

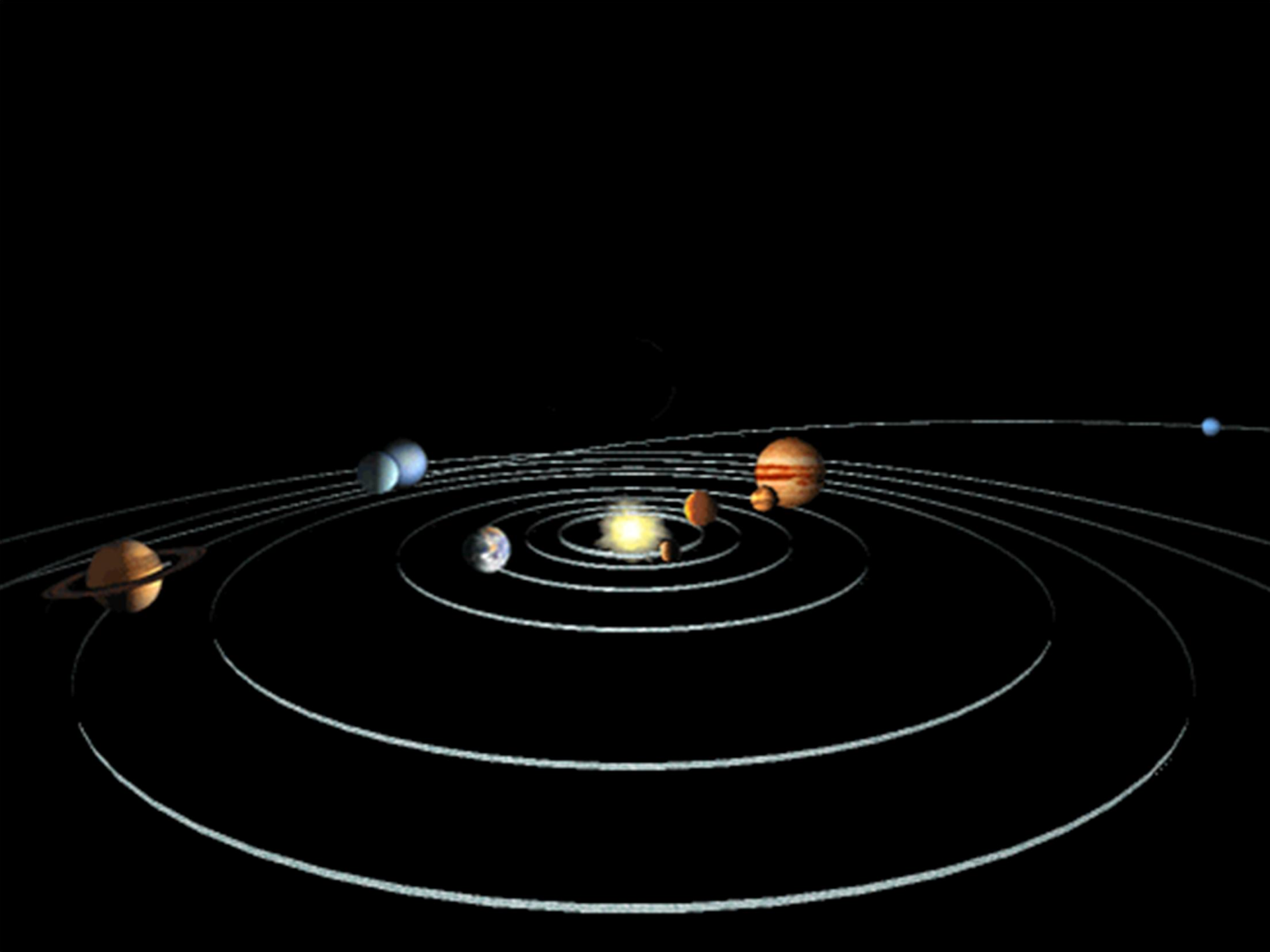
# 科學、技術、與人類社會的發展

李遠哲

# I. The Power of the Sun

The origin of all life on earth,  
including human civilization







2004 Transit of Venus  
Ingress: 05:13 UT

*F. Espenak, NASA's GSFC*



迎婦  
數邑東螺西螺大  
武郎半線等社娶  
彭迎婦名為牽手

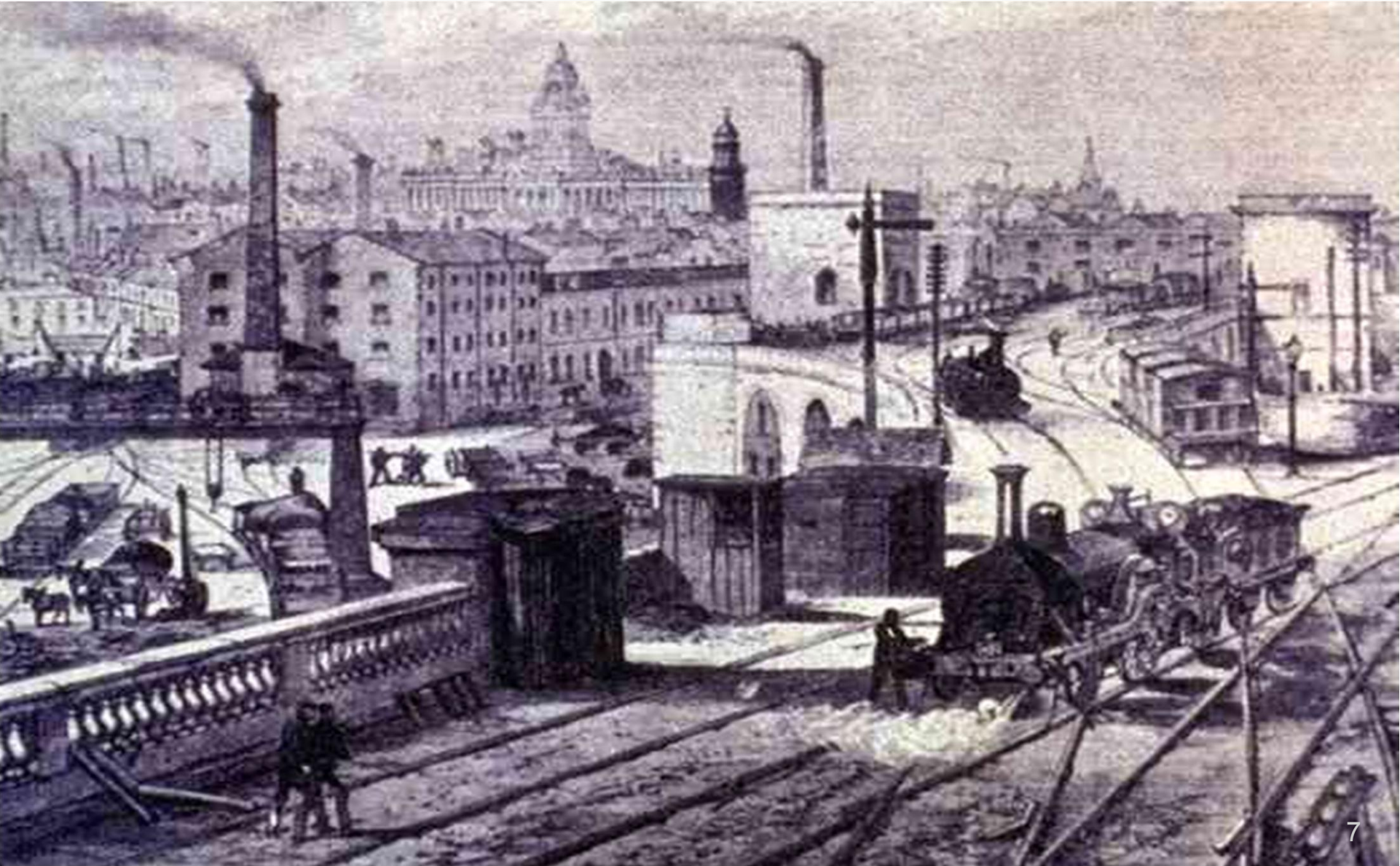
*Once  
upon a time  
Man was  
a part of  
nature*

## **II. The Great Divergence**

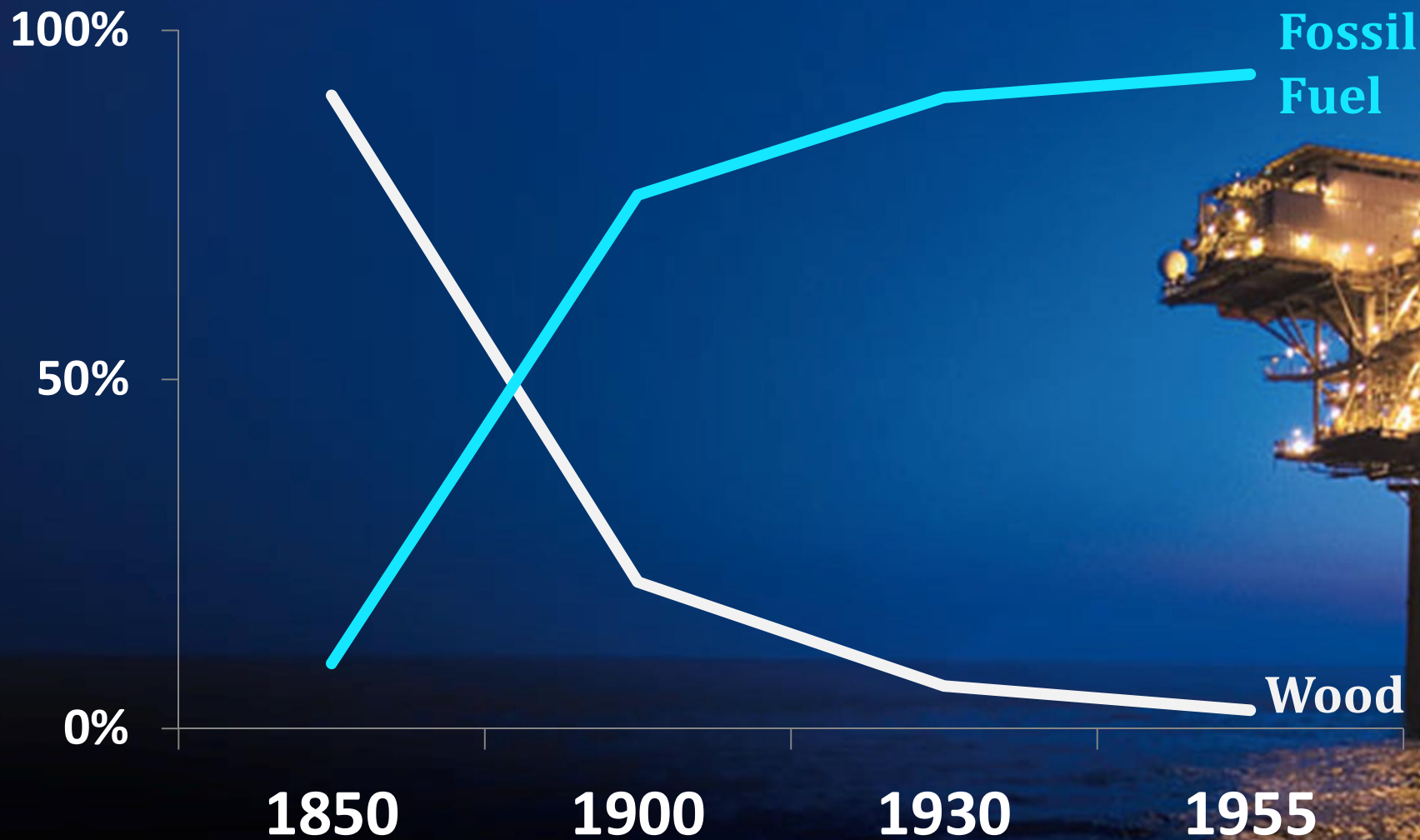
Away from sunshine, away from nature



# The Industrial Revolution ...



# Share of U.S. Energy



*Data source: US Energy Information Administration*



# III. From Unlimited to Limited Earth

A. Exploding Human Production & Consumption

B. Exploding Human Population

C. Exploding Human Footprint







# III. From Unlimited to Limited Earth

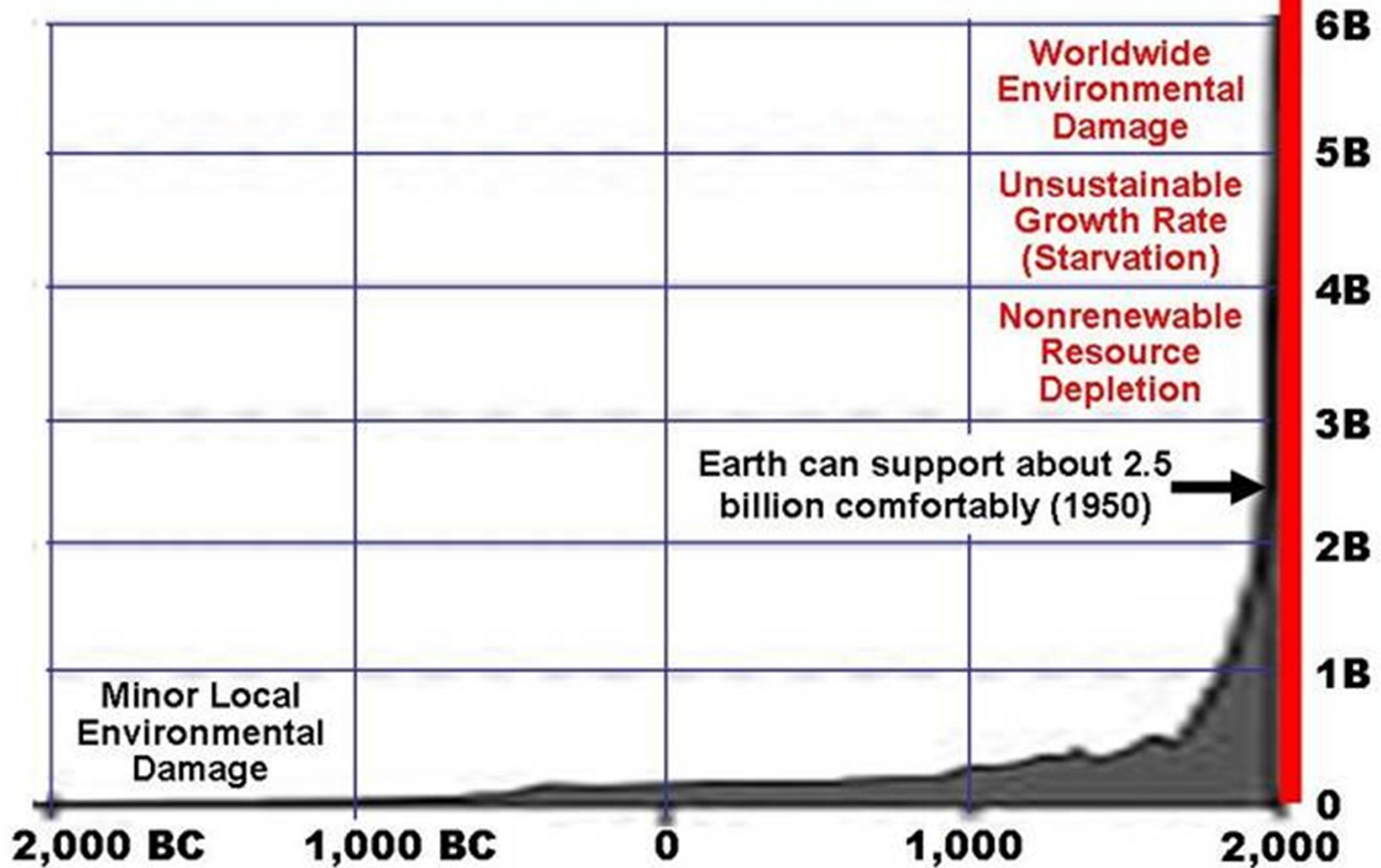
A. Exploding Human Production & Consumption

B. Exploding Human Population

C. Exploding Human Footprint



# Worldwide Human Population Explosion (Billions)





# III. From Unlimited to Limited Earth

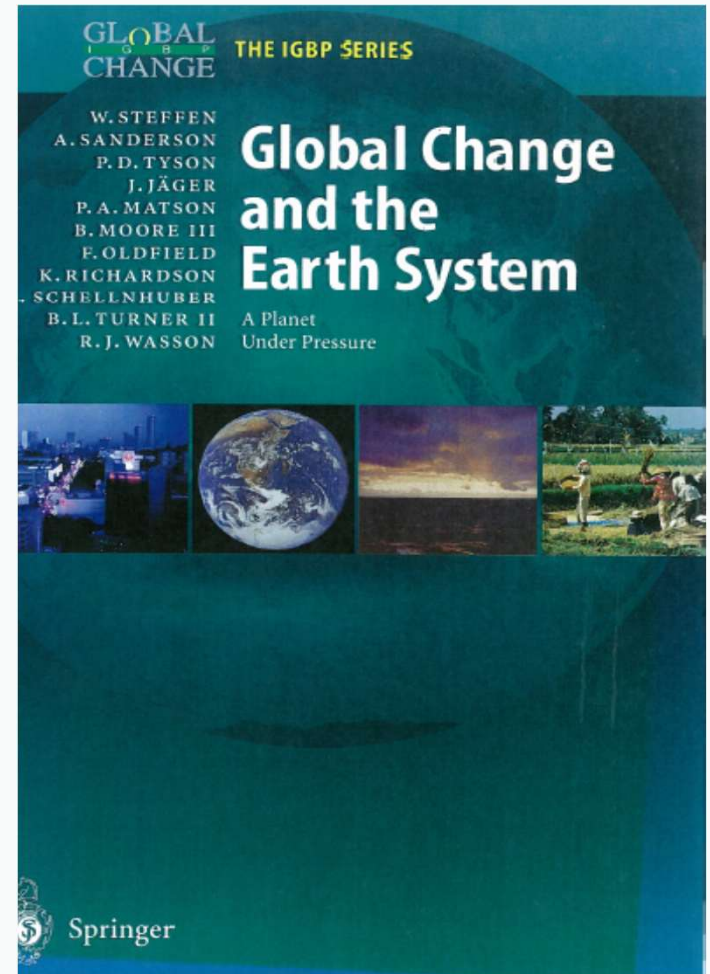
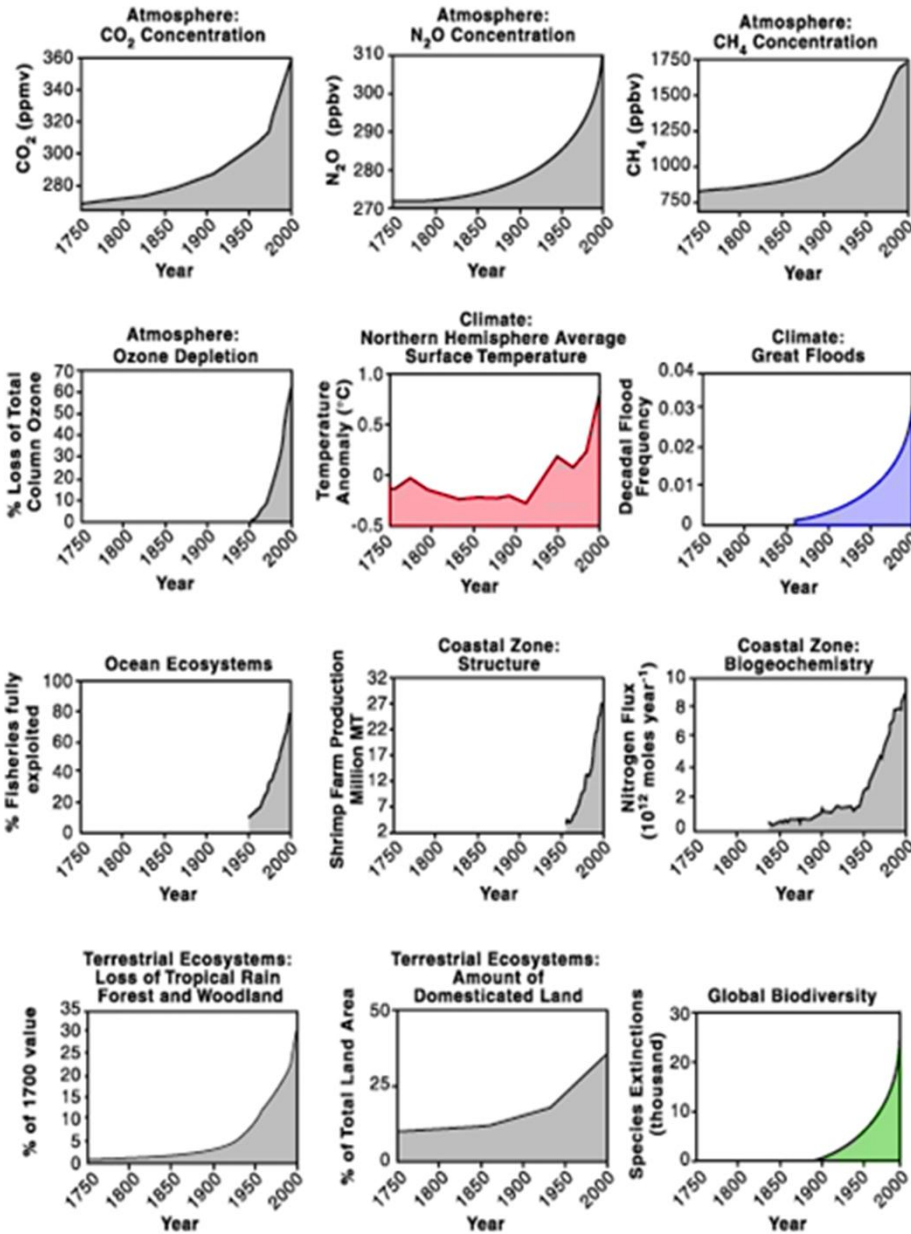
A. Exploding Human Production & Consumption

B. Exploding Human Population

C. Exploding Human Footprint



# Spectacular Growth of Human Impacts on the Planet





# There are now **6.8 billion** people on the planet.

Together we consume  
**1.4 Earths'** worth of  
resources per year.



If everyone consumed like  
Americans, we'd need  
**5.4 Earths** to sustain us.



SOURCE: GLOBAL FOOTPRINT NETWORK

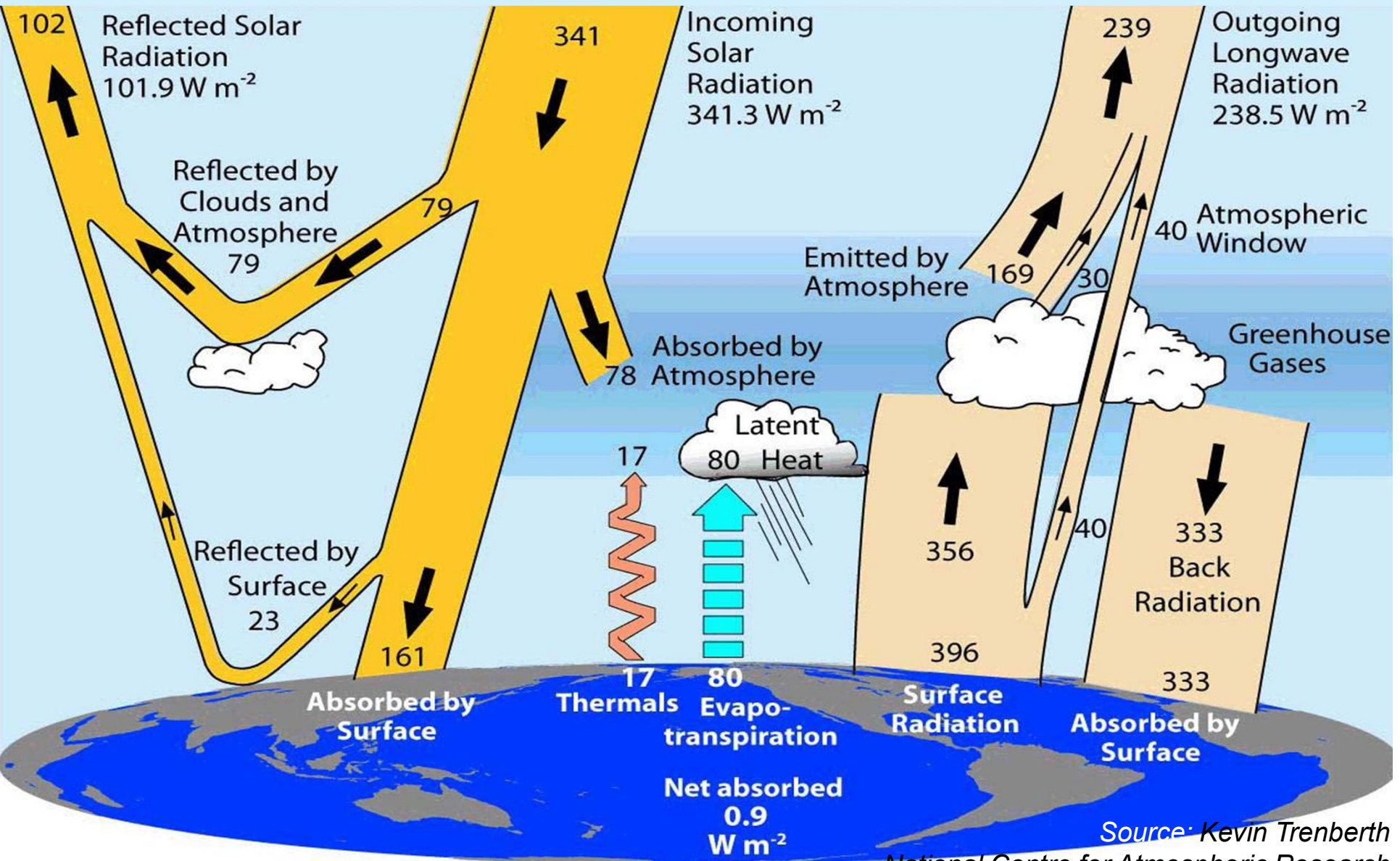
## **IV. The Crisis facing Human Survival**

**A. Rising temperature, changing climate, and extreme weather**

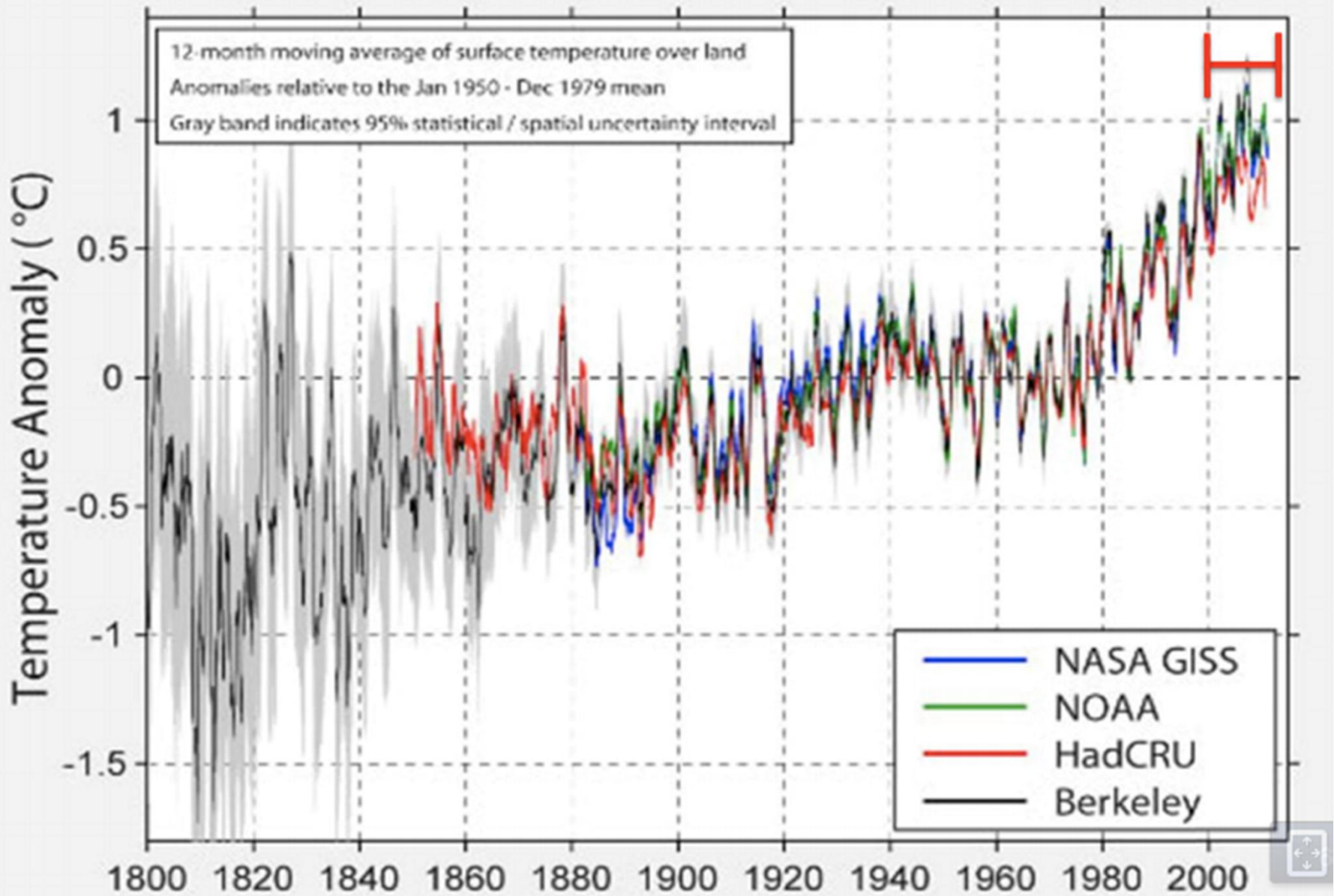
**B. Disappearing biodiversity, fading ecosystems**




# Global Energy Flows



# Annual Land-Surface Average Temperature



Excerpted from the Energy All-Stars presentation by Dr. Steven Chu, US Secretary of Energy

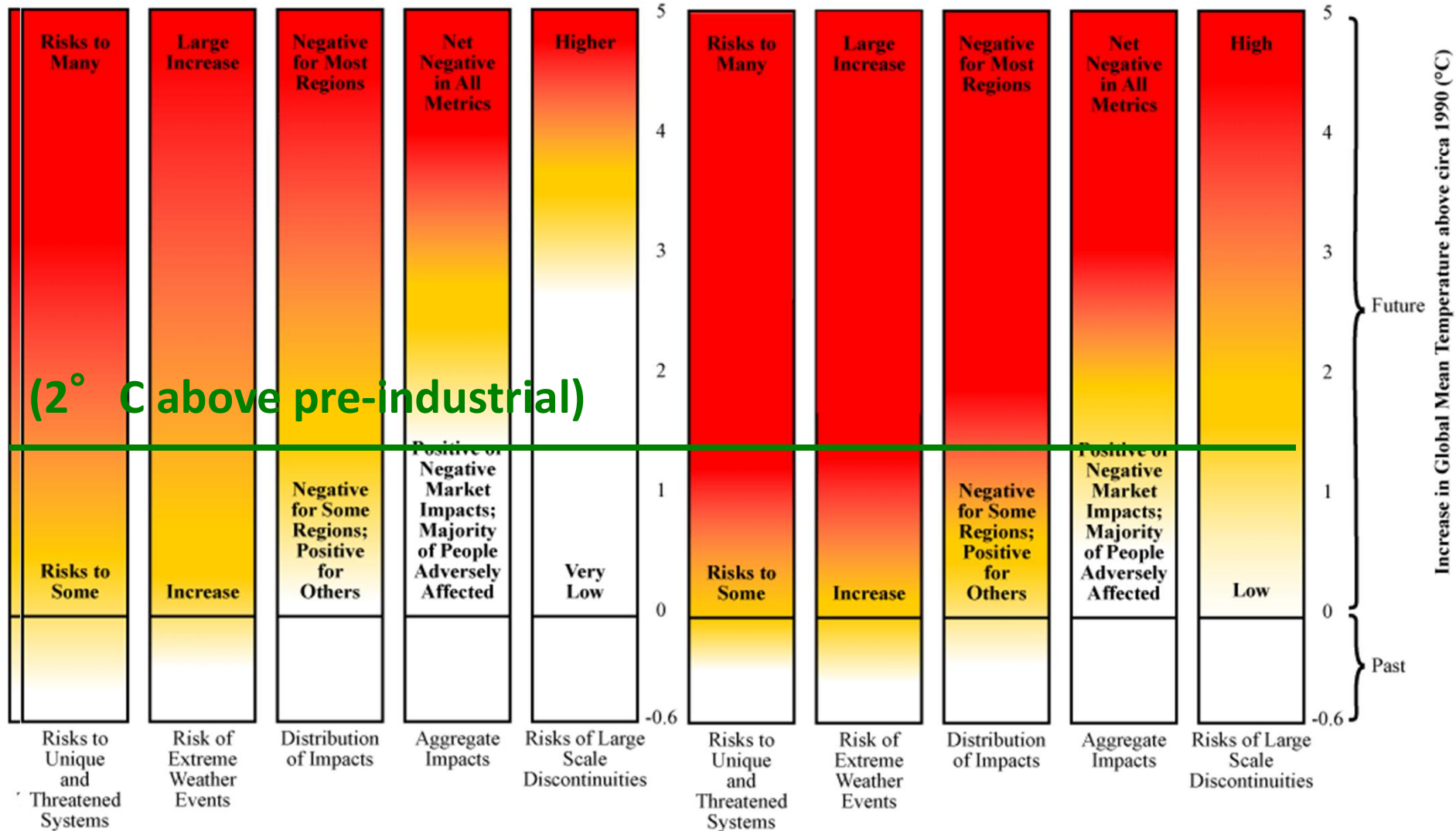
A close-up photograph of a hand flipping two coins into the air. The coins are in motion, with motion blur, and are positioned to the left of the main text. The hand is visible from the bottom left, with the thumb pointing upwards.

**450ppm = 50%  
chance of 2° C  
warming**

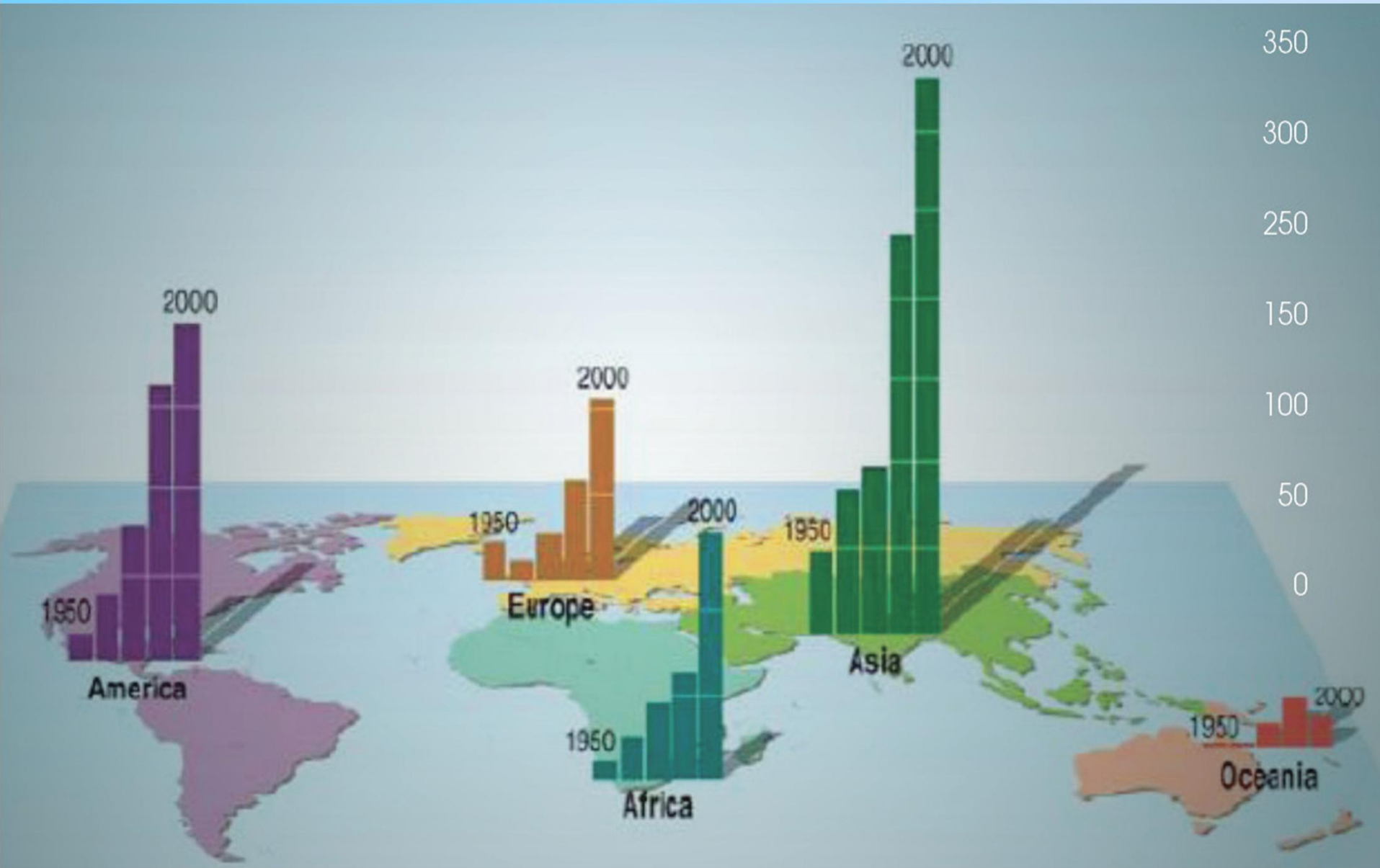
# Updated Reasons for Concern

TAR (2001) Reasons For Concern

Proposed AR4 (2007) Reasons For Concern



# Major Floods Per Decade



2011: Floods in Australia covered an area  
**The size of France and Germany *combined***  
Australian Official: “A disaster of **biblical proportions**”





# Shiao Lin village, Taiwan, drastic changes after typhoon Morakot.



# IV. The Crisis facing Human Survival

A. Rising temperature, changing climate, extreme weather

B. Disappearing biodiversity,  
fading ecosystems





**1/3**

of the food we eat is  
pollinated by wild  
insects, worth over

**\$200 billion  
USD**



# 25%

of Marine Fish Species  
are supported by coral  
reefs, as are

# 30 million

livelihoods



At risk of extinction are...

**22%** of mammal, **33%** of amphibians

**27%** of coral reefs, **28%** of conifers

# V. Pathways to Sustainability

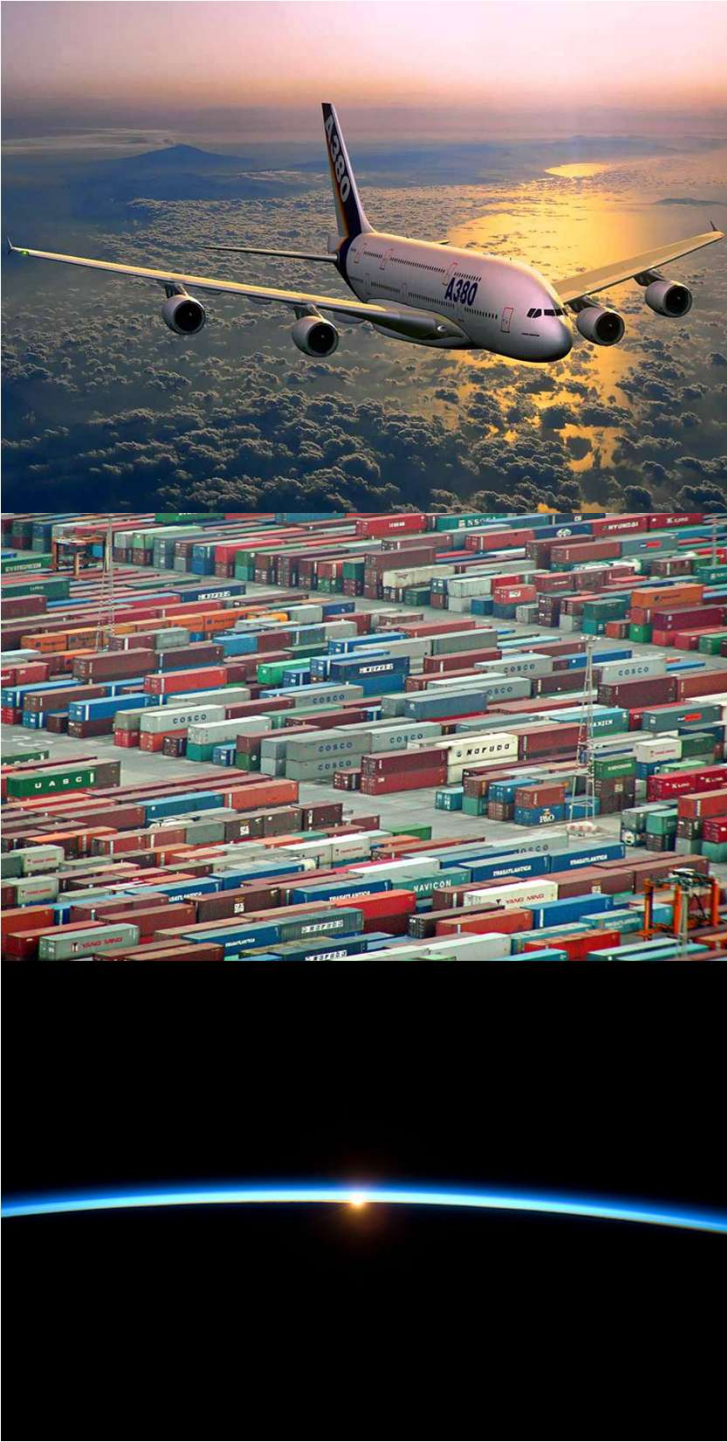
A. Global Responses for Global Challenges

B. Back to Nature, Back to Sunshine

C. Live Better... For Less

D. Control Population Explosion





**Everyday, thousands of planes and people traverse the skies, and innumerable goods cross the seas... the scourges of diseases and environmental problems do not respect national borders.**



2004 Transit of Venus  
Ingress: 05:13 UT

*F. Espenak, NASA's GSFC*



*Can “Global Problems” be effectively solved by “nation”-based systems and approaches?*



The biggest threat to human security is no longer conflict between nations... but **our own unsustainability**



# V. Pathways to Sustainability

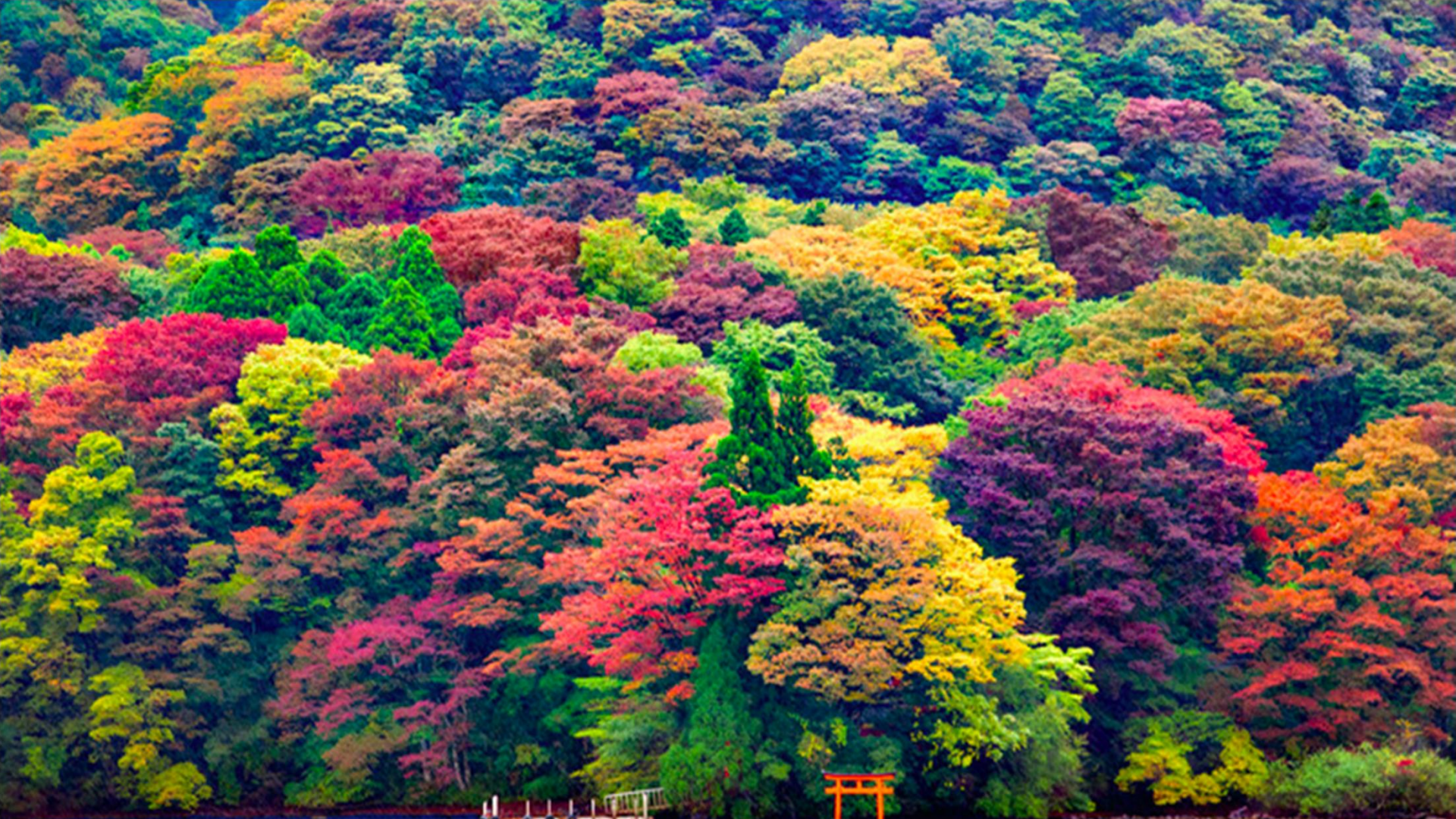
A. Global Responses for Global Challenges

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**Place “Stewardship of Natural Heritage” at the center of all policy**



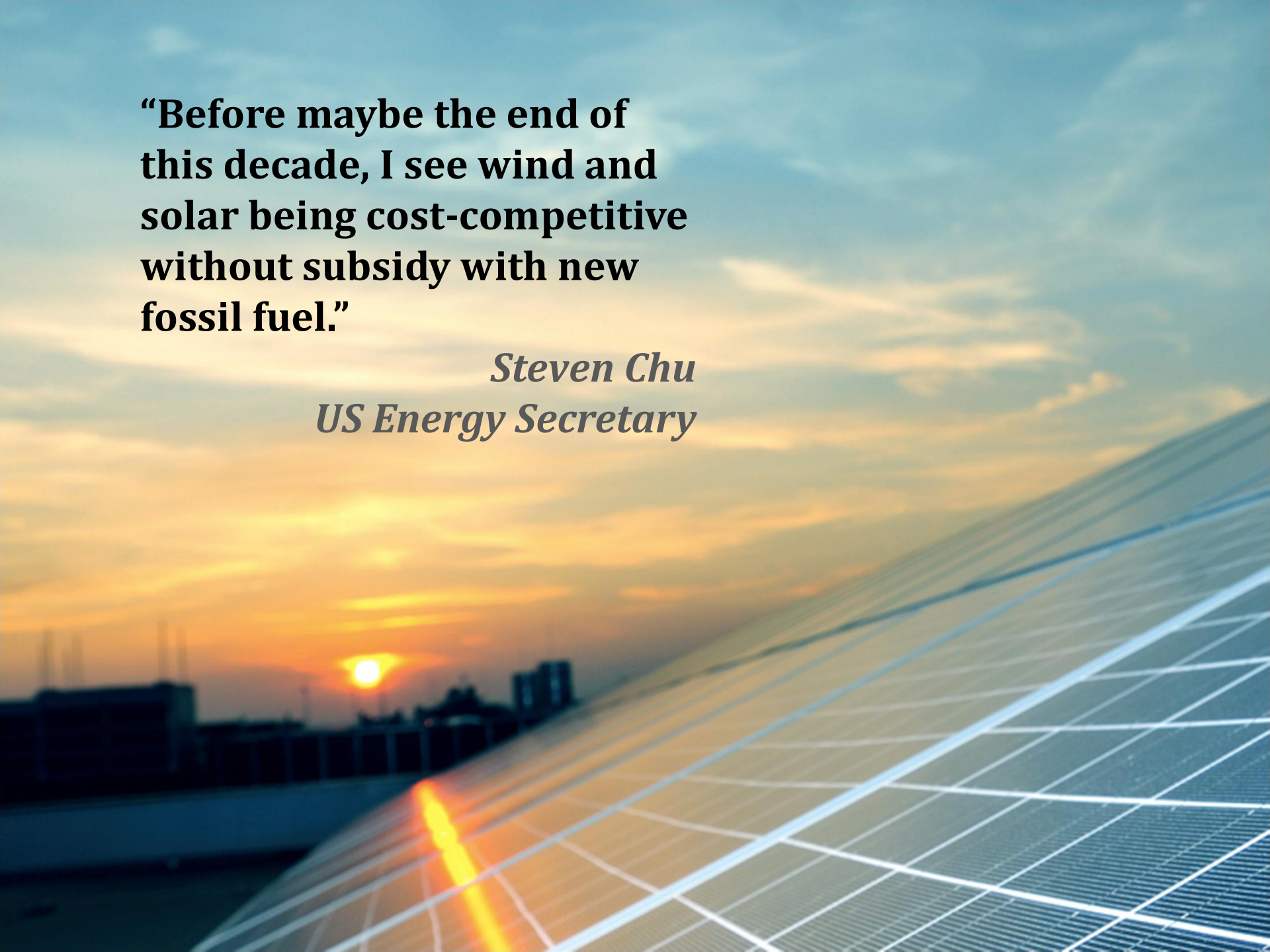
**Allan Savory: Restoring Nature  
by Mimicking Nature**


A composite image of Earth from space. The top half shows the dark, cloud-covered surface of the planet. The bottom half shows a bright sun rising over the horizon, casting a golden glow over the planet's surface. The sun is positioned in the center, and its light creates a bright, glowing arc across the horizon. The text "Back to Sunshine" is overlaid in the center of the image, in a white, serif font.

**Back to Sunshine**

**“Before maybe the end of  
this decade, I see wind and  
solar being cost-competitive  
without subsidy with new  
fossil fuel.”**

*Steven Chu  
US Energy Secretary*





**“The best wind farms in the world already produce power as economically as coal, gas and nuclear generators; the average wind farm will be **fully competitive by 2016**”**

*Bloomberg New Energy  
Finance*



# V. Pathways to Sustainability

A. Global Responses for Global Challenges

B. Back to Nature, Back to Sunshine

C. Live Better... For Less

D. Control Population Explosion





**You don't need a car** because you can and *love* to walk, bike, or take mass-transit to meet ALL of your daily needs within 10-20 minutes...



**You don't need a big house** because you make the most of smaller space, and enjoy tiny energy bills...

# You rarely buy new things because...

... what you own  
last forever



... when they break  
you fix them...

... and what you don't have  
others share with you



# V. Pathways to Sustainability

A. Global Responses for Global Challenges

B. Back to Nature, Back to Sunshine


C. Live Better... For Less

D. Control Population Explosion



“If current predictions of population growth prove accurate and patterns of human activity on the planet remain unchanged, science and technology may not be able to prevent irreversible degradation of the natural environment and continued poverty for much of the world.”

- *58 Academies of Sciences, 1994*

An aerial photograph of a very crowded beach. The sand is packed with people, many of whom are holding colorful umbrellas. The water is also filled with people, some swimming and others on inflatable toys. The overall scene is one of a busy, popular summer destination.

Give parents security of  
livelihood. Give girls and  
women education,  
employment and the freedom  
to decide when and how many  
children to have

# **VI. International Council for Science**

Strengthening International Science  
for the Benefit of Society

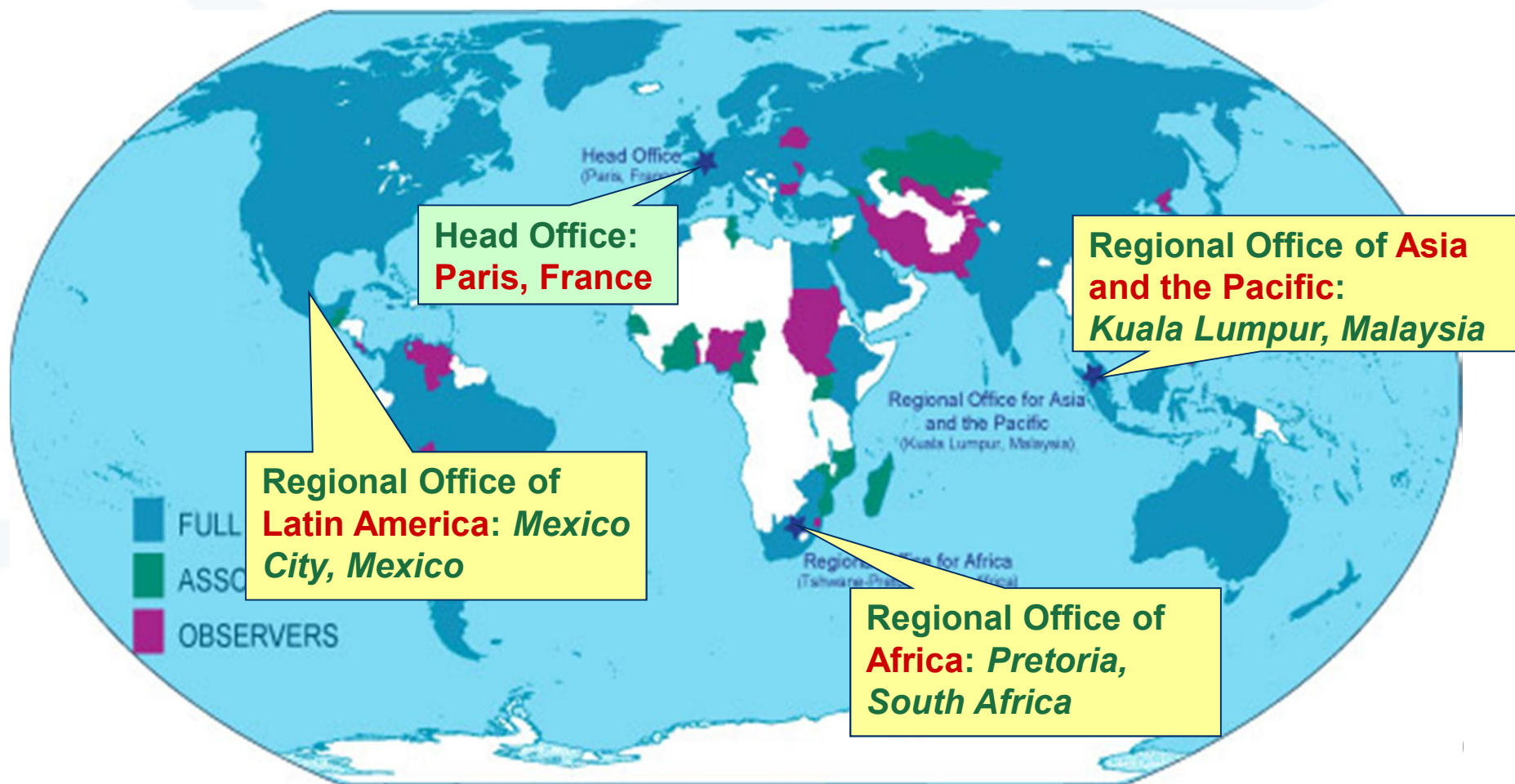




# ICSU: *Year 2013*



- 120 National Members representing 140 countries
- 31 International Scientific Unions
- 22 International Scientific Associates
- 17 Inter-disciplinary bodies in key areas



# Future Earth: Research for Global Sustainability



# A 10-year initiative by a new global Alliance

**BELMONT**  
FORUM



**ICCSU**

International Council for Science

**Future Earth:  
research for global  
sustainability**



INTERNATIONAL GROUP OF  
FUNDING AGENCIES FOR  
GLOBAL CHANGE RESEARCH



United Nations  
Educational, Scientific and  
Cultural Organization



UNITED NATIONS  
UNIVERSITY



WMO is an observer

# Can we answer the **BIG QUESTIONS**?



How & why is the global environment **changing**?

What are likely **future changes**?

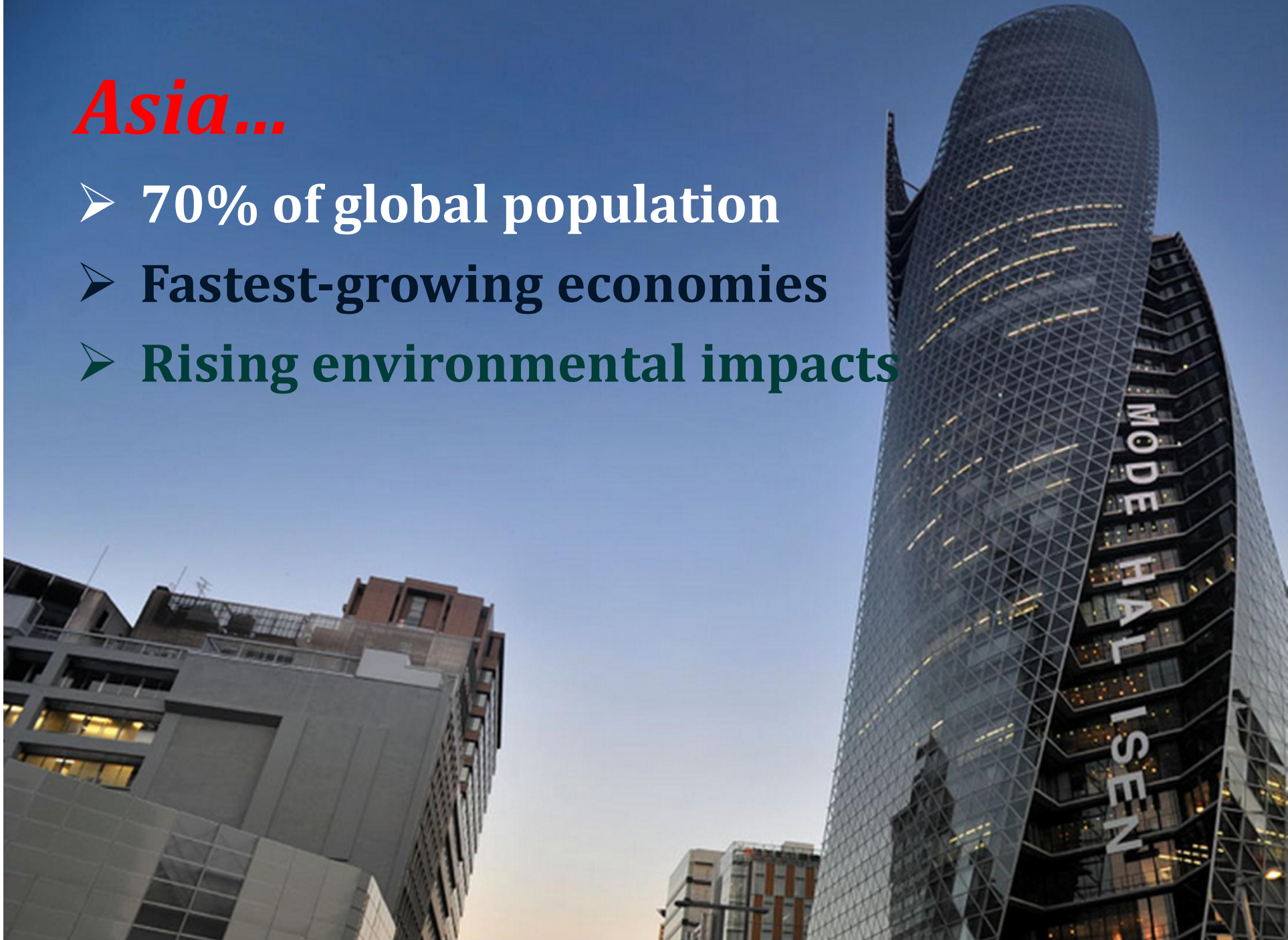
What are the **implications** for the wellbeing of humans and other species?

What **choices** can be made to reduce harmful risks and vulnerabilities and enhance resilience?

How can this knowledge support **decisions** and sustainable development?

# *Asia...*

- **70% of global population**
- **Fastest-growing economies**
- **Rising environmental impacts**



## *West*

Nature as **separate** from humans... to be studied, controlled and used

## *East*

Nature and humans **as one**, whose relationship is defined by harmony

# Future Asia: Blazing Our Own Path





***Thank you very much  
for your audience***