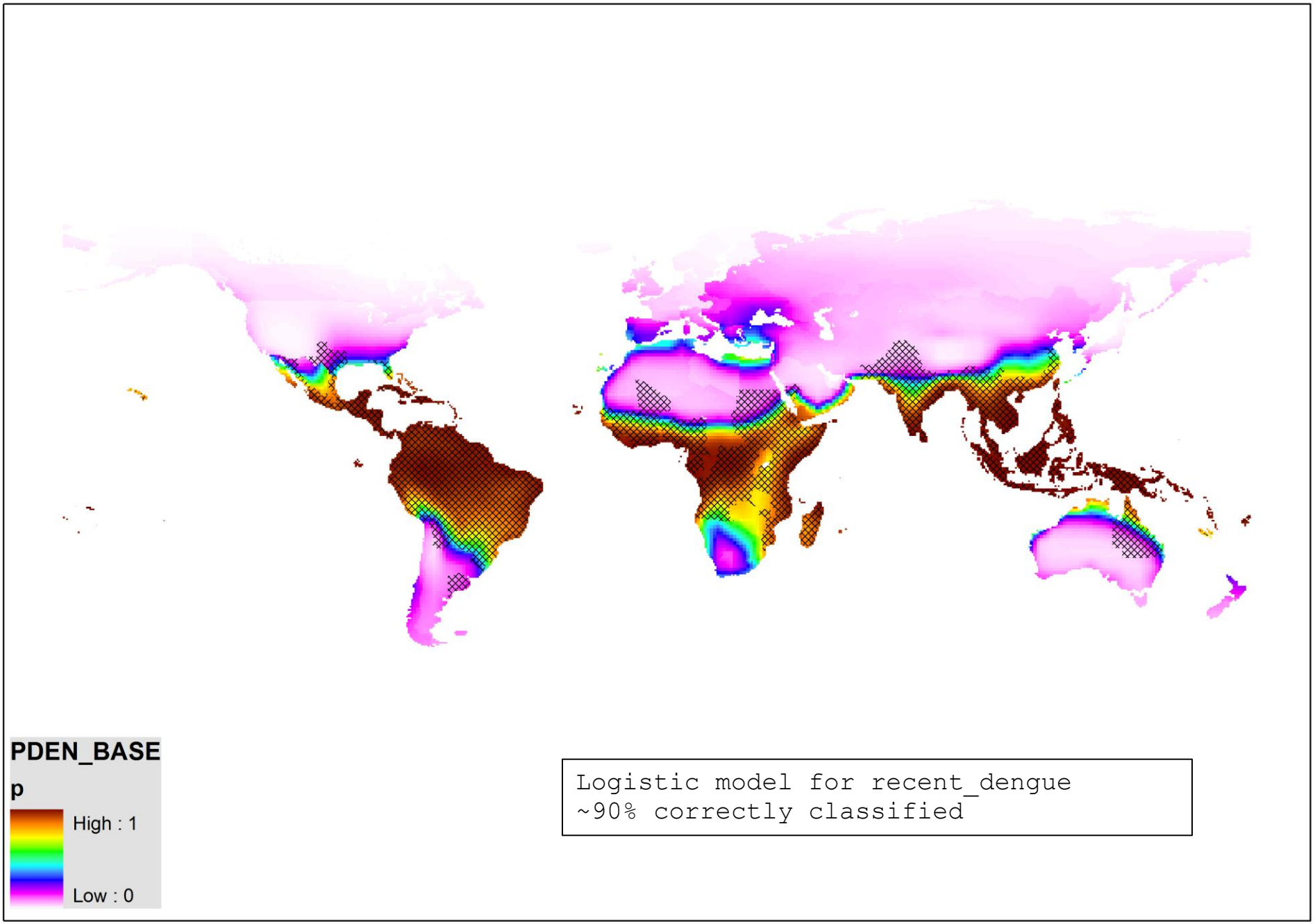


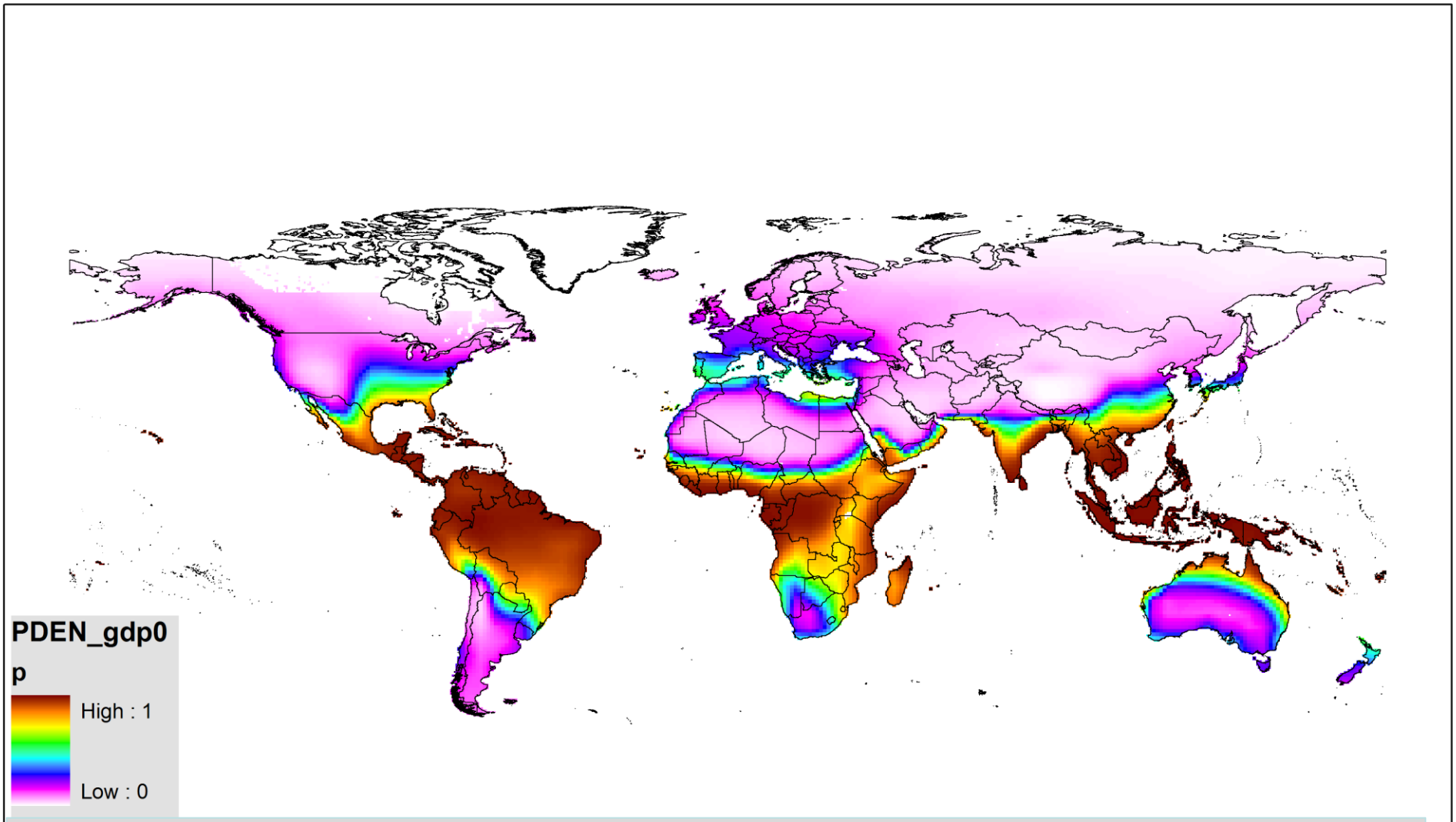
PDEN_BASE
p
High : 1
Low : 0

GDPpc OR= 0.9
humidity OR= 1.7

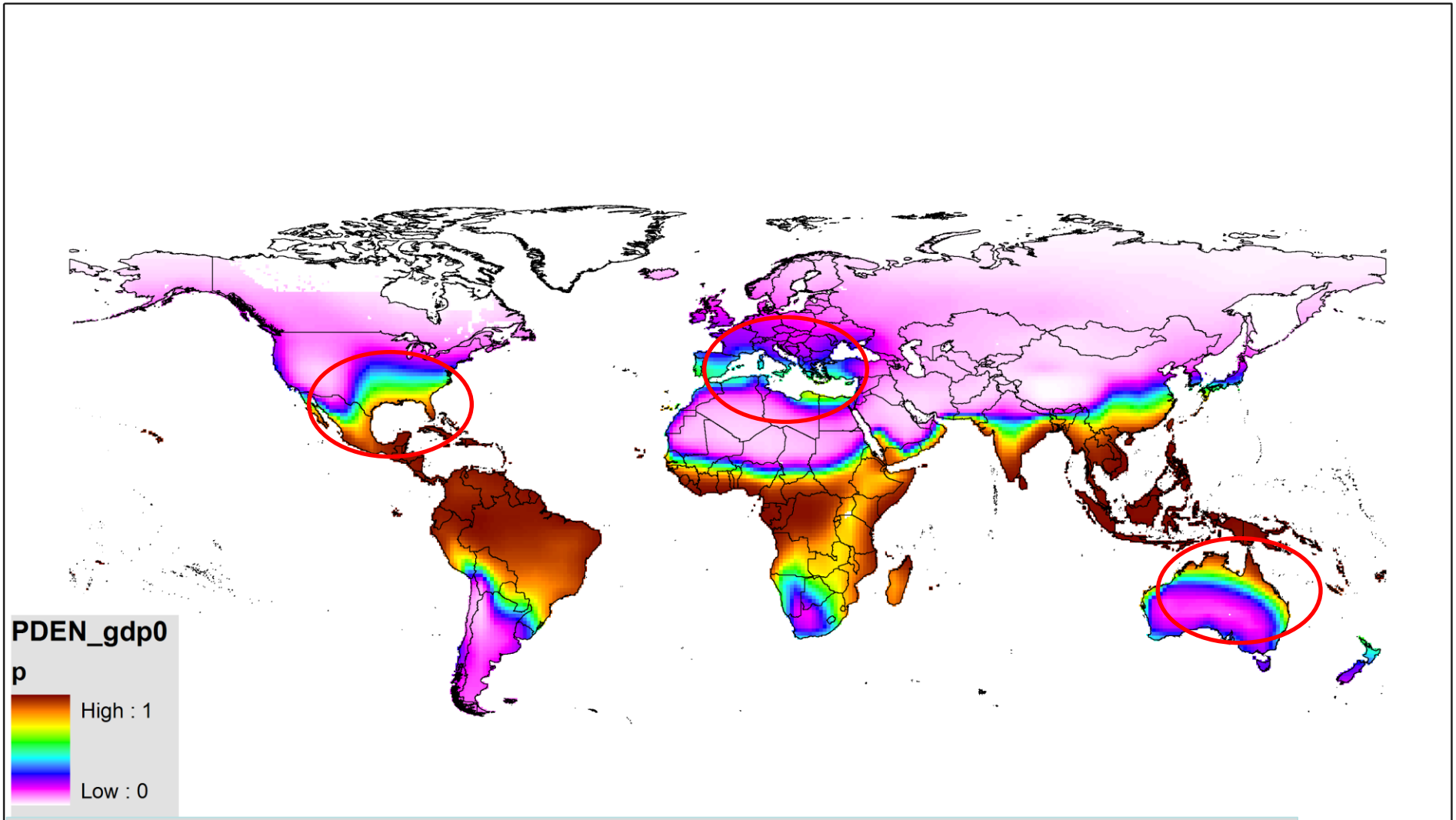
Geographic distribution of dengue: 1975-present (red)




PDEN_BASE
p
High : 1
Low : 0
Logistic model for recent_dengue
~90% correctly classified

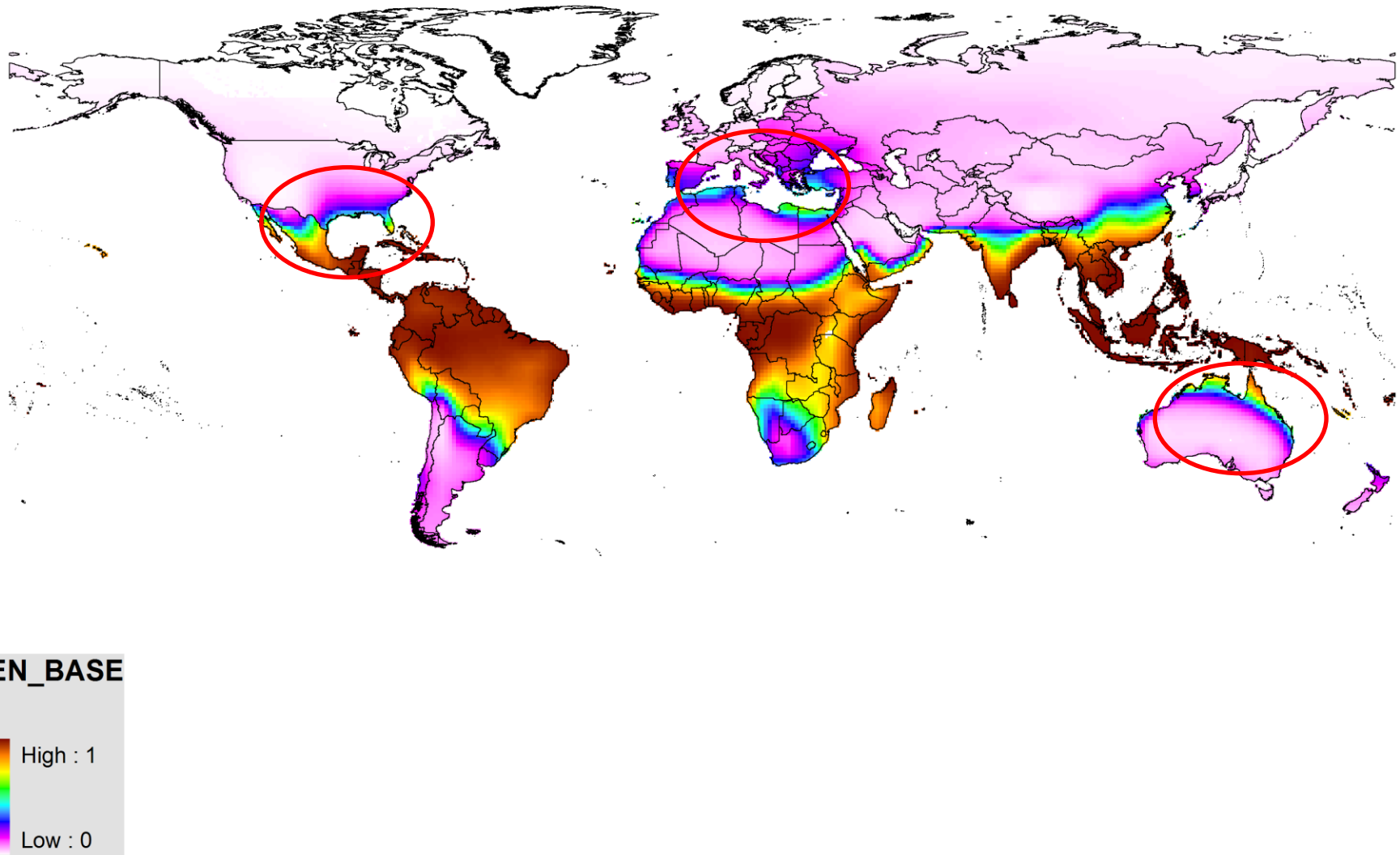


Going back in time… GDPpc~0 and observed humidity (ca 1900)



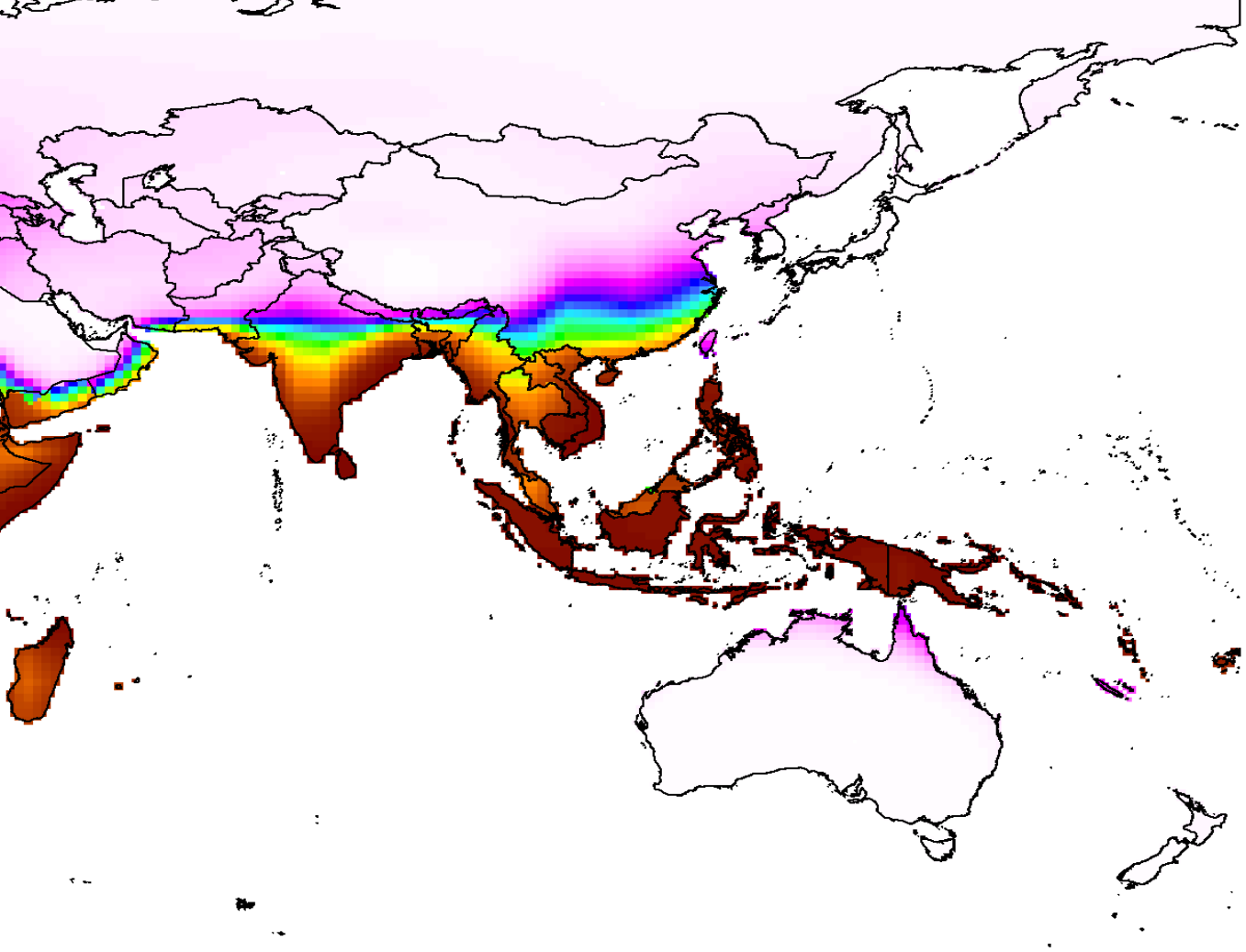
Areas of note…

Comparison with base model ca 2000

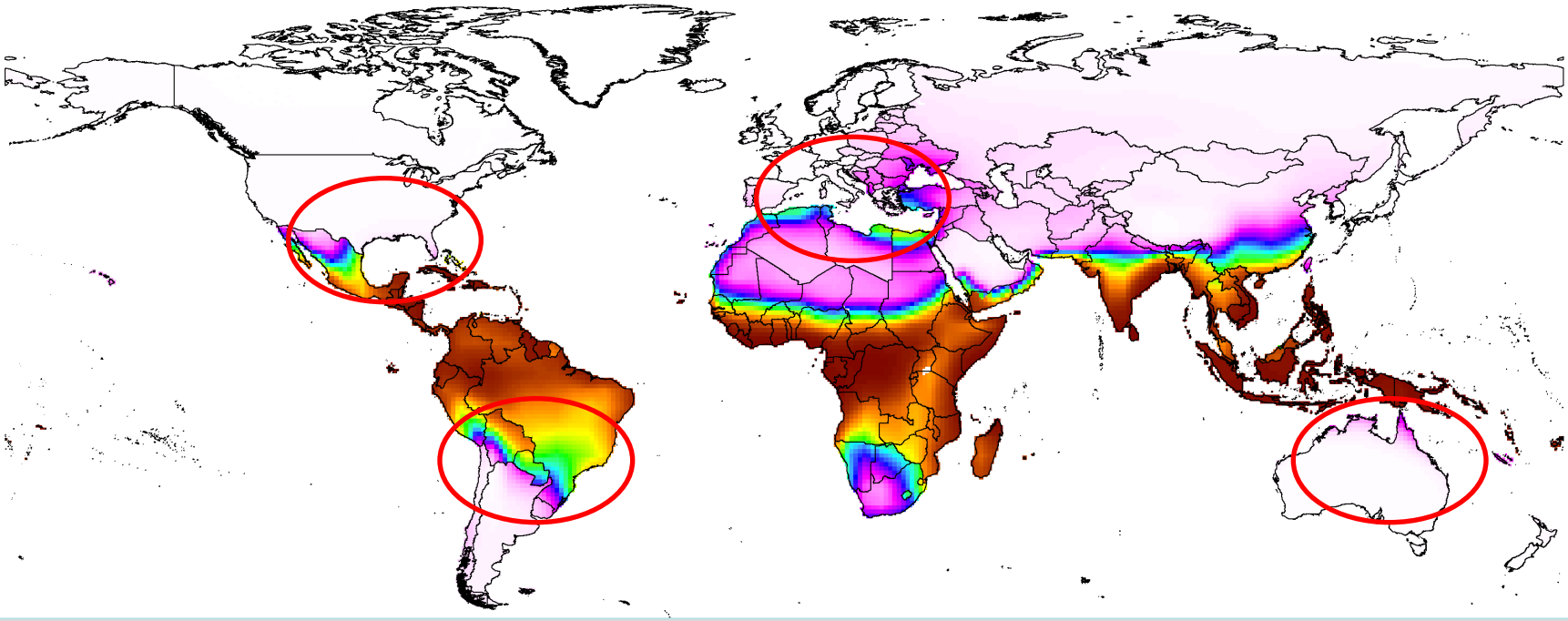


Forecasts for future

- GDPpc and specific humidity projected by global models
- Account for influence of climate change and socioeconomic development



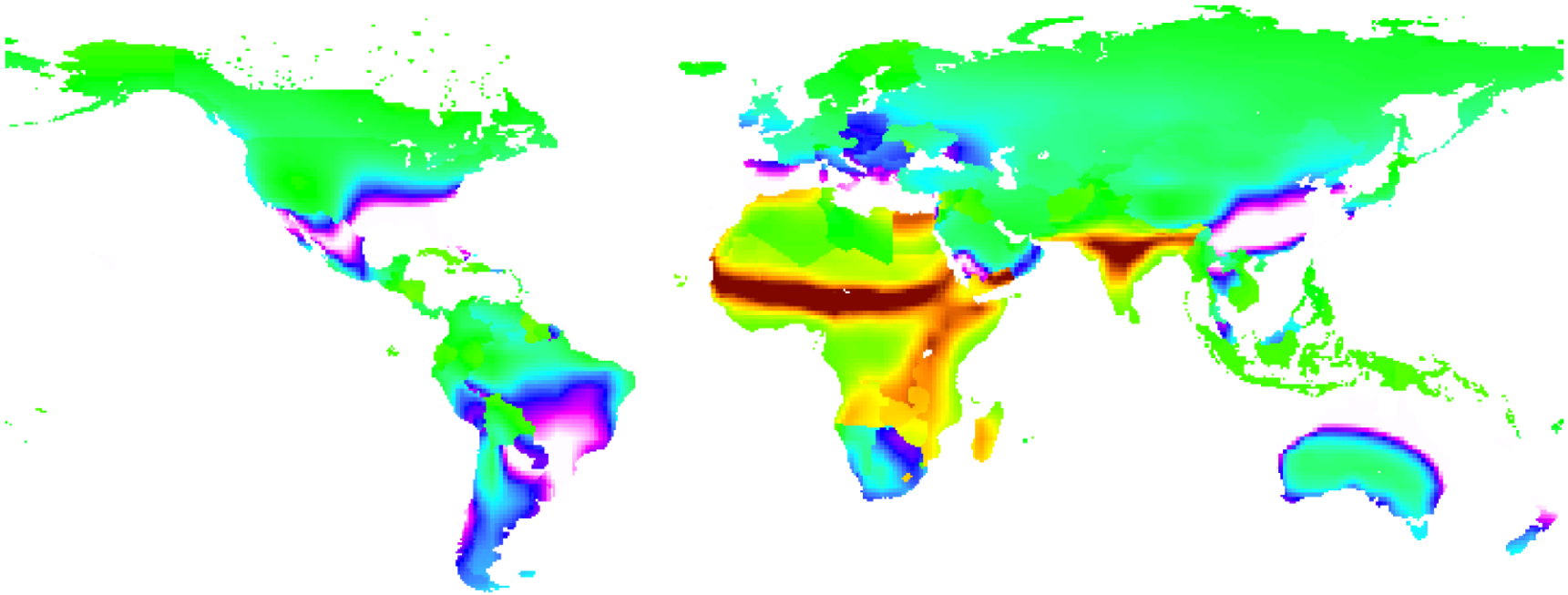
Forecast for 2050s

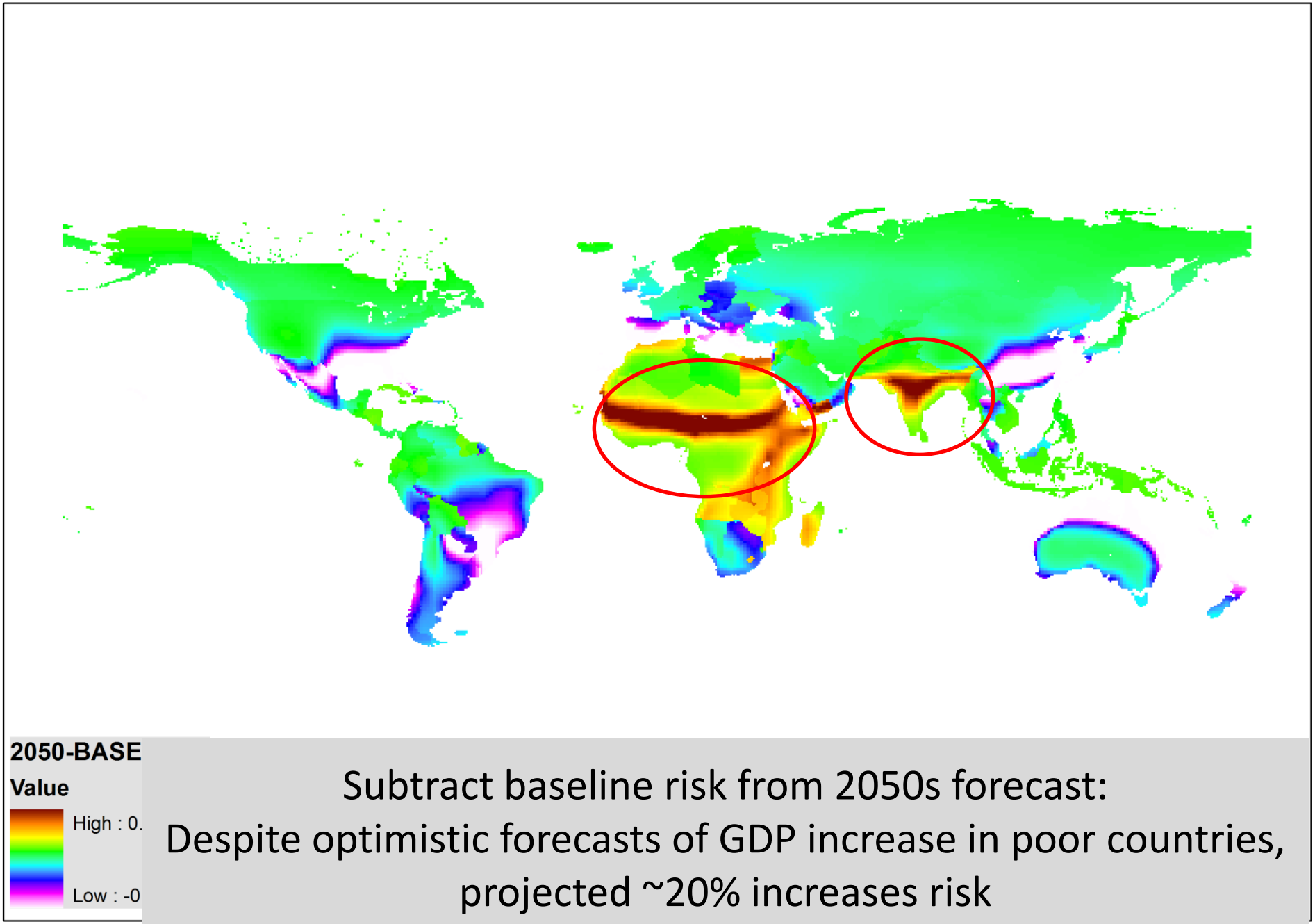


Forecast recession of dengue with socioeconomic development, despite more favourable climate

Does this mean we can forget about climate change?

Perhaps not…

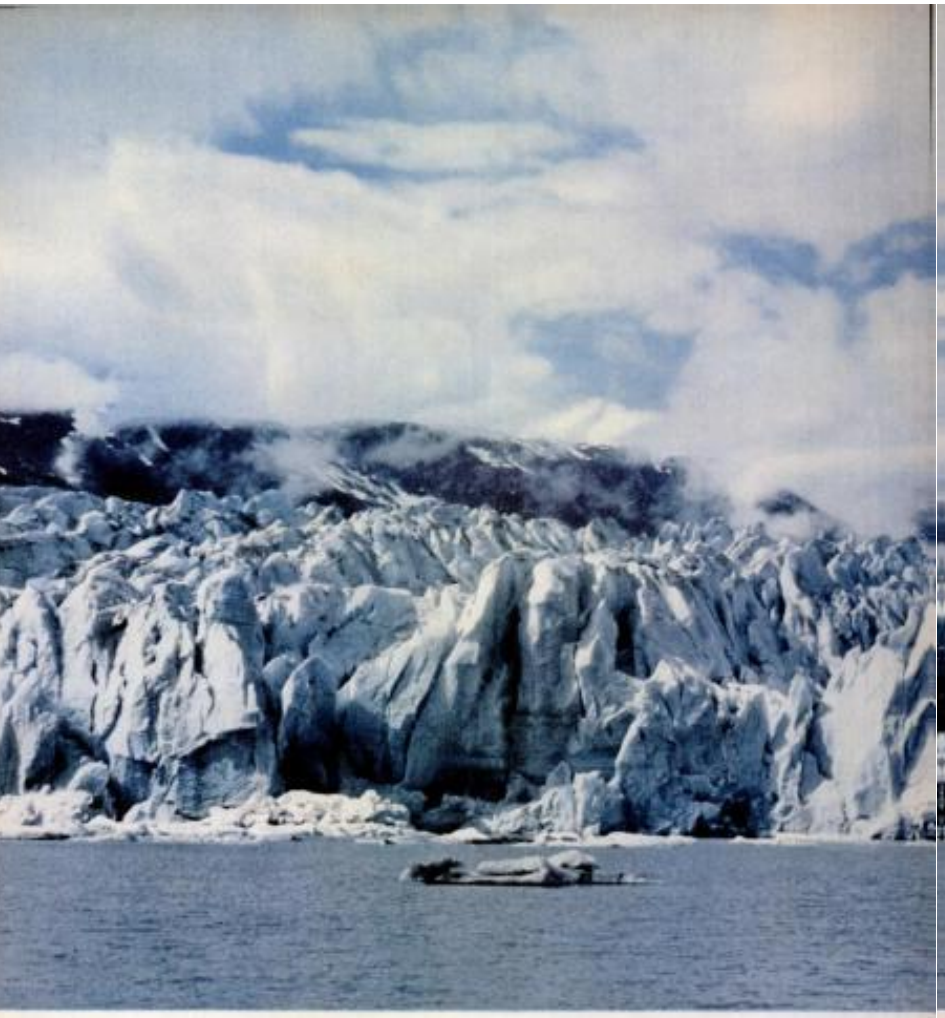




Subtract baseline risk from 2050s forecast:
Despite optimistic forecasts of GDP increase in poor countries, projected ~20% increases risk

Conclusions:

- Quantify some of the health effects via some *CC pathways* (with much uncertainty)
- Climate change increases risks for *some diseases*
- Socioeconomic development is protective (but GDPpc is probably a poor indicator)
- Very limited ability to quantify effects of adaptation.



TAKU GLACIER, ALASKA, IS A RIVER OF ICE STRETCHING 378 SQUARE MILES. YET THE PETROLEUM ENERGY HUMBLE SUPPLIES AMERICA COULD MELT IT AT THE RATE OF 7 MILLION TONS A DAY!

EACH DAY HUMBLE SUPPLIES ENOUGH *ENERGY* TO MELT 7 MILLION TONS OF GLACIER!

This giant glacier has remained unmelted for centuries. Yet, the petroleum energy Humble supplies—if converted into heat—could melt it at the rate of 80 tons each second! To meet the nation's growing needs for energy, Humble has applied science to nature's resources to become America's Leading Energy Company. Working wonders with oil through research, Humble provides energy in many forms—to help heat our homes, power our transportation, and to furnish industry with a great variety of versatile chemicals. Stop at a Humble station for new Enco Extra gasoline, and see why the "Happy Motoring" Sign is the World's First Choice!

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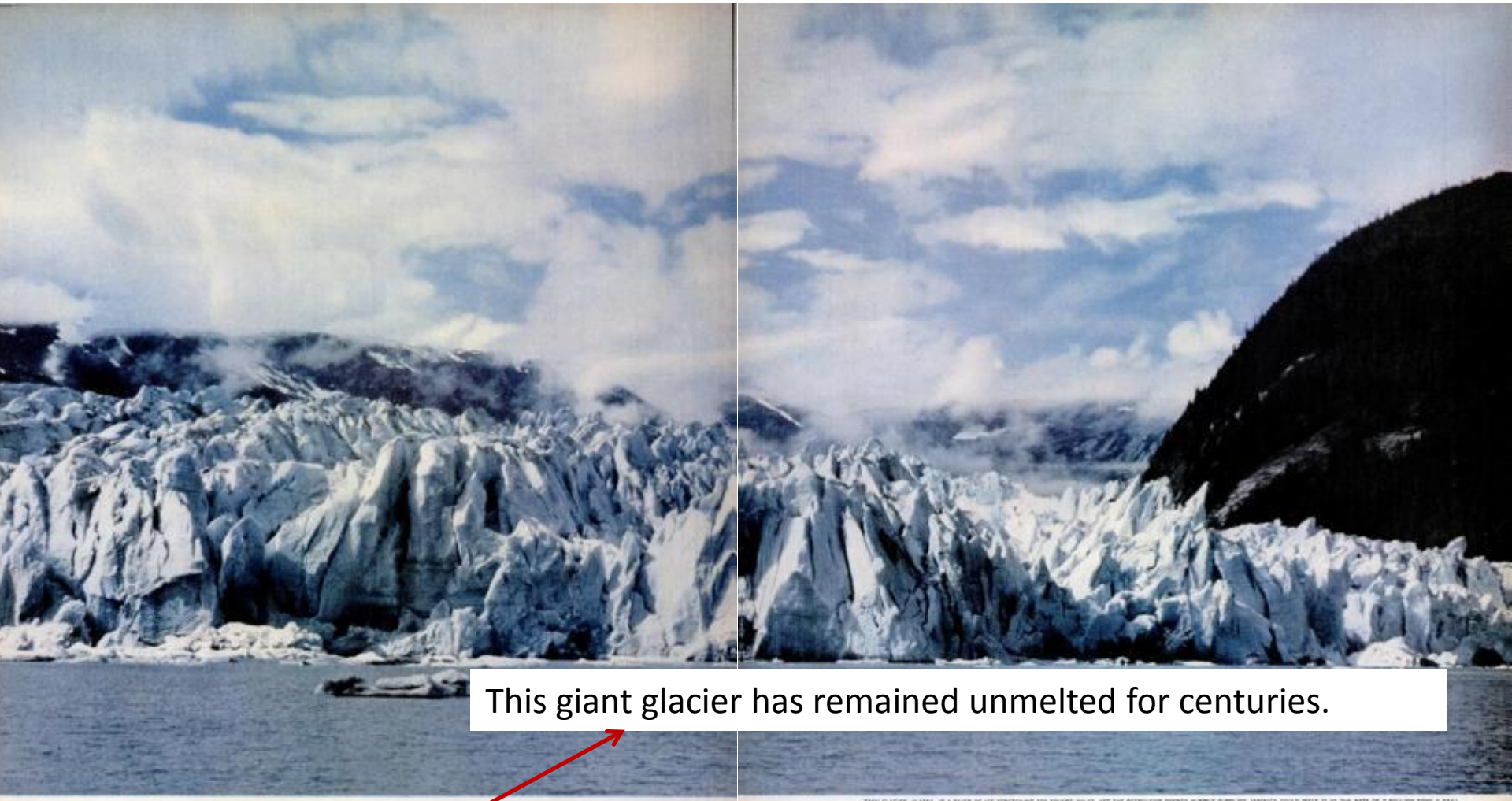
ENCO

R2



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