



Central Asia and Climate Change: Collaboration for Local Solutions



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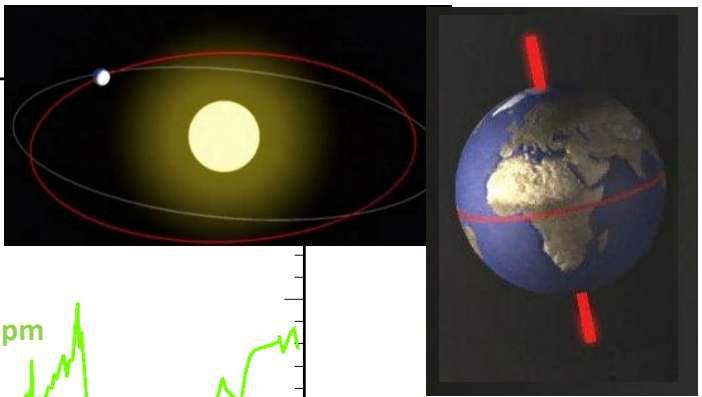
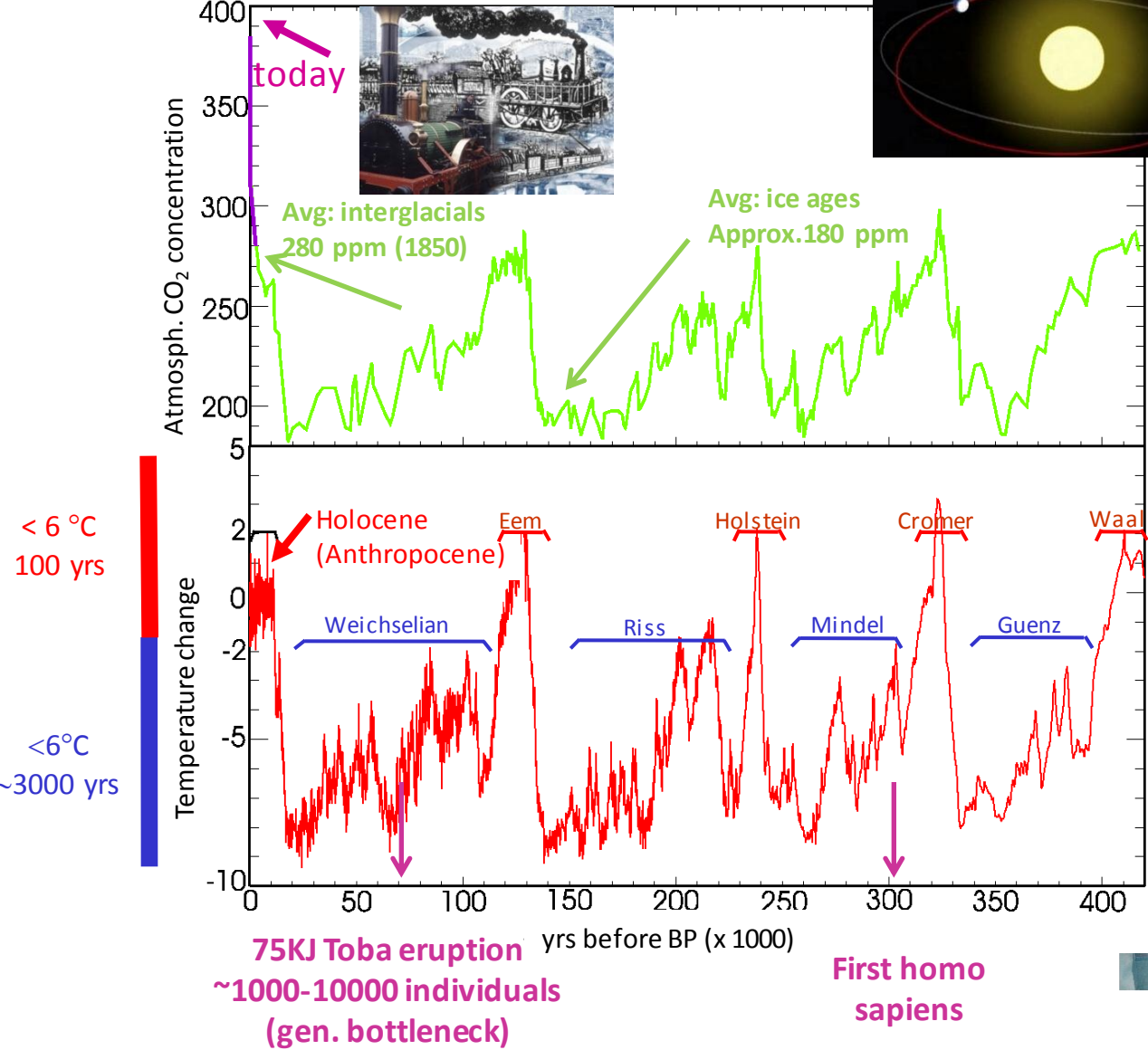
www.climatemediade.de



Geohistorical or anthropogenically induced changes?

April 2014 (highest value since 3 mio. yrs)

401 ppm (~480 CO_{2eq.})



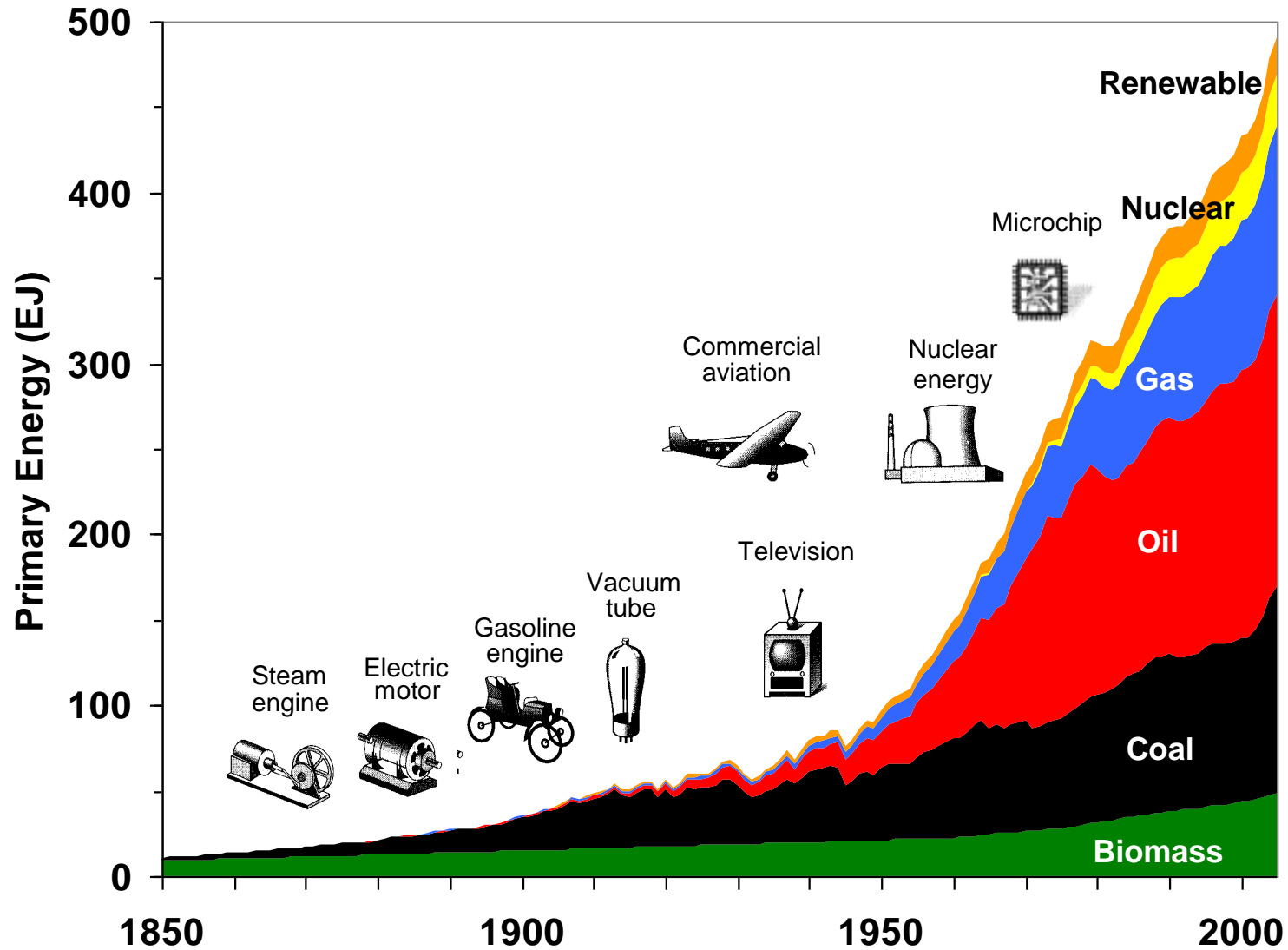
- humankind increases CO₂ concentration ~35% since 1850
- expected change at least 20 times faster



Climate archives:
Antarctica: Epica Dome Concordia C: 900.000yrs
Antarctica: Vostok Ice Core 420.000yrs
Arctic: Sediment Elgygytyn lake: 3.7mio yrs

Early theories: Fourier, Stefan, Boltzmann, Arrhenius: ~1820-1920

World's primary energy mix



Are there indications for a man-made warming?



Stoneage hunter “Ötzi”
iceman, fully equipped with
longbow, arrows, stone knife,
etc.

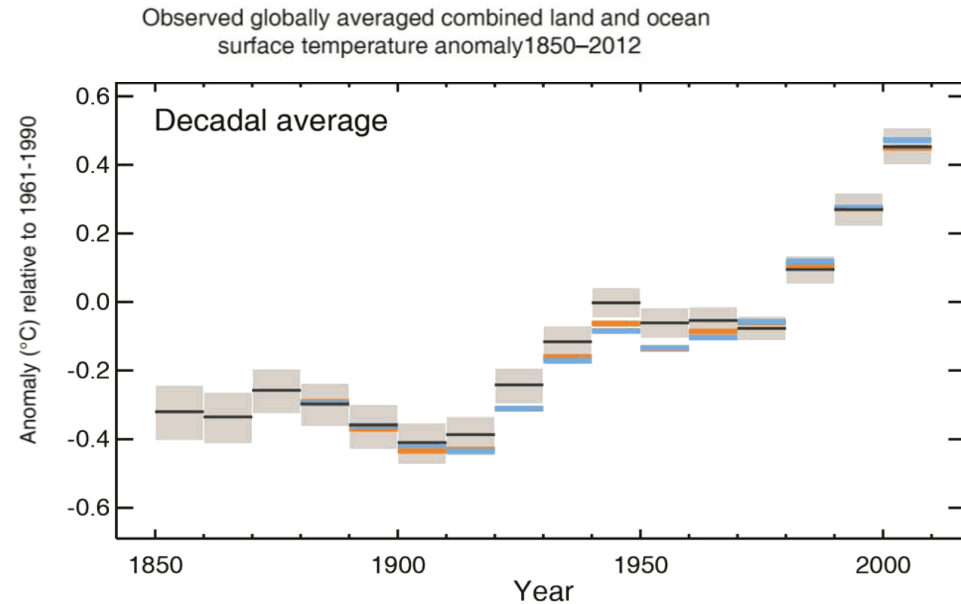
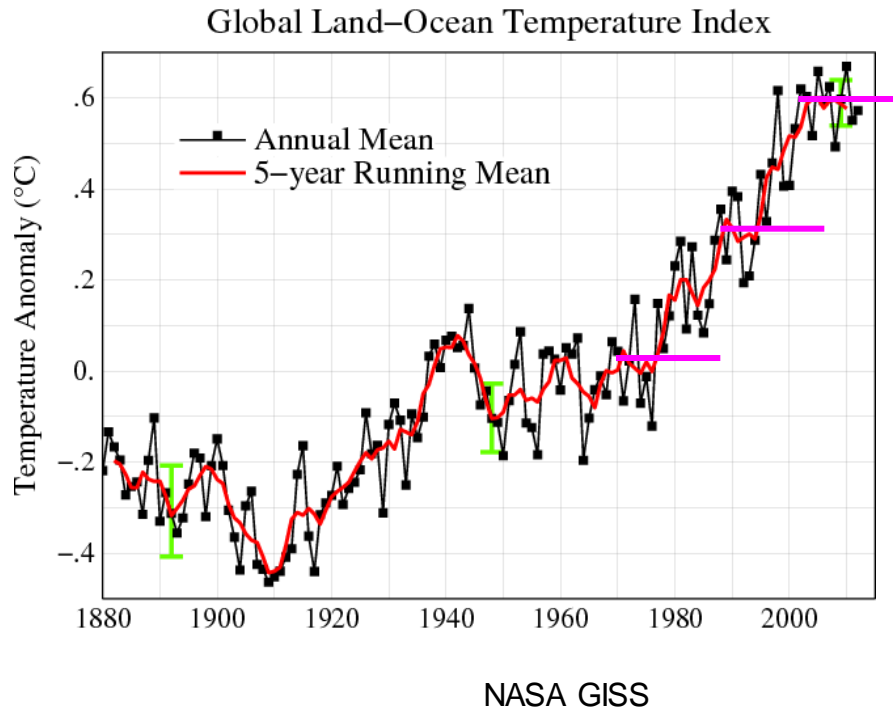
released
by Similaun (> 3000m ASL)
Glacier/European Alps

Age of corpse: ~5300yrs,
Killed by murder at an age
of ~40

..now in Ötzi Museum
Bolzano/Italy

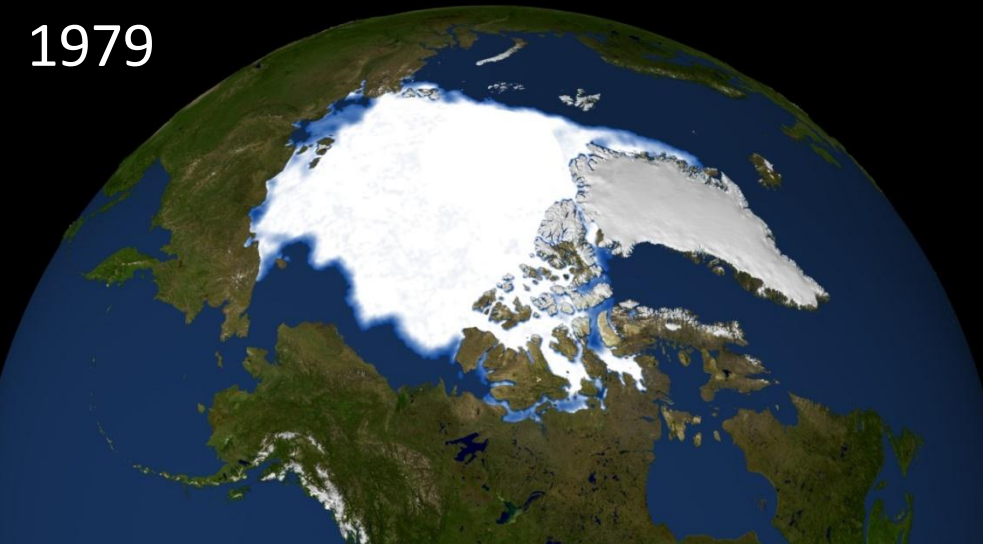
Is global warming taking a break now?

Each of the last three decades has been **successively warmer** than any preceding decade since 1850.



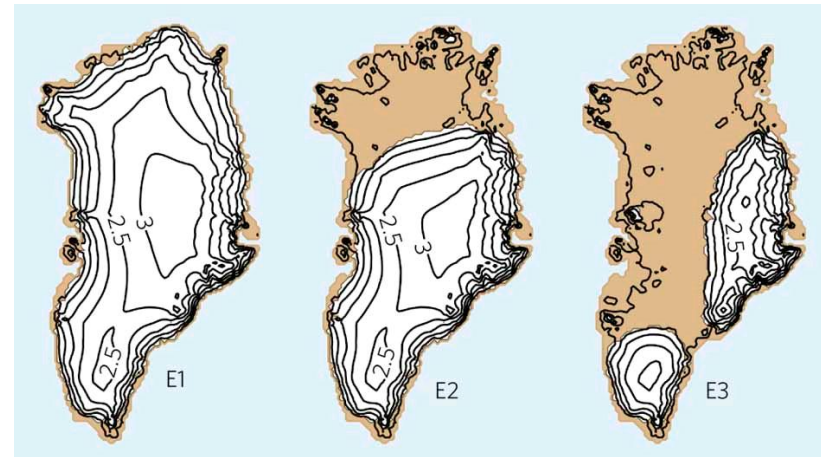
The evidence for human influence has grown since AR4. It is **extremely likely** [*i.e.* 95% certainty] that **human influence has been the dominant cause** of the observed warming since 1950.

1979



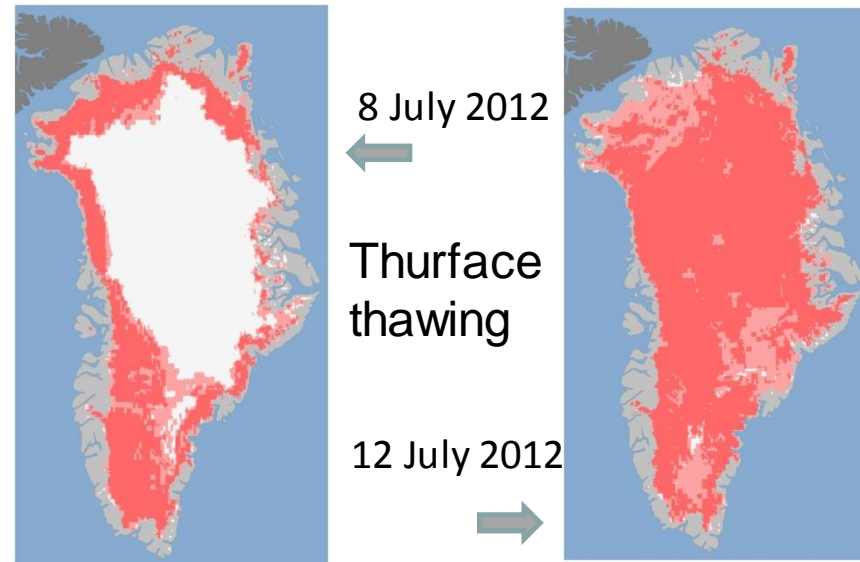
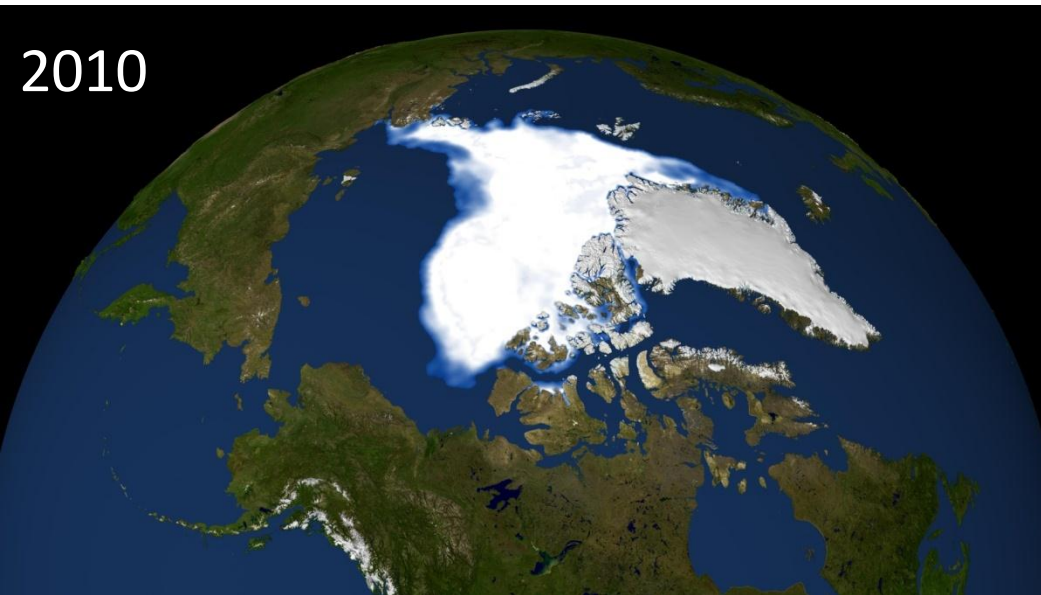
-49% in comparison to the 80ties

Irreversible loss of Greenland Ice sheet could start at $+1.6^{\circ}\text{C}$



Robinson et al. 2012

2010



(U.S. National Snow and Ice Data Center) Arctic Sea Ice Decline

(Notz 2010 after Stroeve et al. 2007 GRL)

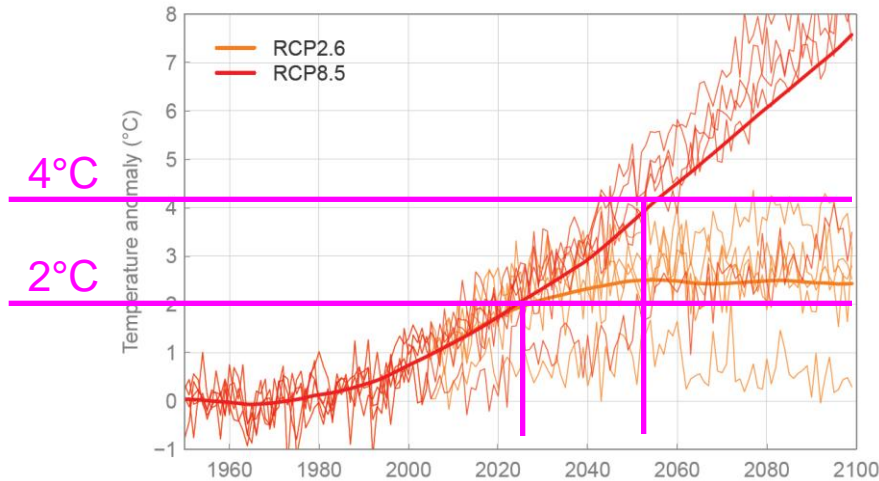
Nicolo E. DiGirolamo, SSAI/NASA GSFC, and Jesse Allen, NASA Earth Observatory 2012



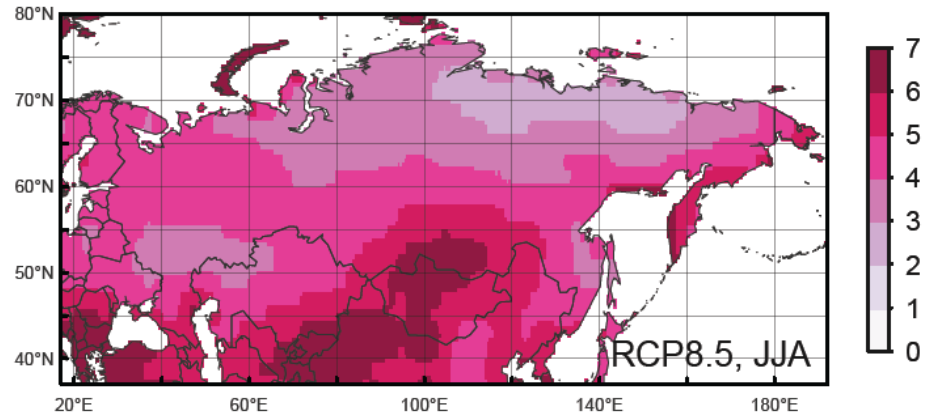
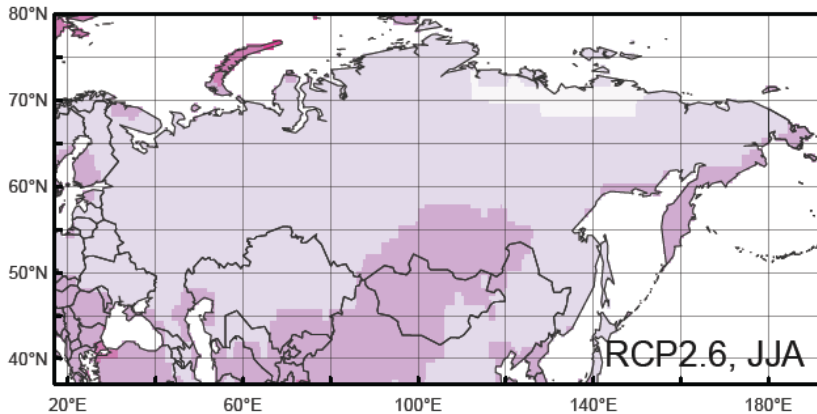
Relevance for the region?



Climate projections



- Warming is likely to be more than global average
- Moderate increase in drought risk
- Dry is getting drier, wet is getting wetter

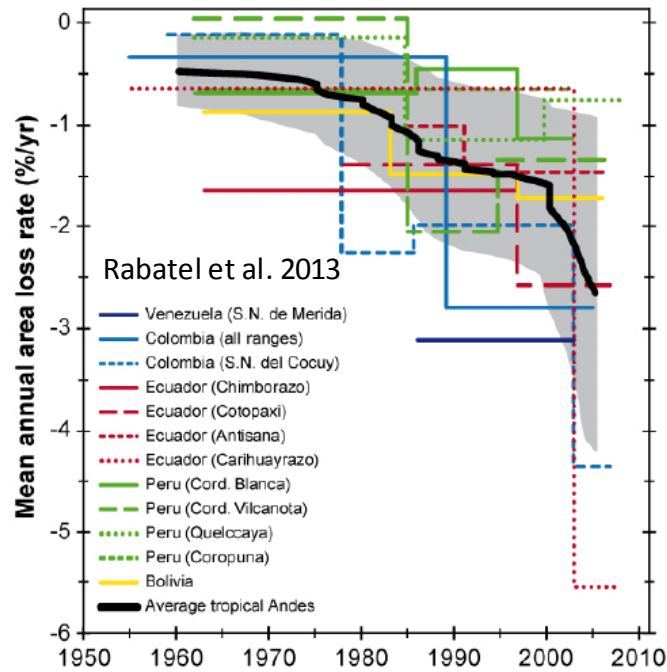


summer temperature anomalies for June-August under 2°C and 4°C world scenarios

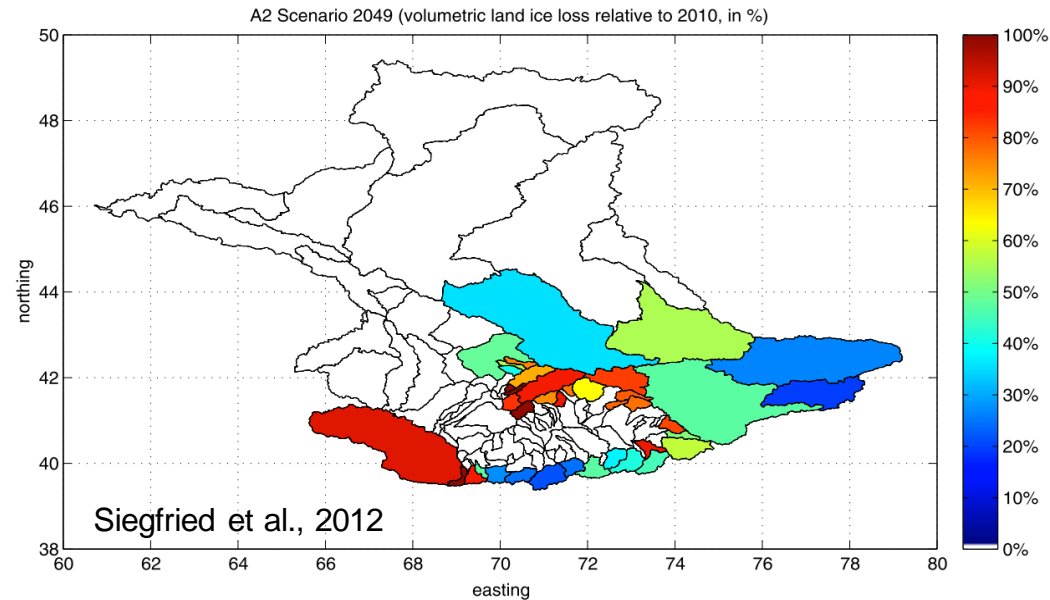
Source: Coumou & Robinson, 2014

Glacial retreat – a global problem with regional emphasis

Sample: 50% of all glacier's in SA Andes

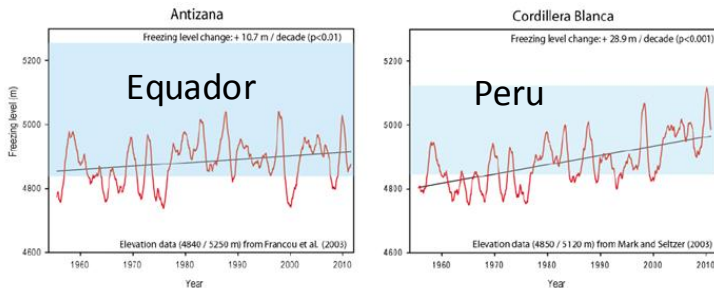


What happens in Central Asia?



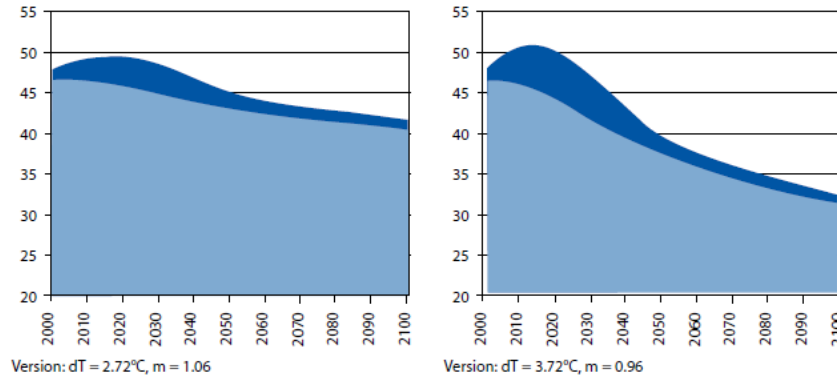
Syr Darya catchment mean % loss of glacier ice by 2049 relative to 2010 for subregions

Estimated Glacial Retreat in CA:
~50% by 2050 (Lutz et al. 2013)



Water resources

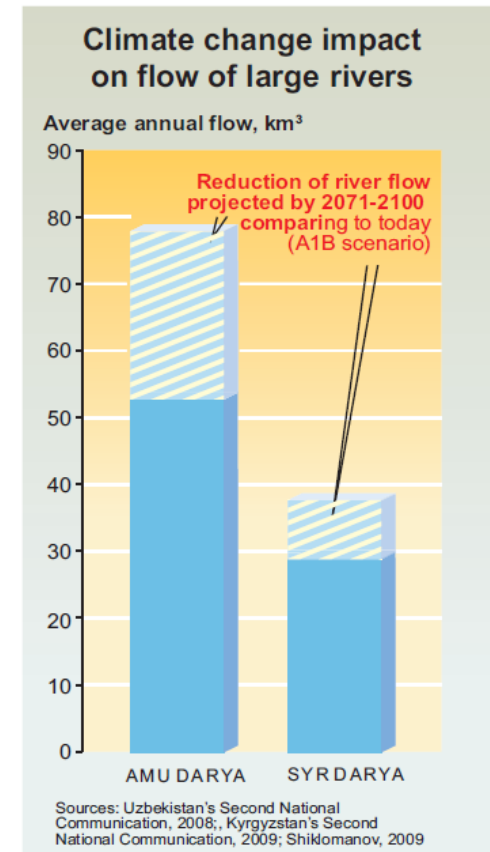
- Annual river runoff peak in Central Asia is likely to shift towards winter and spring
- Reduction of glacial area to be compensated by enhanced melt rates until 2050, but cause water shortages later



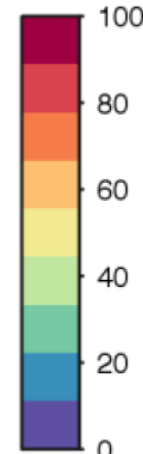
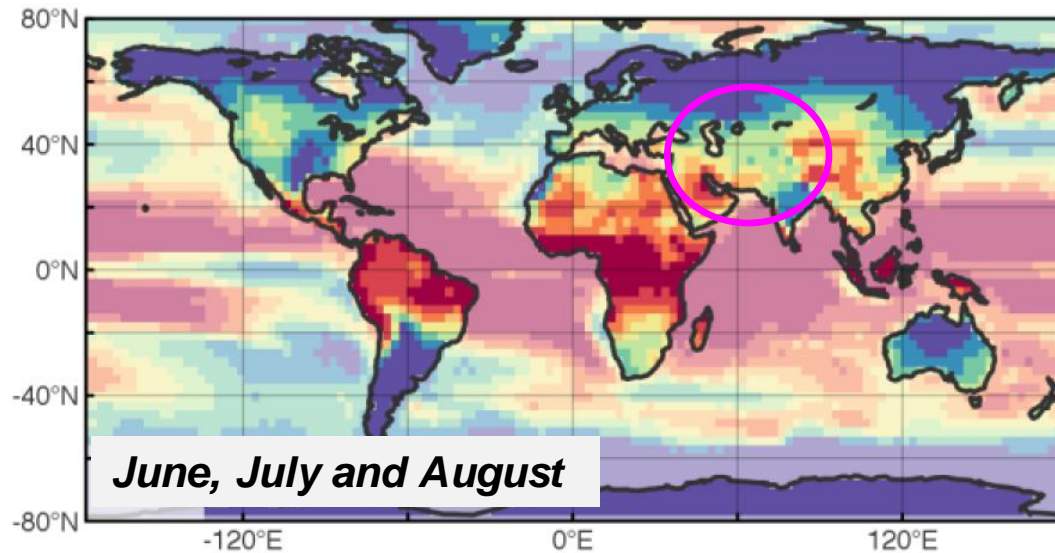
■ -from precipitation ■ -from glaciers

Dynamics of surface water-flow structure for Kyrgyzstan (all rivers) for different temperature rise scenarios

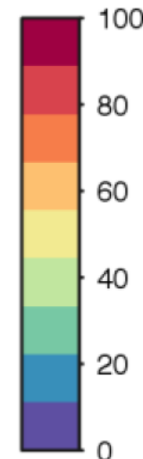
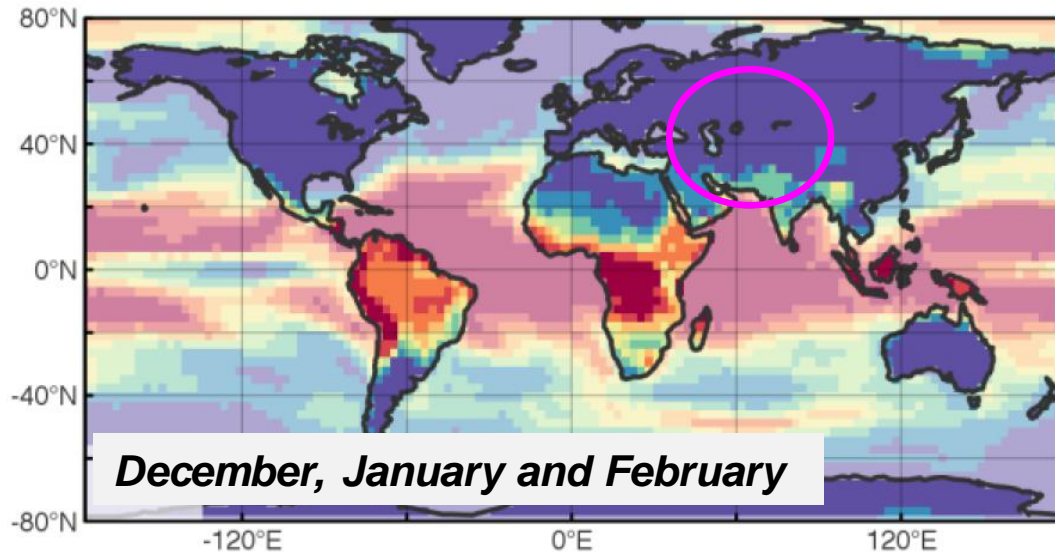
Davletkeldiev & Takenov, 2009



Frequency of Significantly Warmer Months



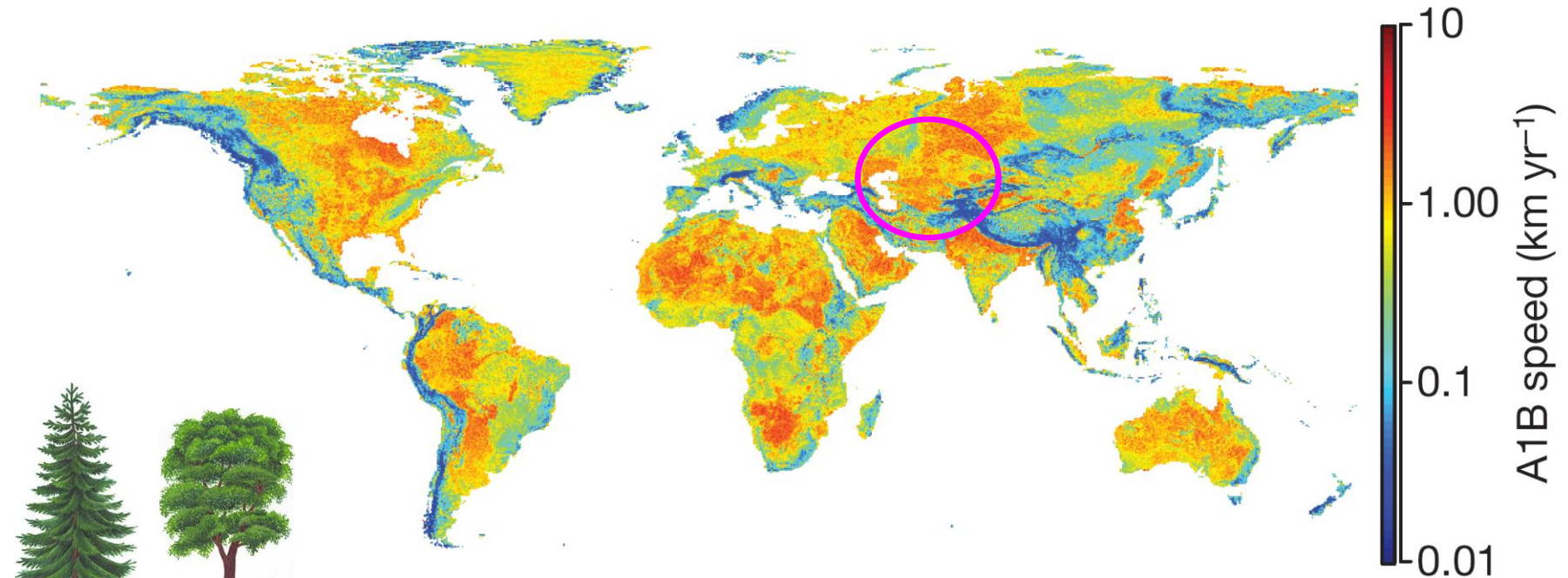
Multimodel mean of the percentage of months during 2080-2100 that are warmer than 5-sigma relative to the present-day climatology



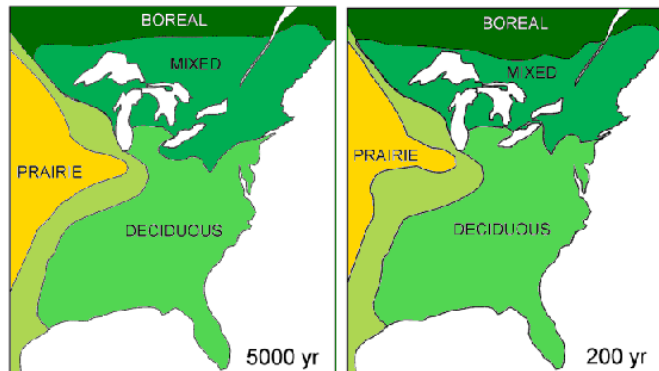
Turn Down the Heat – Why a 4°C Warmer World Must be Avoided, 2012

The Velocity of Anthropogenic Climate Change

Instantaneous local velocity along Earth's surface needed to maintain constant temperatures for vegetation for SRES A1B emission scenario (2050-2100)

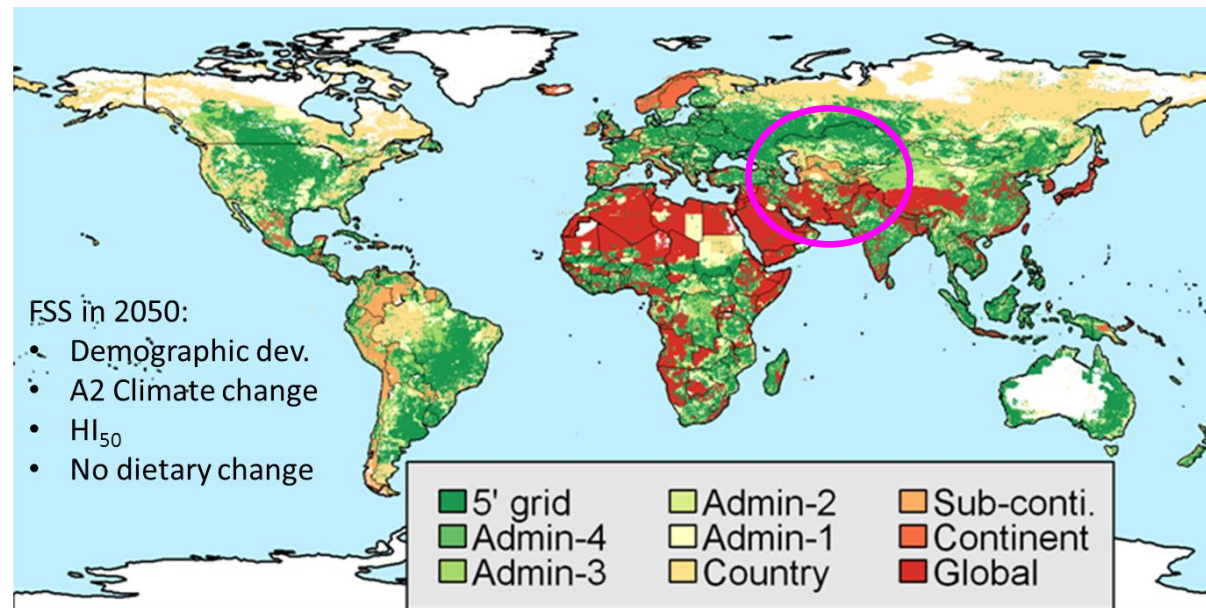


Loarie et al. 2009



Large areas of the globe will require velocities faster than the more optimistic plant migration estimates from a landscape before anthropogenic fragmentation.

How much self-sustainability is feasible in a region: example food?



2050: pop., diets & climate change

self-sufficiency (5' grid)
decrease from ≈ 2.6 bn to
 ≈ 2.04 bn due to pop. change &
to ≈ 1.56 bn when considering
diet changes

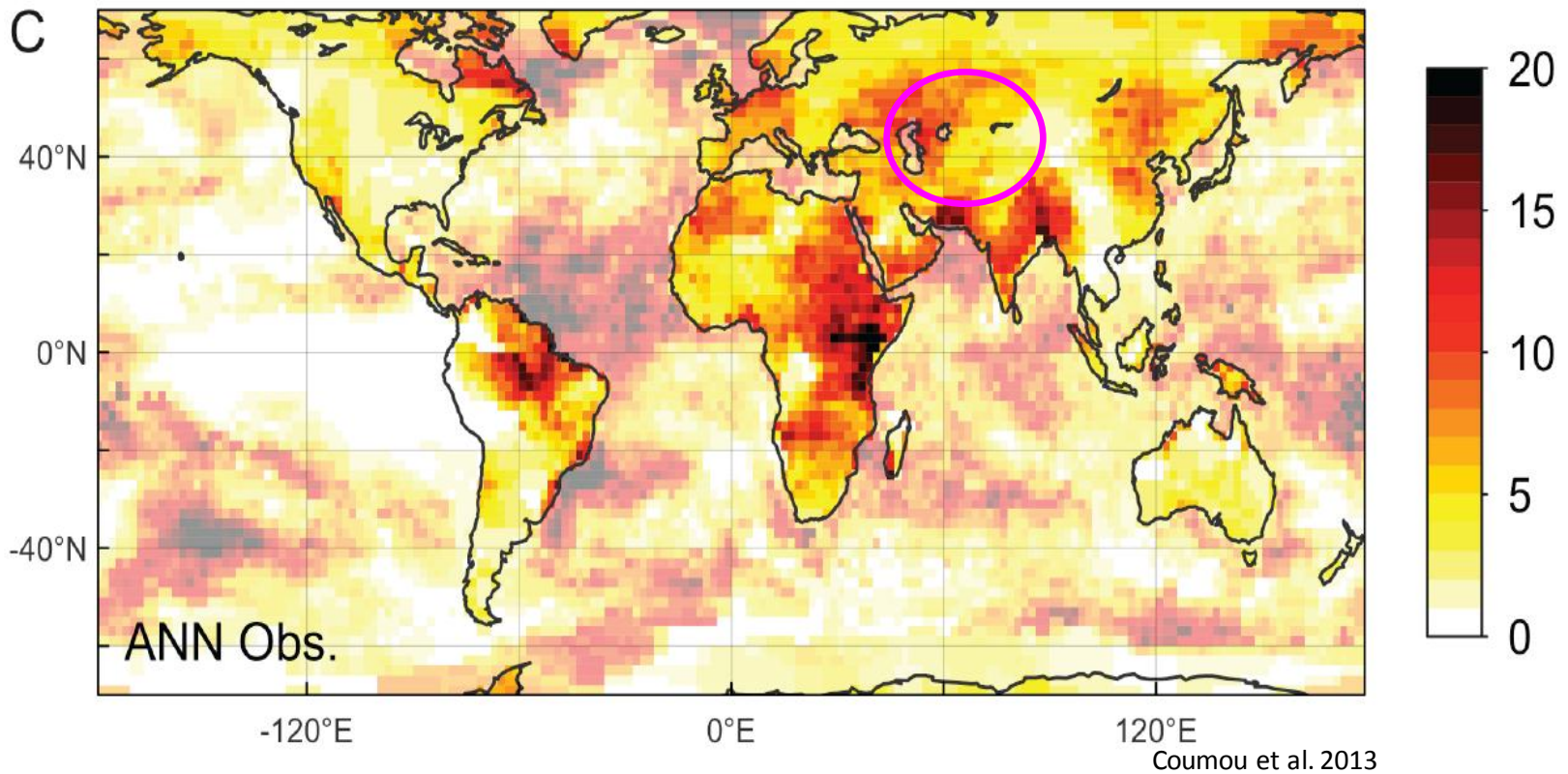
Pradhan/Lüdeke/Reusser/Kropp (2013)

Dietary patterns & climate change make food security more dependent on international trade: **climate change will exacerbate this effect!**

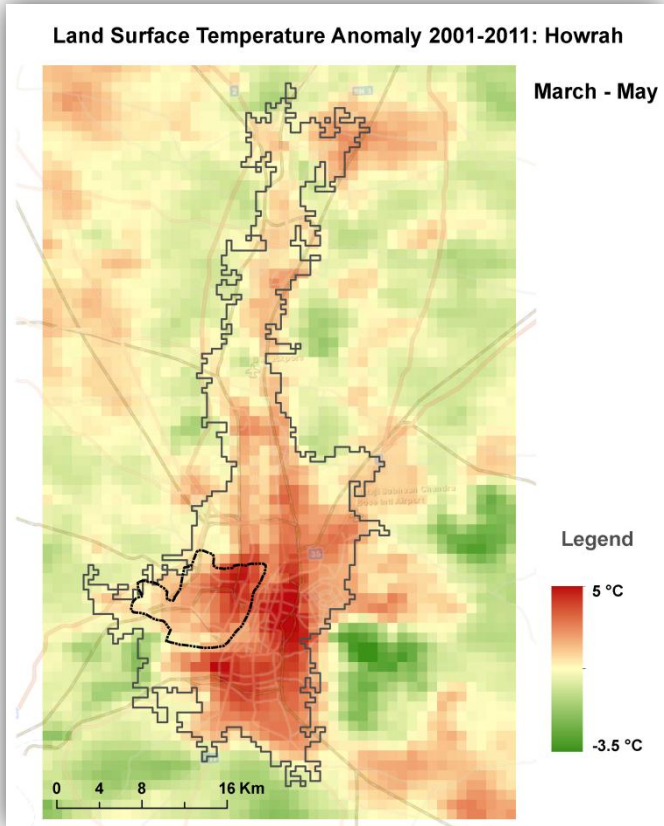
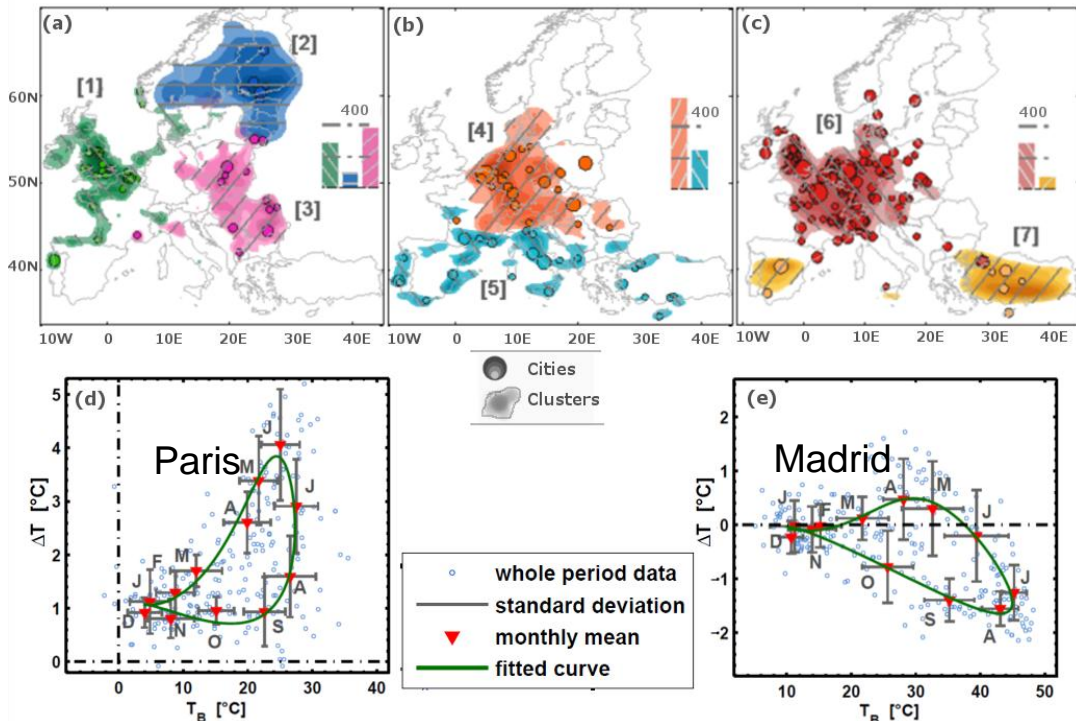
Heat Waves

Observed 5-fold increase in monthly heat records

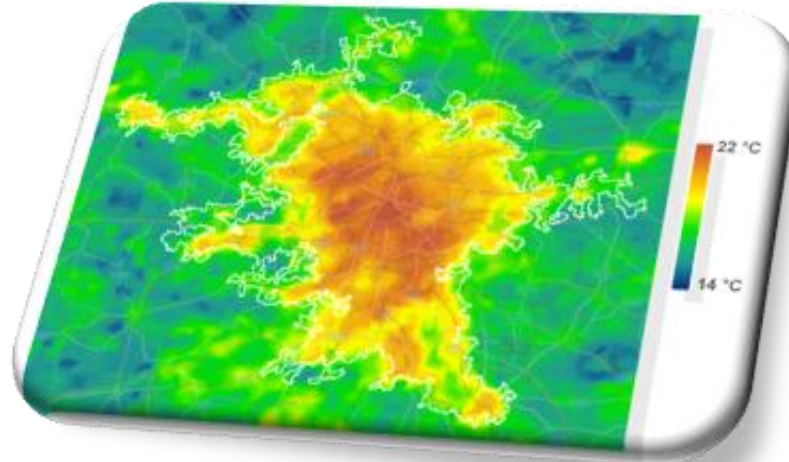
- Based on 150.000 time series starting in the year 1880



Heat burden in cities: typologies can be identified!



Annual typologies and overlapping clusters provide a clear indication that climate and Infrastructure composition is important for heat burden



Some major expected impacts:

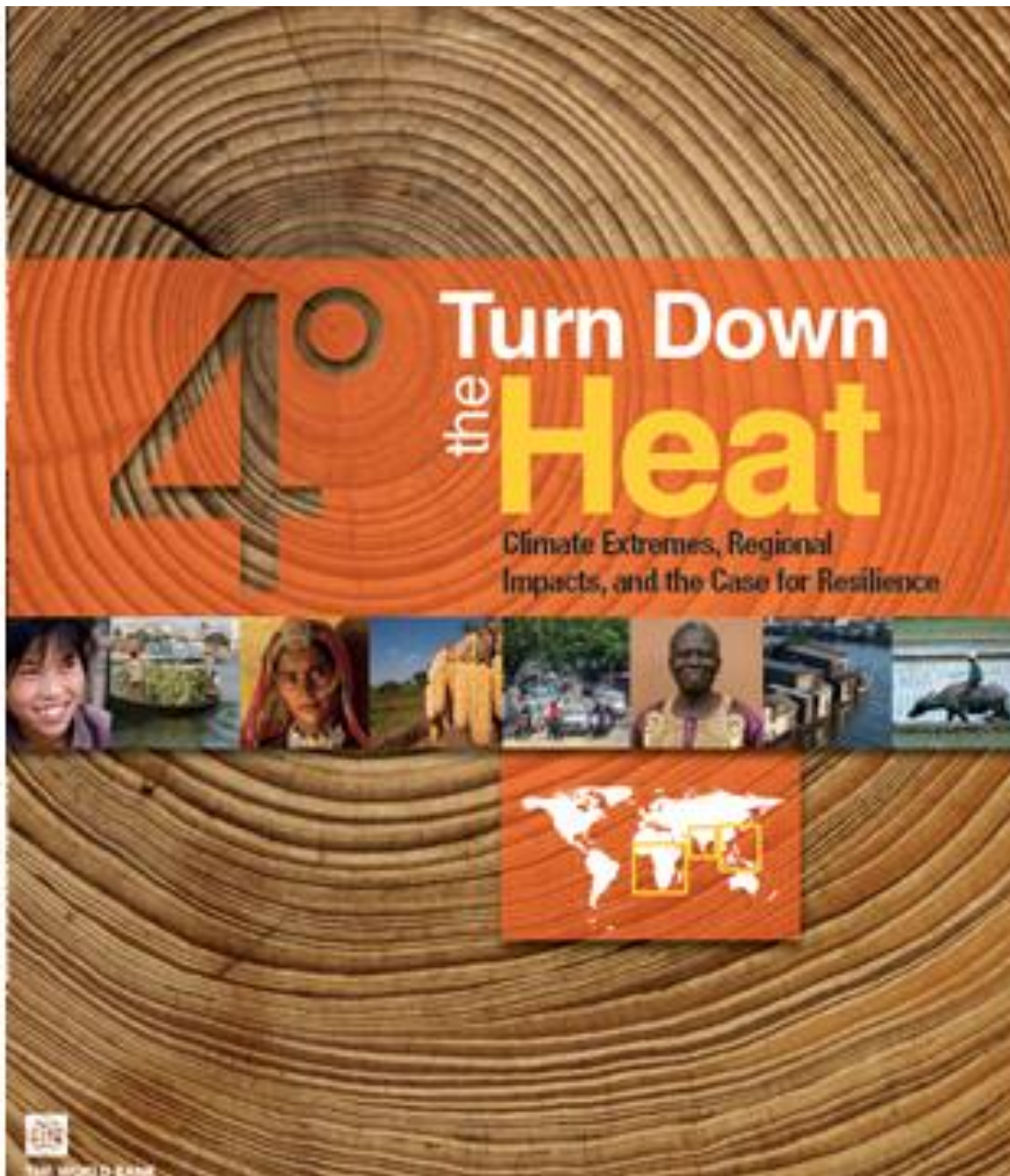
- Shift of river runoff peak towards winter and early spring will impact hydropower generation in Central Asia
- Water stress will continue to play a major role in Central Asian agriculture
- The heat wave-induced mortality will increase in the future in Central Asia
- Glacial lake bursts can pose significant life and health threat in the mountainous regions of Tajikistan, Kyrgyzstan and Uzbekistan

....and potential solutions:

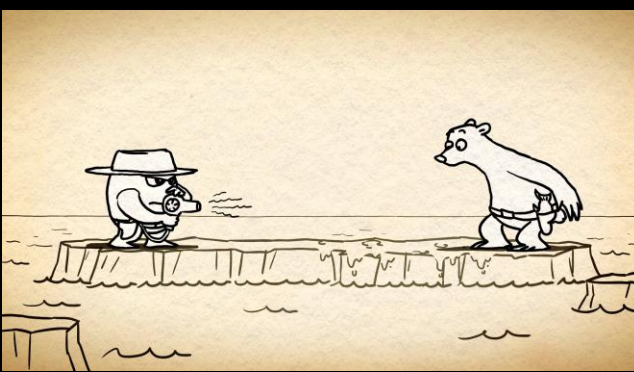
- water harvesting mechanisms, suitable domestic policies and measures aimed at improvement of water and energy efficiency will greatly contribute to long-term resilience of the whole region
- Enhancement of water storage capacity will mitigate negative consequences of river runoff peak shift on agriculture and energy generation
- International cooperation, modernisation of infrastructure and development of institutional capacity are the key factors of sustainable climate change-resilient development of the region

June 2013

**A follow-up report for the
World Bank by the
Potsdam Institute for
Climate Impact Research
and
Climate Analytics**

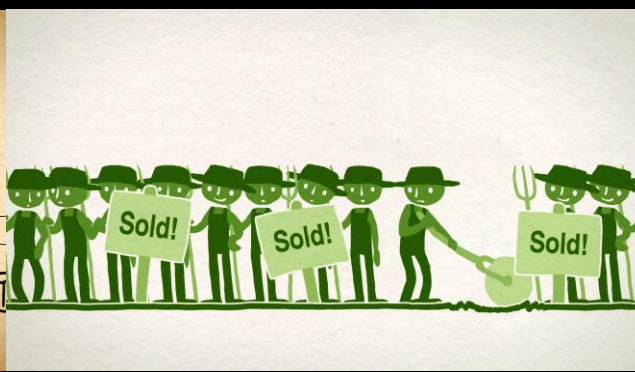


Awareness rising is one key.....



Outlaws in Air City

<http://youtu.be/I19M2FcfSzQ>



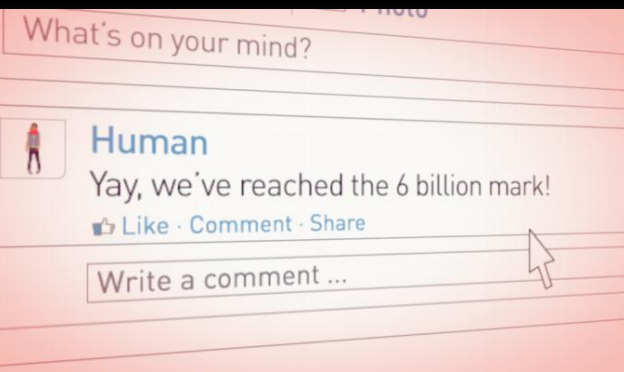
The Value of Soil - ELD-Initiative

<http://youtu.be/403sT9CGRl0>



We know enough... - GIZ

<http://youtu.be/FO46sPwm4xk>



Earthbook 2.0

<http://www.youtube.com/watch?v=GBrLOITbJQc>



Wimmelwelt Energy

<http://vimeo.com/52399627>

Climate Engineering
<http://www.youtube.com/watch?v=3GKjl7afwaY>

Use Climate Adaptation Services

Climate Impacts: **g**lobal and **r**egional
adaptation **s**upport **p**latform
cigrasp.pik-potsdam.de

Global and Regional Climate Change Information

ci:grasp The Climate Impacts: Global and Regional Adaptation Support Platform
ci:grasp 2.0 - module demonstrator

Home About Background Impact chains Adaptation projects Global and regional information City module Contribute

you are here: home

Welcome to ci:grasp 2.0

about this project

The Climate Impacts: Global and Regional Adaptation Support Platform (ci:grasp) is a web-based climate information service. It aims to support decision makers in developing and emerging countries to prioritise adaptation needs, and to plan and implement appropriate adaptation measures. [Read more ...](#)

ci:grasp is structured based on **impact chains**, which demonstrate how a given climate **stimulus** propagates through a system of interest via the direct and indirect **impacts** it entails. [Learn more ...](#)

What can ci:grasp do for me? Have a look [here](#).

partners

A project of **giz** and **PIK**

On behalf of
Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
of the Federal Republic of Germany

what's happening

Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy ermod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua.

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a collection of interactive applications

ci:grasp comes with a growing collection of tailored interactive tools that allow you to explore climate information in its geographical context.

Discover where **adaptation projects** have taken place. Explore our climate maps and the scenarios they provide for the development of climate stimuli and impacts on global and regional level.

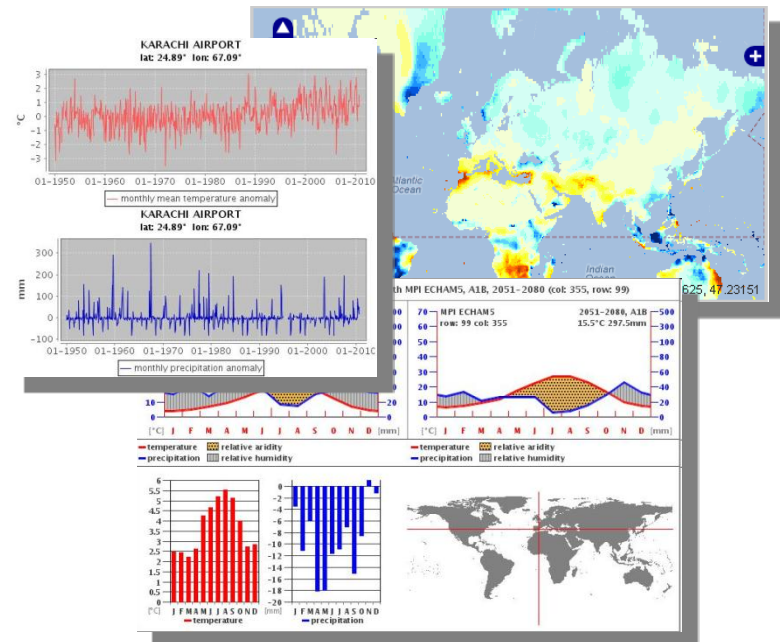
As a start, you may visit for ex. **Multi-Map Viewer**, the **Climate Explorer** or ci:grasp's **City Mod**.

share your knowledge on adaptation

ci:grasp encourages people to climate-change related adapted knowledge.

[Learn how to contribute](#)

Adaptation Project Database



Source: PIK/Kropp & CCD Team 2013

Scientific Underpinning of policy making



Ramon Pichs Madruga (Cuba),
Ottmar Edenhofer (PIK, WG III)
and Birama Diarra (Youba
Sokona)

Inaugural Talk by J. Kropp on AvH
Conference with Governor Bhardwaj
2011/India



John Schellnhuber on G8+5 Environmental
Ministers at PIK 2007

Nobel Prize Winners
Meeting, Potsdam 2007



J. Schellnhuber at Doha/COP18 - 2012



Advice to European Commission (Barroso),
and UN Security Council by J. Schellnhuber



J. Kropp on UNFCCC Climate Conferences
COP15/COP16 Copenhagen/Cancun

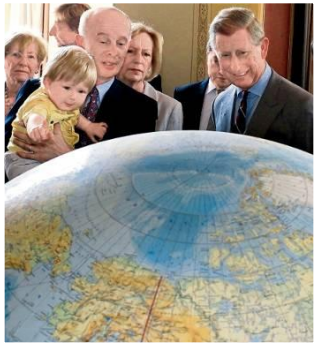


J. Kropp at Opening of Pakistani Climate
Change and Development Research Centre

J. Kropp on 1st Climate & Development
Conference Islamabad, 2010 at President
Residency



Visit of the Prince of Wales 2009



J. Kropp on opening panel of
Resilient Cities conference
2011

Ind. Minister J. Ramesh at PIK 2011



The motto for the next decades must be:

Avoiding unmanageable situations (climate protection) and learning to cope with unavoidable Climate change (adaptation)

Prerequisites:

Learn to diagnose (not only climate change!)

Perform world class research (together with other institutions)

Find solutions (on several scales, define options!)

Identify your needs (take care of transdisciplinary work and seek for cooperation)

The consequence will be trust of stakeholders and politicians (intensified outreach helps)

Thank you for your attention!

www.pik-potsdam.de/nsp



Source: (c) Stefano C. Picco

Questions?

