



RYERSON UNIVERSITY

Environmental Applied
Science & Management

Green Think Tank

Global Warming - Realities, Root Cause Analysis, and Solutions

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Feb 3, 2012

Sustainable Construction ASC 850/ AR 8225
Globalization and Construction

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RYERSON UNIVERSITY

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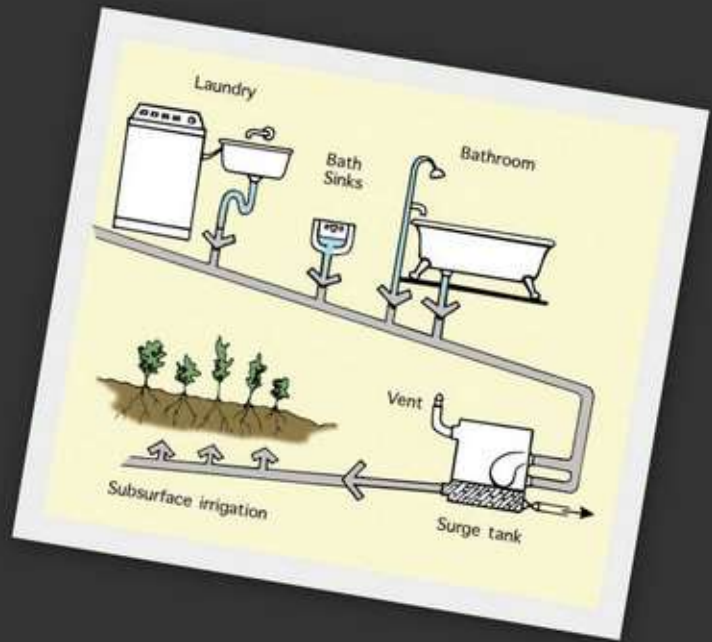
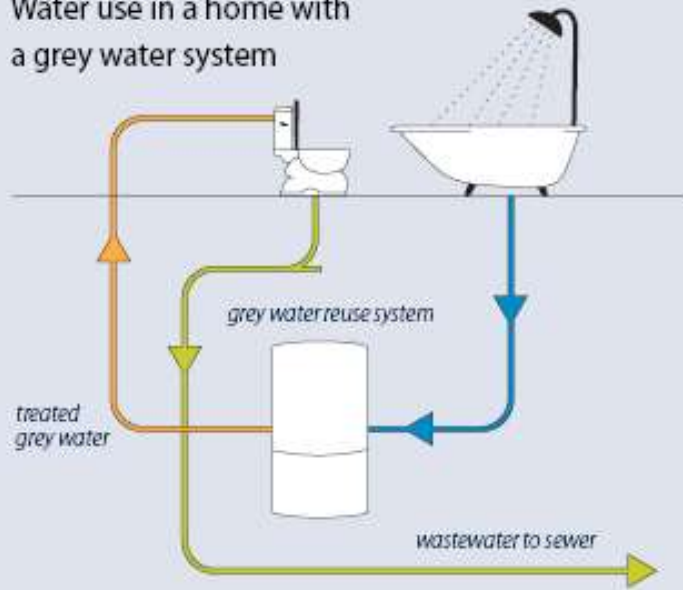
President, Green Think Tank





Water Reuse

Water use in a home with a grey water system



"You must be
the change
you wish to
see in the
world."

*Mahatma
Gandhi*



Building code



Reasonable Energy Demand?

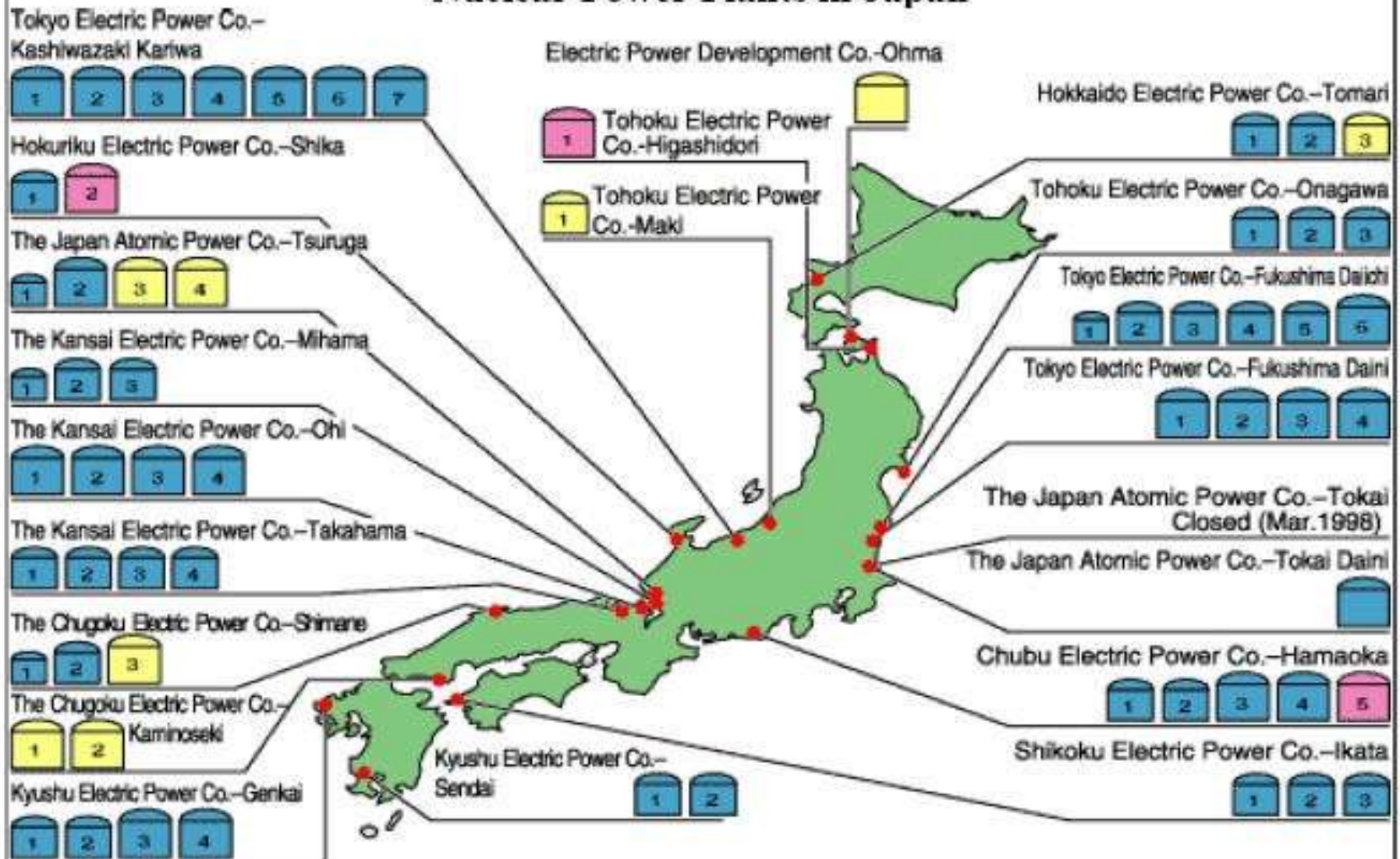


In memory of Tsunami
victims in Japan

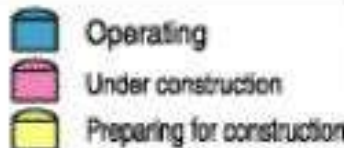




Nuclear Power Plants in Japan



Output scale



	Number of Units	Total Output (MW)
Operational	52	45,742
Under construction	3	3,638
Preparing for construction	8	10,315
Total	63	59,695

gulf of Mexico oil spill



energy appetite has provoked global nightmares

- Energy = the ability to do work
- Energy → electricity → electric current
→ currency → money
- Physics / economics
- Open up the thinking boxes, multi-disciplinary, Trans-boundary, holistic thinking

Section One: Realities

- no more uncertainty & denial
- clear & present danger to humanity and life on earth

Only when the last tree has died,
and the last river been poisoned
and the last fish been caught
will we realize we cannot eat money.

~Cree First Nations Proverb¹³

Typical denial excuses

1. I don't believe it.
2. The science is debatable and inconclusive.
3. Global warming is caused by natural phenomena.

Denying a measurement of reality



1. I don't want to believe it.

Science is not a believe system

1. Science is about measurements and error bars. Thousands of continuous measurements on earth, under the oceans, and from space by many countries

Global scientific credibility

>50 Earth
Observation
satellites acquire
data at exponential
rate providing
unprecedented
synoptic views of
our planet. (ESA -
AEOS Medialab)



Only very few bad apples among
numerous good ones



2. The science is debatable and inconclusive

UN Declaration

“Feb 2, 2007 will be remembered as the date when uncertainty was removed as to whether humans had anything to do with climate change on this planet. The evidence is on the table”

Achim Steiner, executive director, United Nations Environment Program

Cancer is not my fault

Dying is a natural
phenomenon
anyways



3. Global warming is caused by natural phenomena

Humanities' Responsibility

3. Natural phenomena are no excuse and irrelevant to the fact that humans are responsible for green house gas emission.

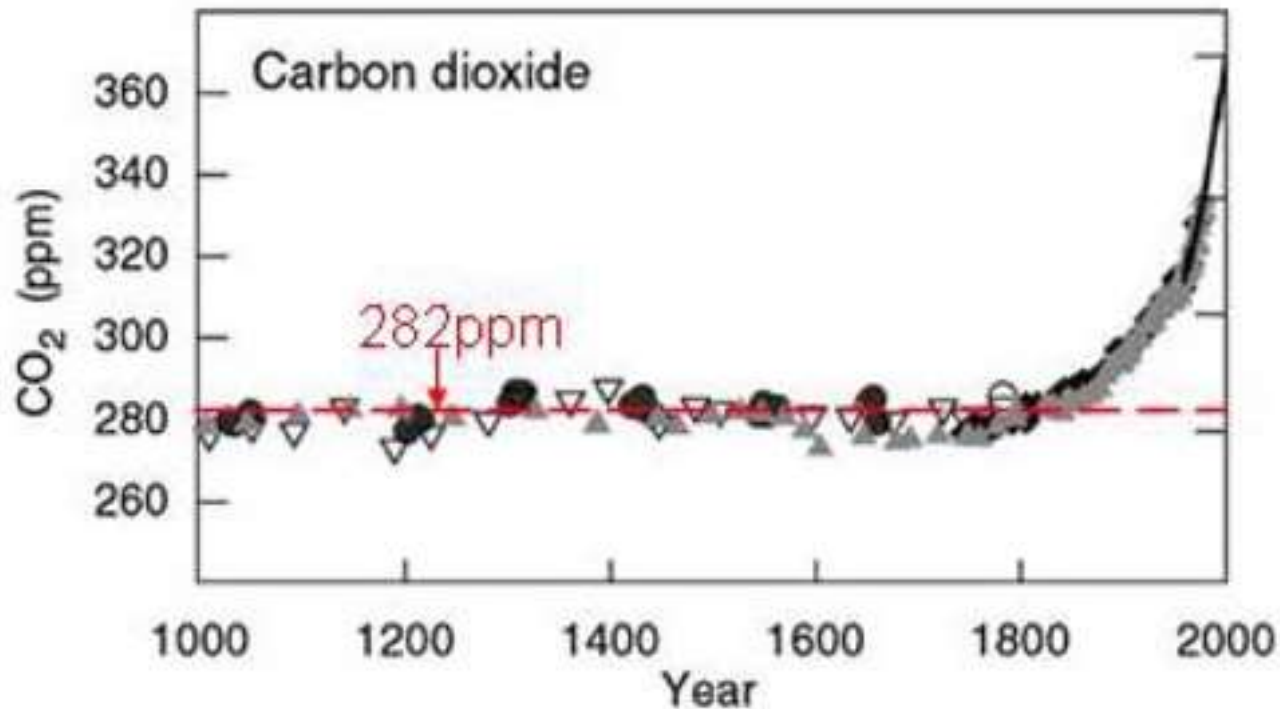
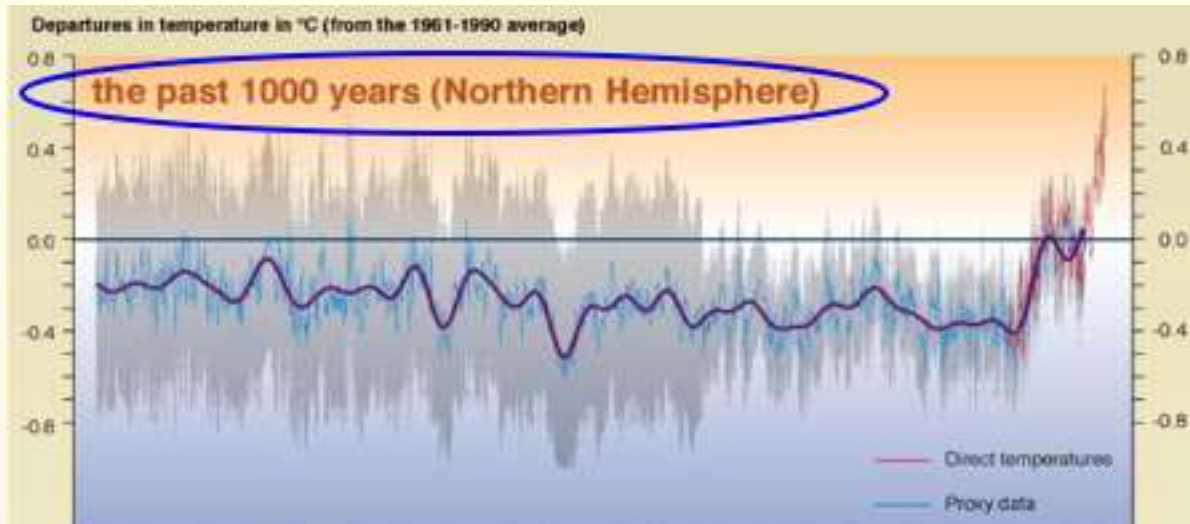
CAUSE: Burning fossil fuel (vehicles & electricity generation) emit CO₂ which **blanket** the earth. Heat from sunlight cannot escape into space



Caused by green house gases (CO₂, H₂O)

- Human activities emit greenhouse gas
 - >7 billion tons of each year or
 - 500 billion tons since the industrial revolution
- Oceans absorbed about ¼ or 125 billion tons and can absorb no more
- Atmospheric CO₂ concentration
 - Today = 380 ppm (parts per million)
 - Pre-Industrial Revolution 1700s = 280 ppm
 - End of the century = 560 to 1,000 ppm
- Double CO₂ increase temperature by 2.2°F

Temp & CO₂ correlate in past 1,000 yrs

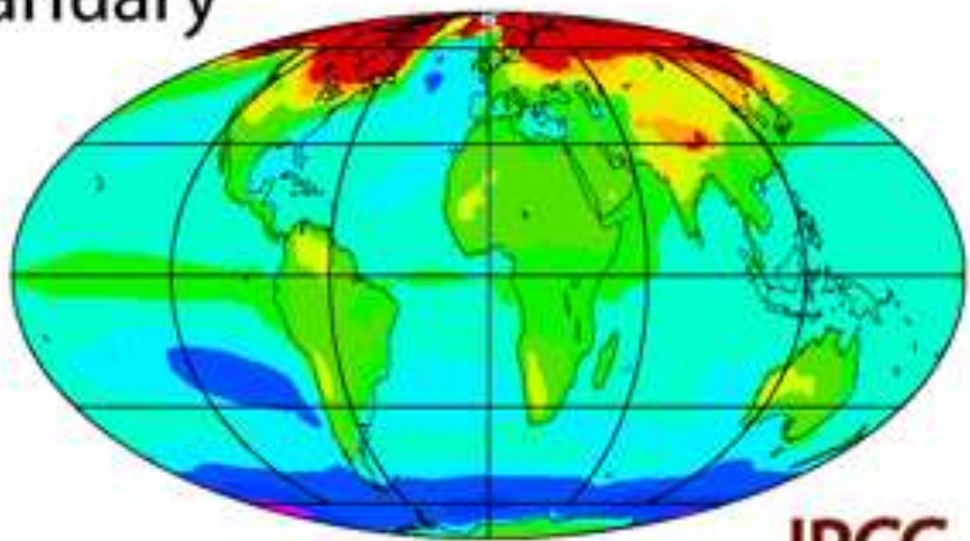


2007 USA

Intergovernmental Panel on Climate Change (IPCC) 4th Assessment Report

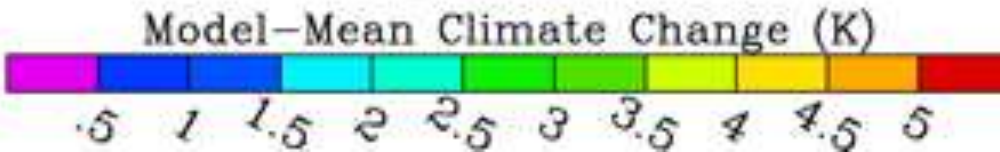
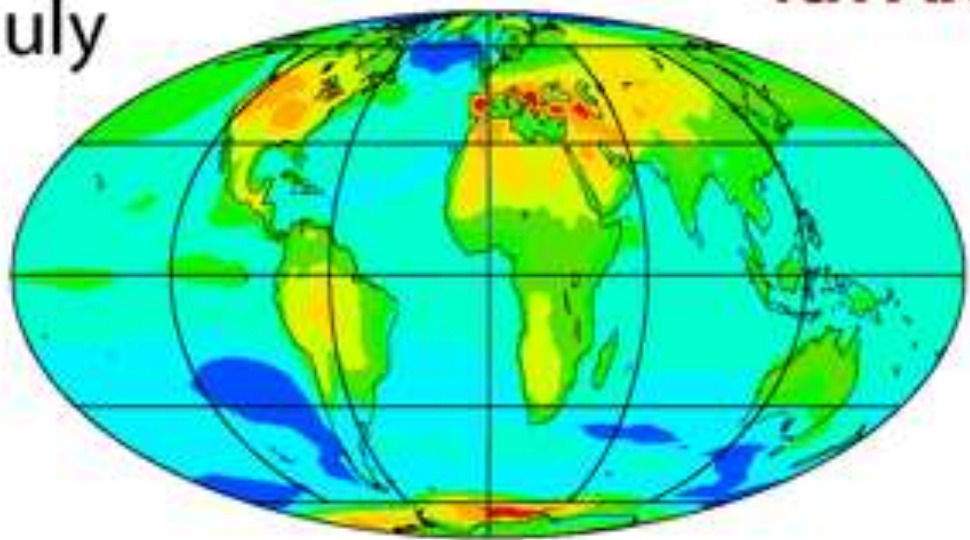
- IPCC measure **Best Case scenario**
- Temperature increase next 100 years
- IPCC & Al Gore share 2007 Nobel Peace Prize

January

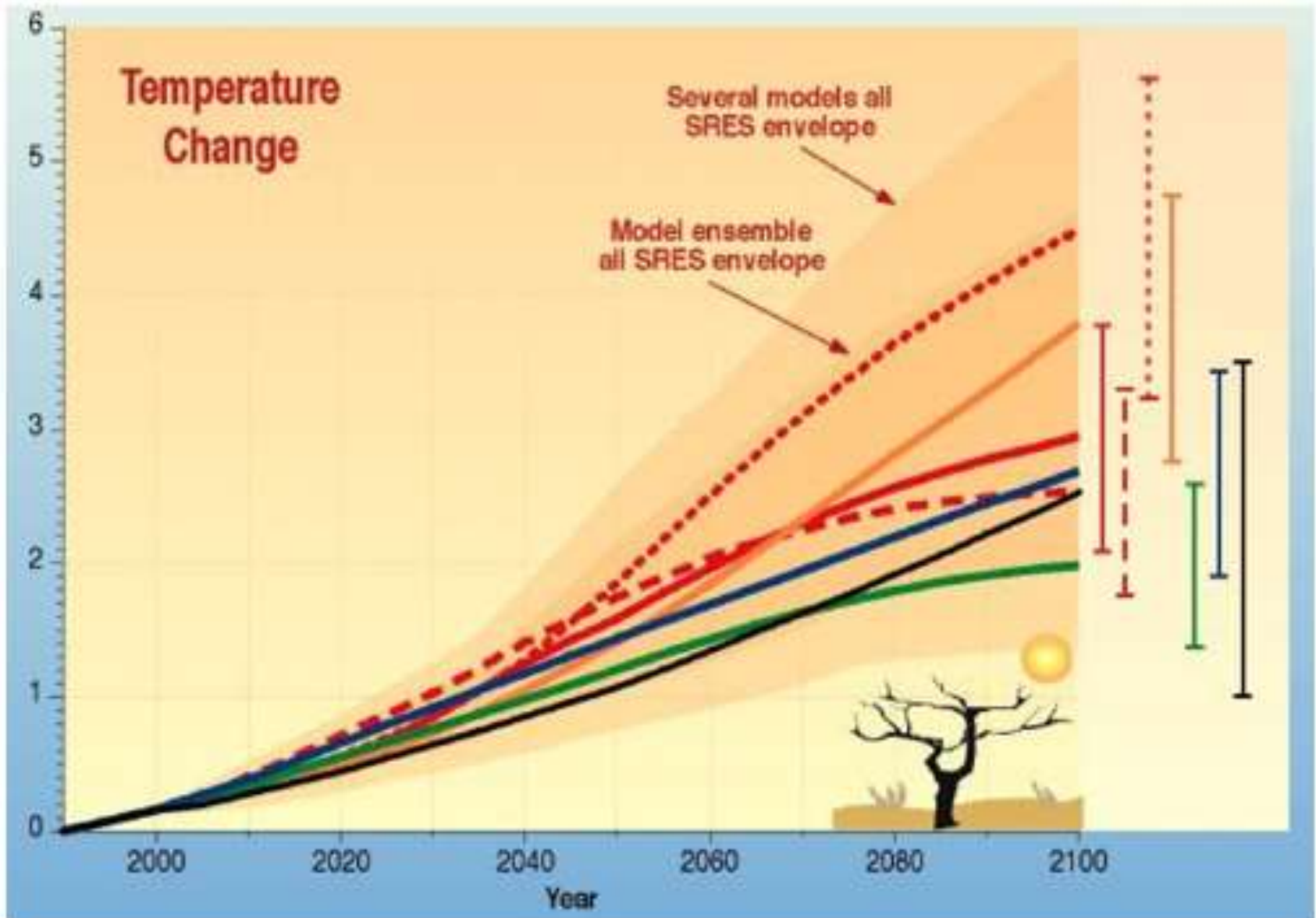


IPCC 4th AR

July



In next 100 years, existing human CO₂ will cause rise in 2°C (best case); additional human CO₂ will double to 4°C (worst case)



National Aeronautics and Space Administration (NASA) measured **much worse** case scenario

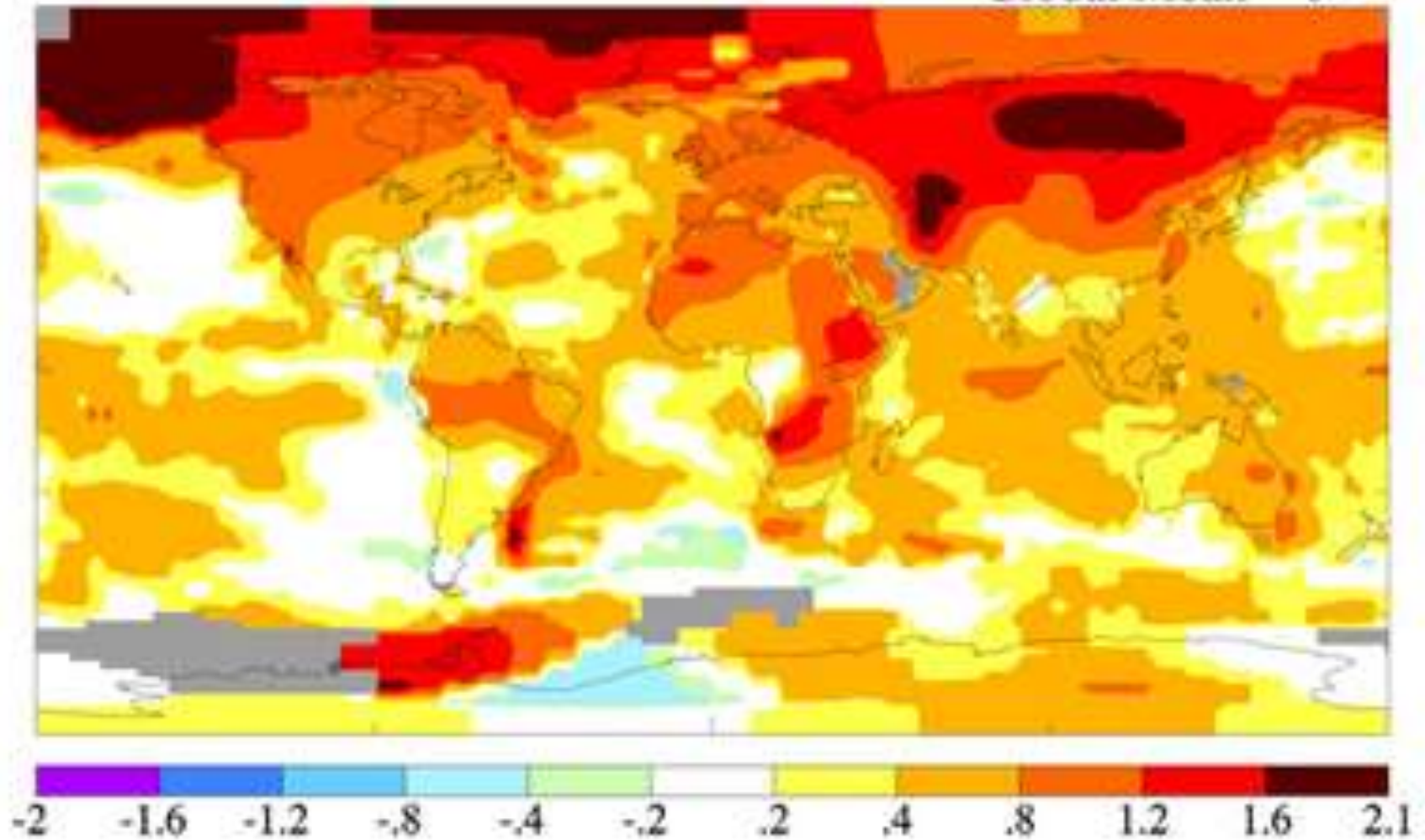
26Sep06 Proceedings of the National Academy of Sciences:

- **“We conclude that global warming of more than 1°C, relative to 2000, will constitute “dangerous” climate change as judged from likely effects on sea level and extermination of species”**
- **3°C over the 21st century could eliminate a majority (60%) of species on the planet**

NASA found accelerated warming

2001-2005 Mean Surface Temperature Anomaly ($^{\circ}\text{C}$)

Global Mean = 0.54



NASA report: Earth is heating up exponentially

- +0.2° C per decade for the past 30 years
- Warmest levels in the last 12,000 years
- Within about 1°C of the maximum temperature of the past million years
- 2001-05 +0.54° C in 4 years
- 2-3° C more = about three million years ago, sea level was 25 meters [80 feet] higher.
- [0.5°/4yr = 16-25 years] Worse Case Scenario
- Contradict IPCC prediction of 23 inches sea level rise within 100 years “business-as-usual” several meters per century with eventual rise of tens of meters

Polar Ice decline

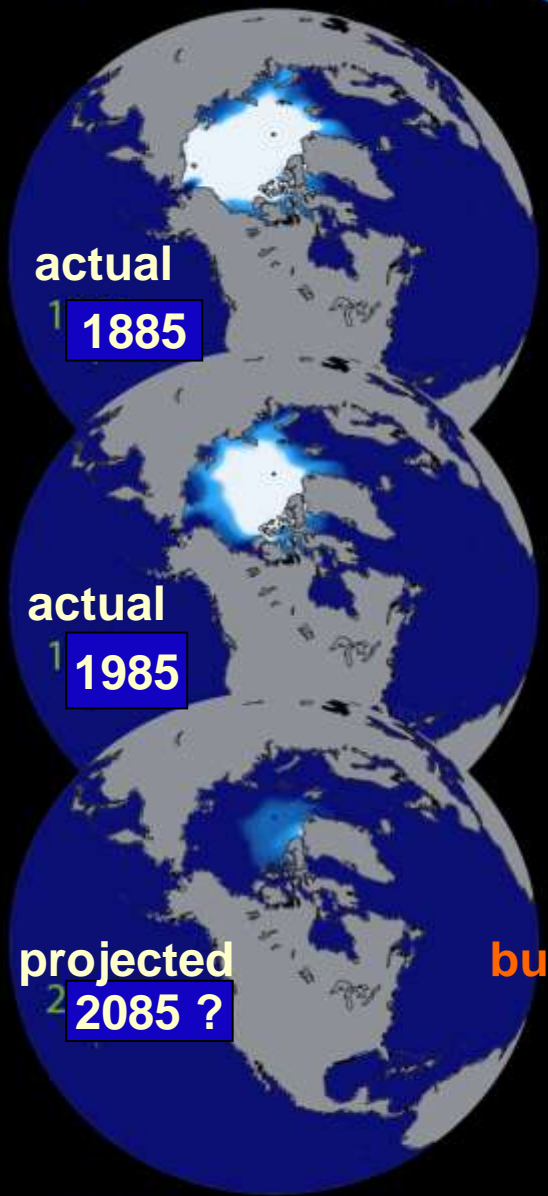
CBC News 11Dec06; Tremblay, McGill & U.S. National Center for Atmospheric Research. Geophysical Research Letters 12Dec06.

- Right now steady decline
 - Higher temperatures → less ice (less **mirror** reflecting sunlight out into space) → more water → more sunlight absorbed by water (**thermos**) → raises temperatures.
 - Next 20 years tip the steady decline to 4x faster decline
 - by Sep 2040 little left (**30 yrs**)
- 2004, chief scientist on Canada's Amundsen research icebreaker predict **50y**. 2007 he predicted **30 yrs**
- Jun06, UBC Byers & European Scientists, NW passage clear in **25y**.



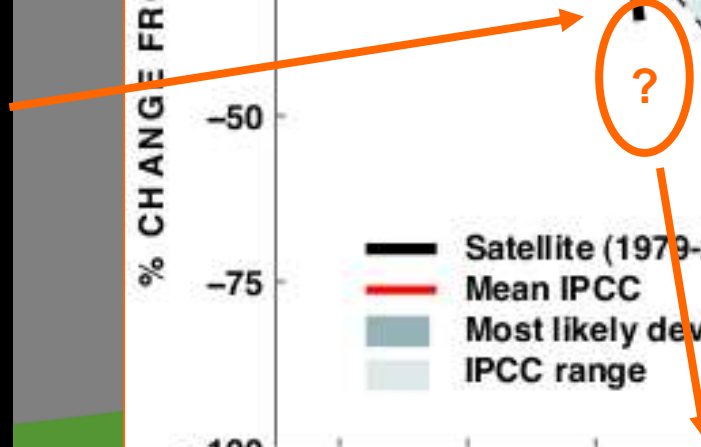
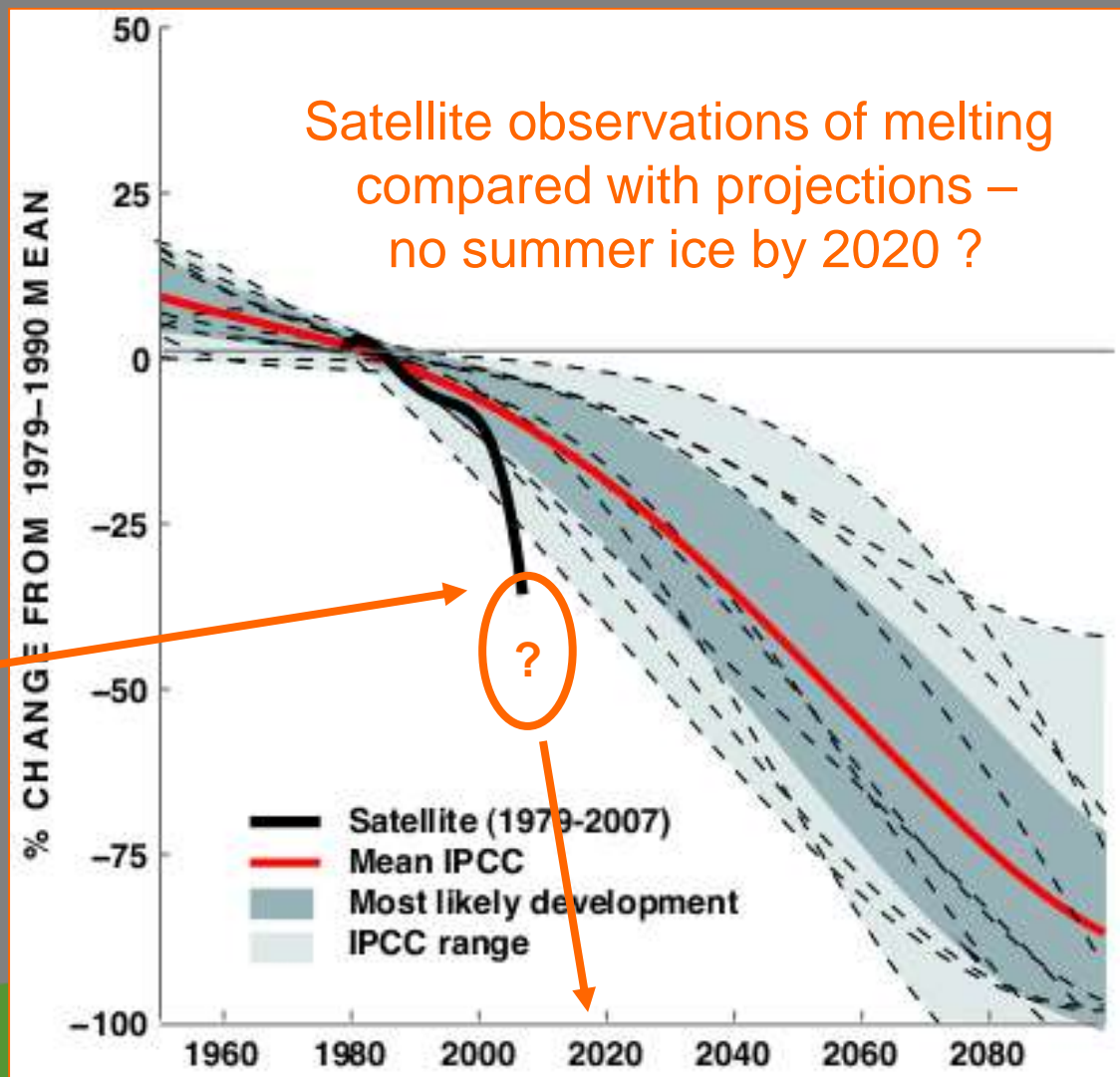
Ice melted in 2006= lake Superior, 2007=Ontario





Aug Sept Oct Avg Sea Ice Concentration

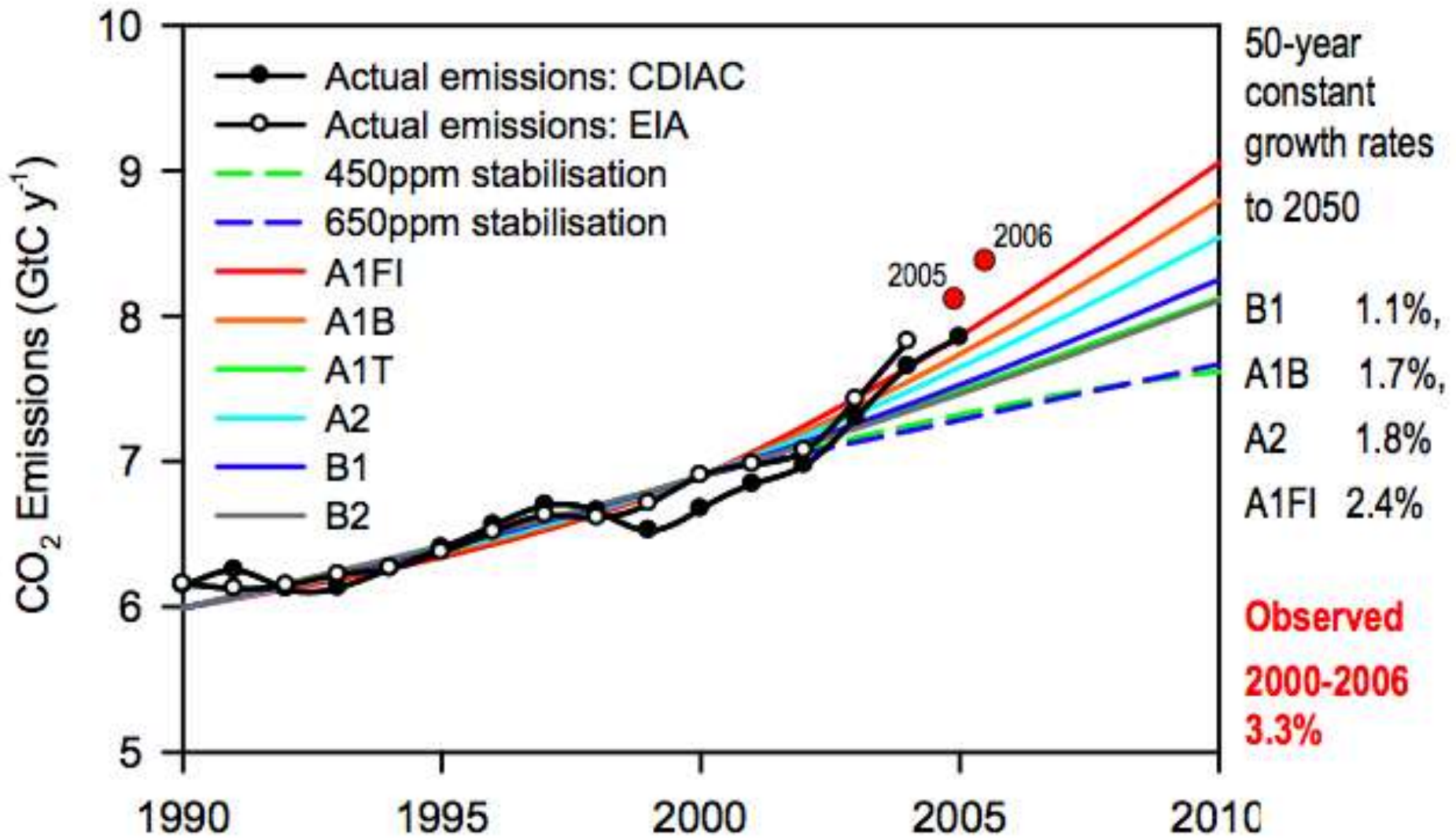
Faster than anyone expected ...



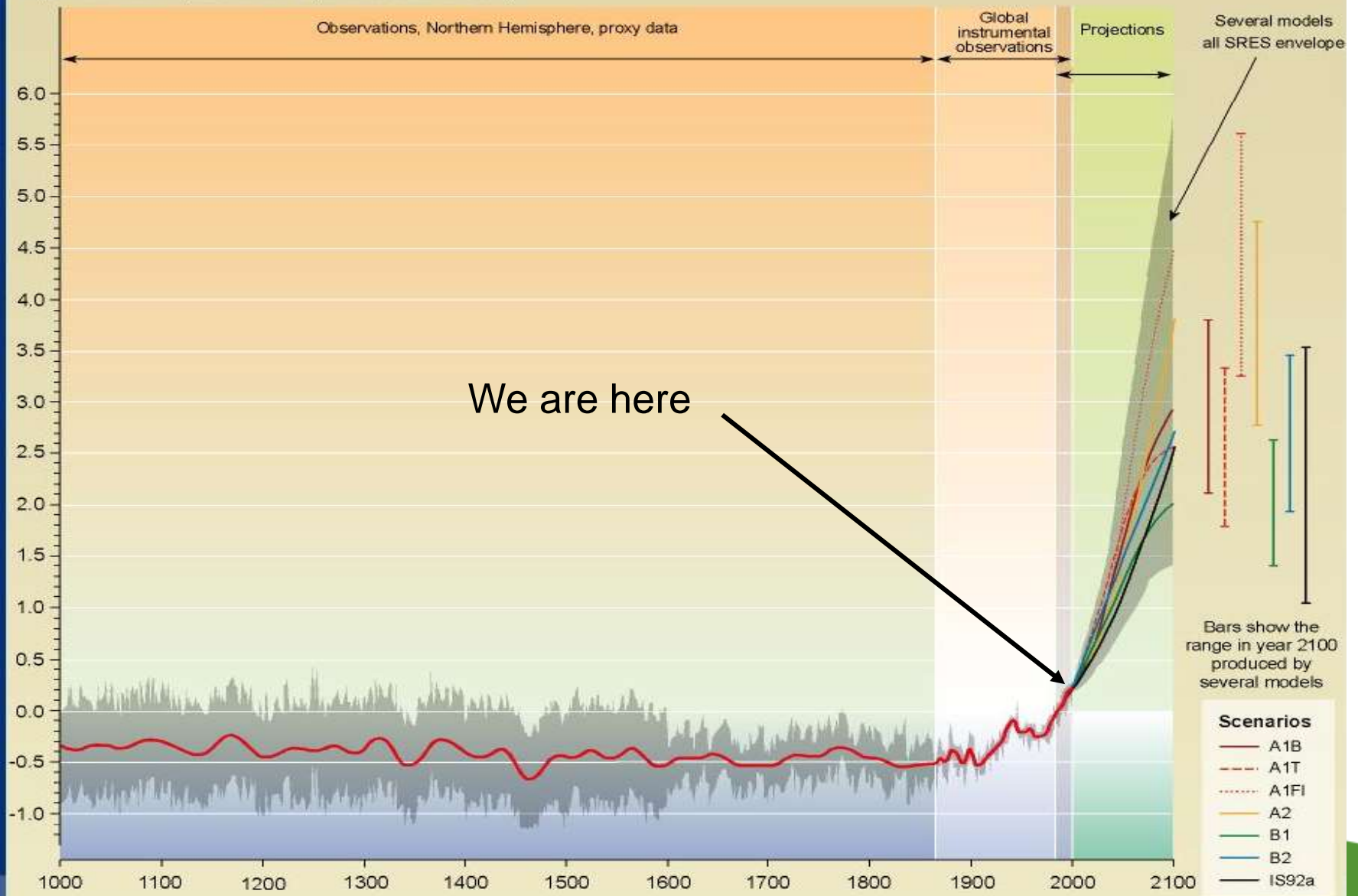
July 17, 2008 Al Gore

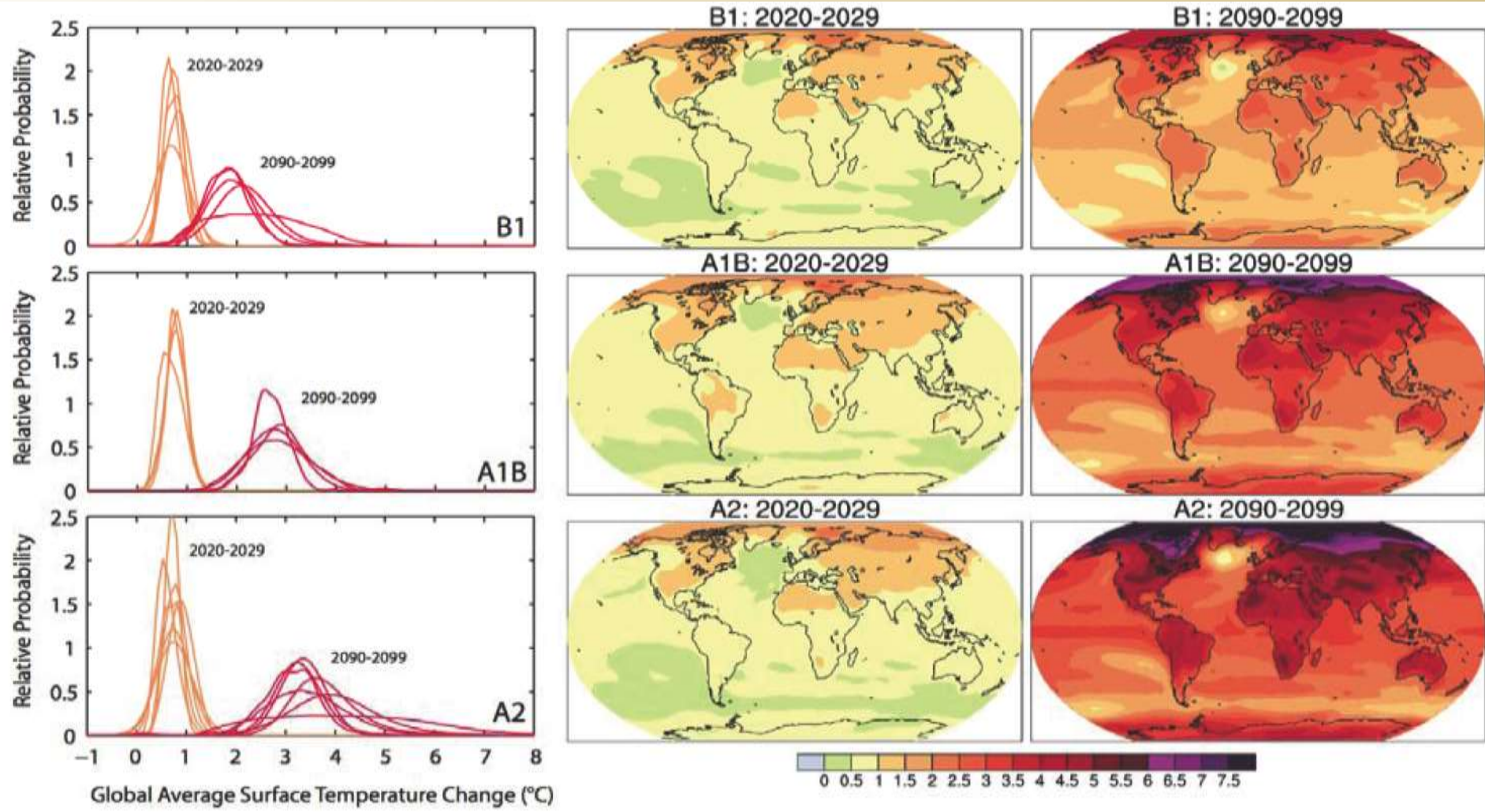
- Scientists with access to data from navy submarines traversing underneath the North polar ice cap have warned that there is now a 75% chance that within **five** years the entire **ice cap** will **completely disappear** during the summer months
- Jakobshavn glacier, one of Greenland's largest, is moving faster than ever before, losing 20 million tons of ice every day, equivalent to the amount of water used every year by New York City





Departures in temperature in °C (from the 1990 value)





Eby M, K Zickfeld, A Montenegro, D Archer, KJ Meissner & AJ Weaver, 2008: Lifetime of anthropogenic climate change. *Journal of Climate*, in press.

No time left

- Even if humans stop all emissions, green house gases concentrations stabilize but the warm blanket is still covering the globe
- Even 100% Kyoto compliance will only reduce global warming by $1/700^{\circ}\text{C}$
- Canada, US, refuse Kyoto
- Australia new government 2007 rectified

Six Global disasters

- 1) Rising Sea level
- 2) Drinking water and crop irrigation
- 3) Food
- 4) Climate
- 5) Disease
- 6) Social economic
- 7) War?

1) Rising Sea Level Disasters

1. A rise in sea level of 1m will submerge an area the size of Portugal along China's eastern seaboard, >half its population and 60% of its economic output.
2. 40% world population lives in coastal areas, <60 km from shoreline, coasts will be flooded worldwide.
3. US Geological Survey, half the country gets drinking water from groundwater. Sea water moves inland, making underground water undrinkable. Crops cannot be irrigated

Glaciers are the planet's largest source of fresh water after polar ice



1. Condense cloud moisture
2. Store water as ice
3. Slowly release water to rivers & underground water table (well water)
4. Avoid flood
5. No glacier, no constant fresh water supply
6. Rainfall is unreliable



Adaptation to flooding



Finch Avenue - 2005



2) Drinking water & irrigation disasters

1. In 13 years (1991-2004), twice as much glacial melted in Europe than in the 30 preceding years
2. Conservative estimate, Glaciers vanish from the Alps by 2050; most by 2037
3. Peruvian Andes, Quelccaya ice-cap covers 44 sq km has halved in size since 2006, will be gone in 5 years
4. Rainfall may decline 30% in 3 of 7 major river basins in China

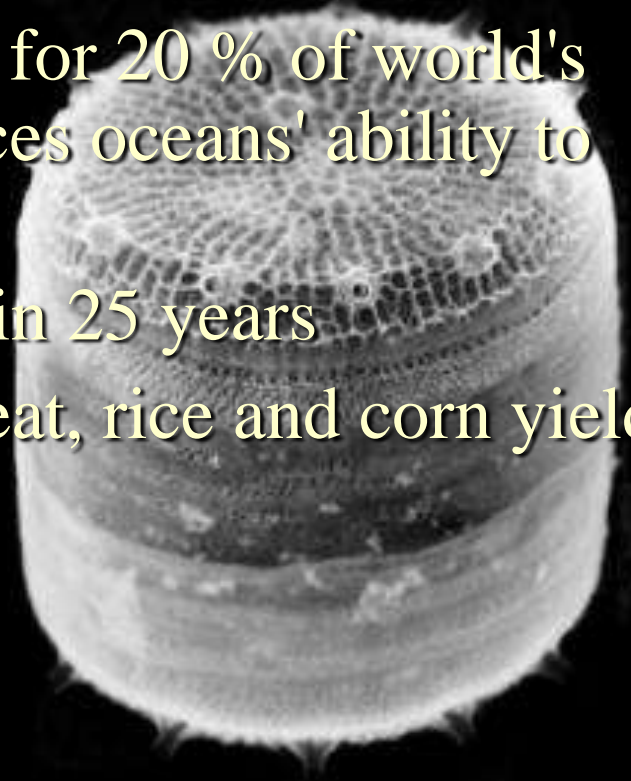


Aletsch glacier in Switzerland Vanished

2005 summer, melting
glaciers caused severe
flooding that devastated
parts of Switzerland

3) Food Disasters

1. >50 % CO₂ dissolve in ocean turning acidic threaten sea life
2. A decade of satellite surveys showed decline in diatoms phytoplanktons, microscopic plants at bottom of food chain.
3. Diatom photosynthesis responsible for 20 % of world's organic carbon. Their decline reduces oceans' ability to absorb CO₂
4. Kill Australia's Great Barrier Reef in 25 years
5. China predict a 37% decline in wheat, rice and corn yields in the second half of the century
6. Newfoundland lost cod stocks
7. Maple tree cannot make syrup



4) Climate Disasters

1. 29 other regions worldwide changes during the 20th century, **rainfall decrease** by $\geq 10\%$ below normal levels, and in all cases **drought lasted for ≥ 10 yrs.** World-wide including Europe, N. America, Australia, China, the former USSR, Middle East, Africa, India & Bangladesh
2. Canadian winters no longer cold enough to kill **pine beetles** which demolish our forest (look bright red from sky)
3. **El Niño** (warm surface waters in the West Pacific move eastward toward South America) altering weather patterns
4. **Heat waves** surge in India over the past century, rising death toll due to heat stress. Serious floods in its N.E. states in July 2005 killed $>1,000$ with economic losses $>$ US \$250 million
5. Sahel **drought** W. Africa late 1960s lasted ~ 2 decades, killed ≥ 1 million and affecting ≥ 50 million

5) Disease Disasters

- Mosquitoes carry dengue fever found at heights of ~2,000 meters above sea level in Mexico and in the Andes Mountains of S. America.
- Tropical diseases shifted northward including:
 1. *Cryptococcus gattii* B.C. none before 1998
 2. N. America hantavirus in 1993
 3. Expanding terrain of ticks that ferry Lyme disease
 4. 1999, the arrival of the West Nile virus
 5. Malaria and encephalitis in Turkey and Azerbaijan

6) Social Economic Disasters

The economic costs of failure to meet the challenge would be catastrophic – greater than the combined costs of the Great Depression of the 1930s and the two world wars (British Government study)

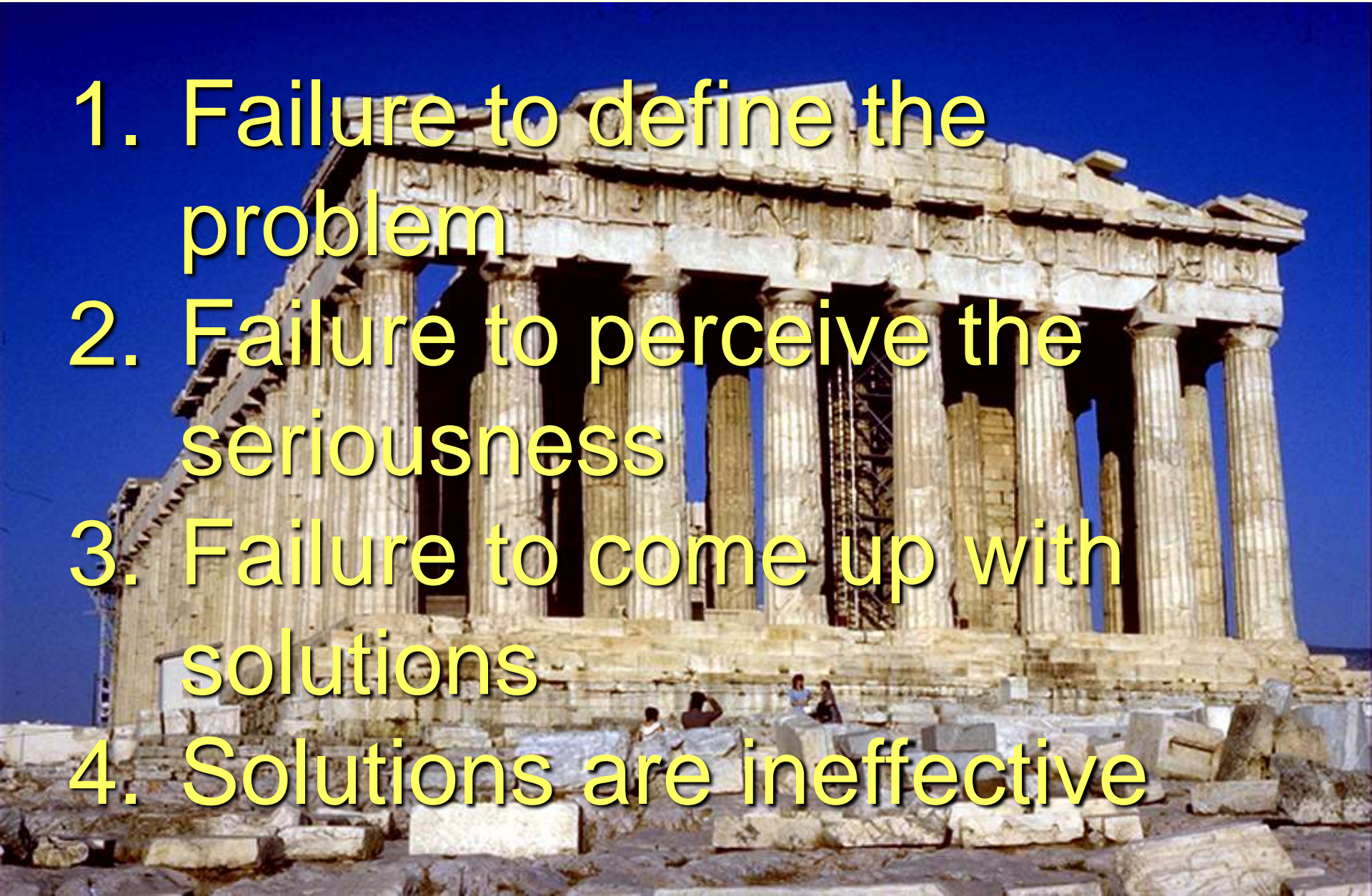
Canada one of the world's highest per capita emitters of greenhouse gases

- Emissions rose 27 % mainly because of Alberta oil
- 758 million tons CO₂ per year
- Exceed Kyoto target by 35% or 200 million tons

- Real (UN, scientific measurement)
- Immanent (25 years)
- Disastrous (extinction and signs of civilization collapse)



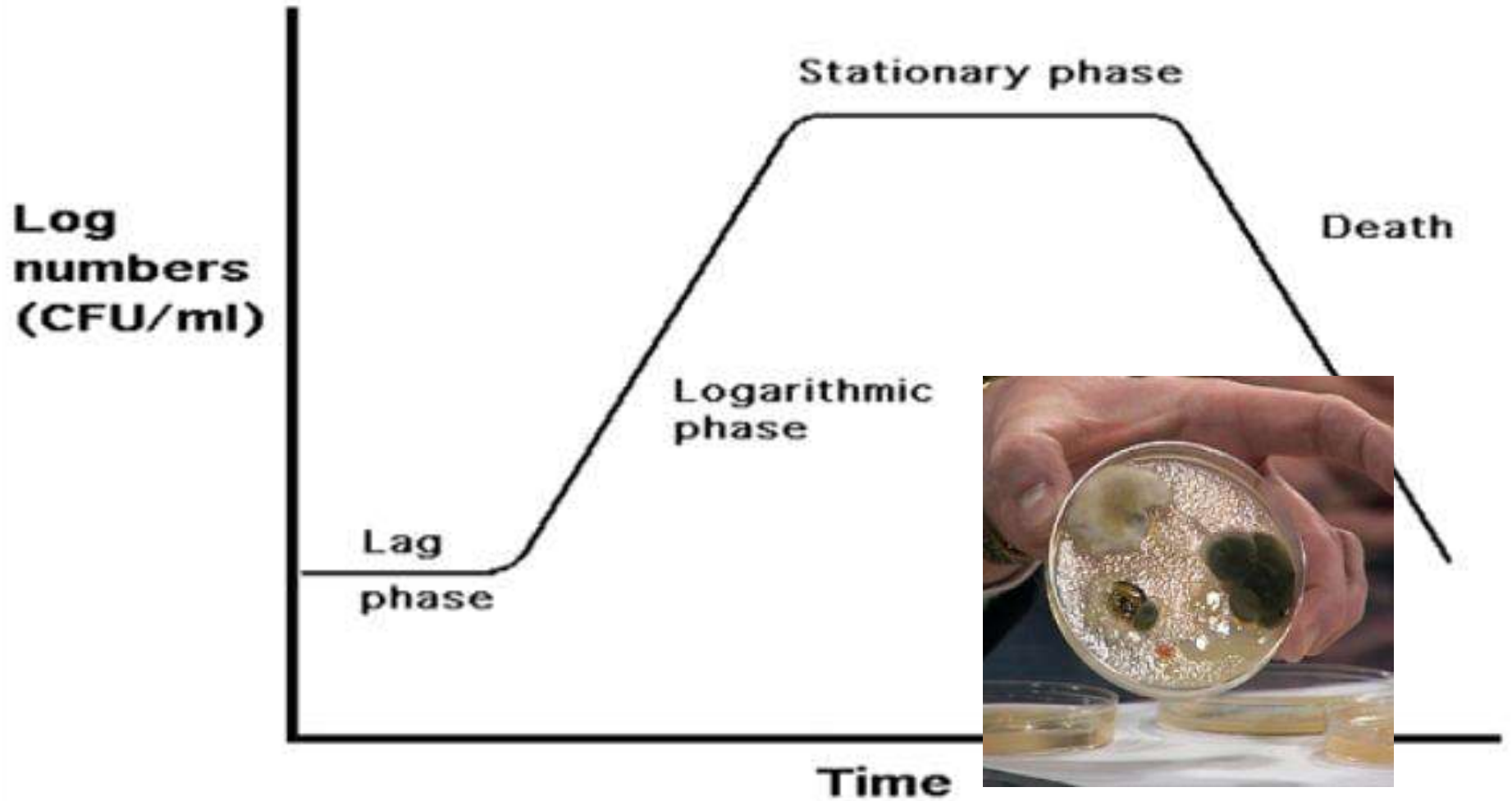
Four symptoms of civilization collapse

1. Failure to define the problem
 2. Failure to perceive the seriousness
 3. Failure to come up with solutions
 4. Solutions are ineffective
- 
- The background image is a photograph of the Parthenon on the Acropolis in Athens, Greece. The temple is shown in a state of significant ruin, with many columns missing or damaged, and a large amount of rubble and debris scattered in the foreground. The sky is a clear, bright blue. The overall scene conveys a sense of historical decay and the collapse of a once-great civilization.

Section Two: Root Cause Analysis – civilization unsustainable



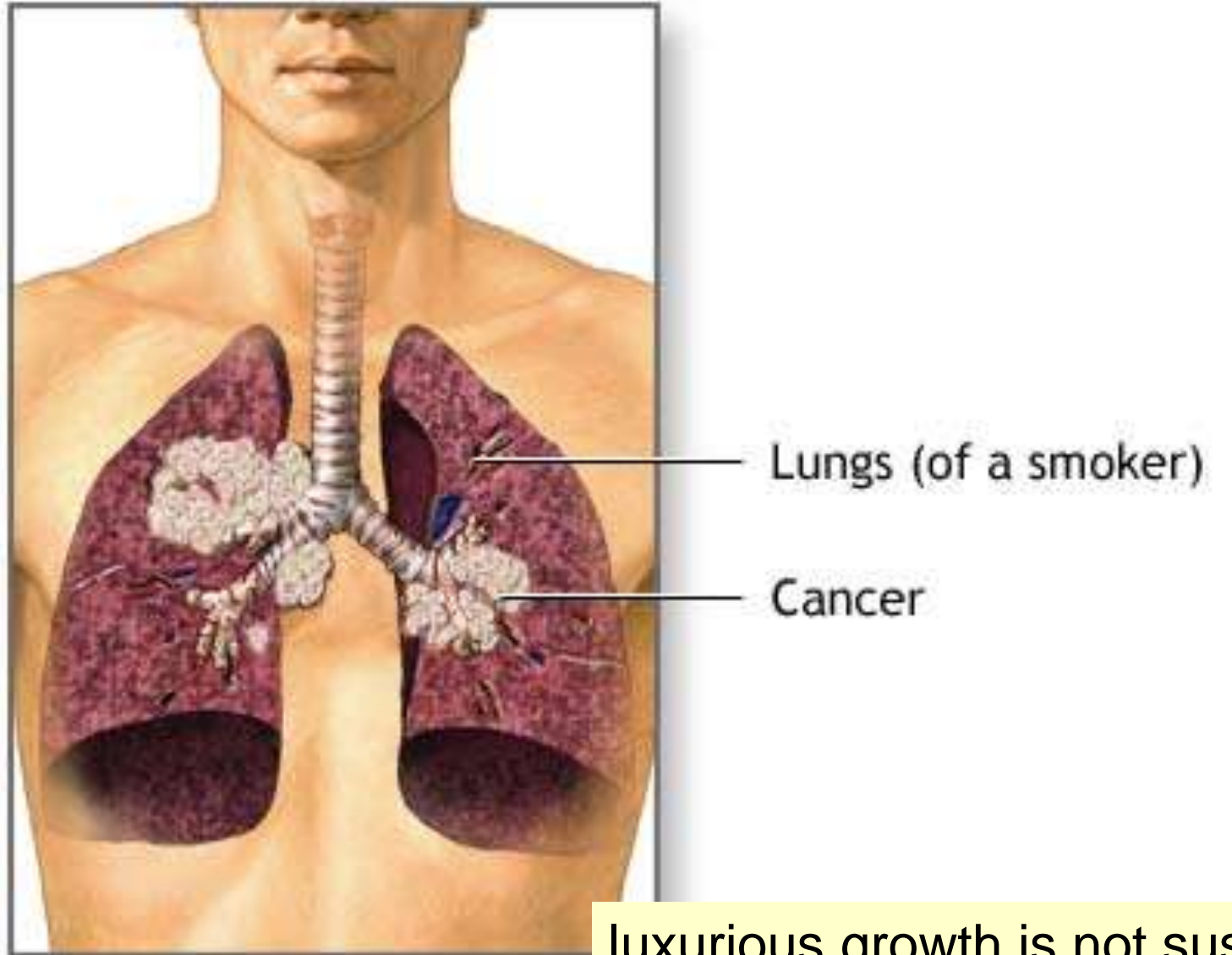
Sustainability with limited resources



Hypothetical bacterial growth curve

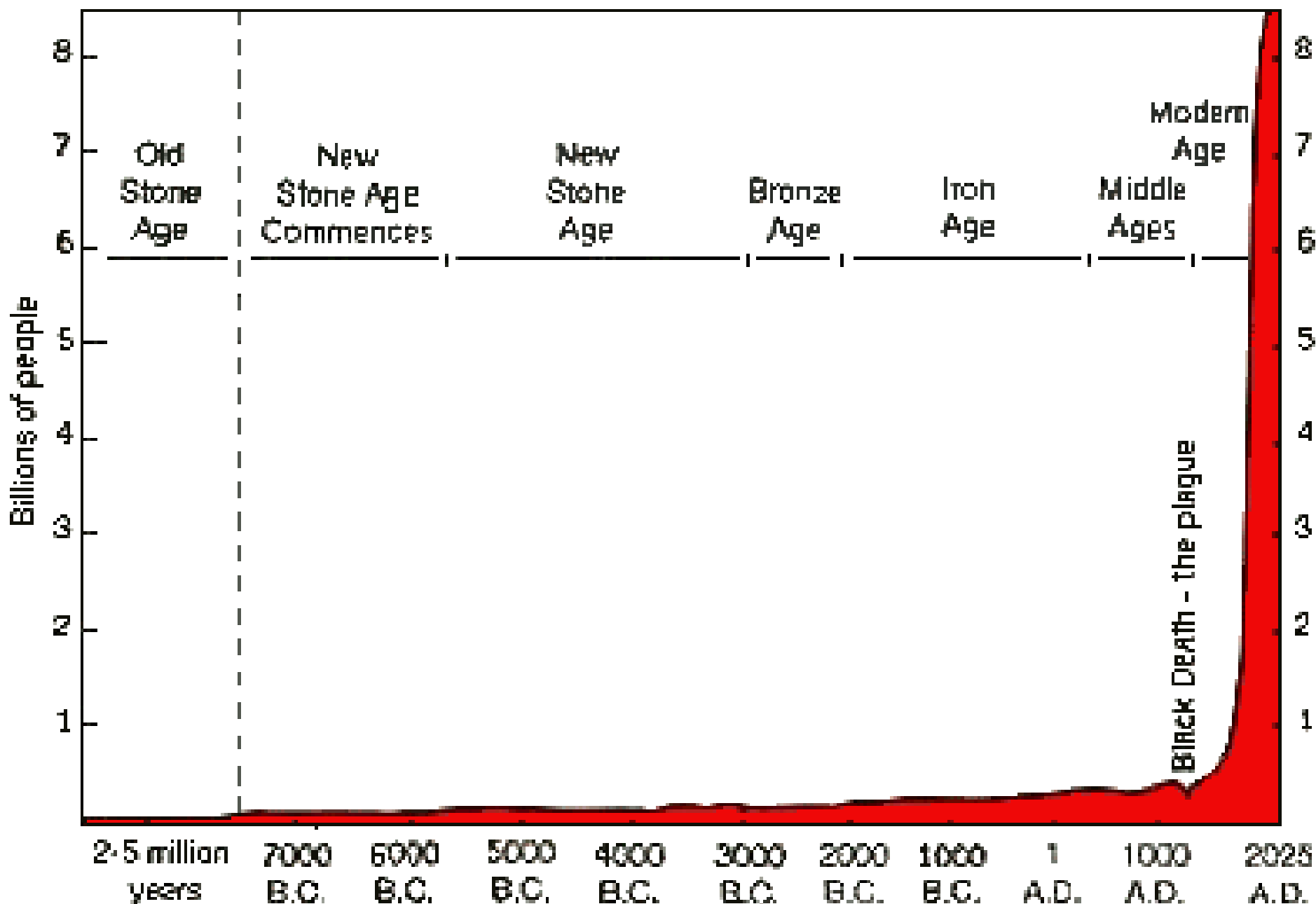
luxurious growth is not sustainable

Sustainability with limited resources



luxurious growth is not sustainable

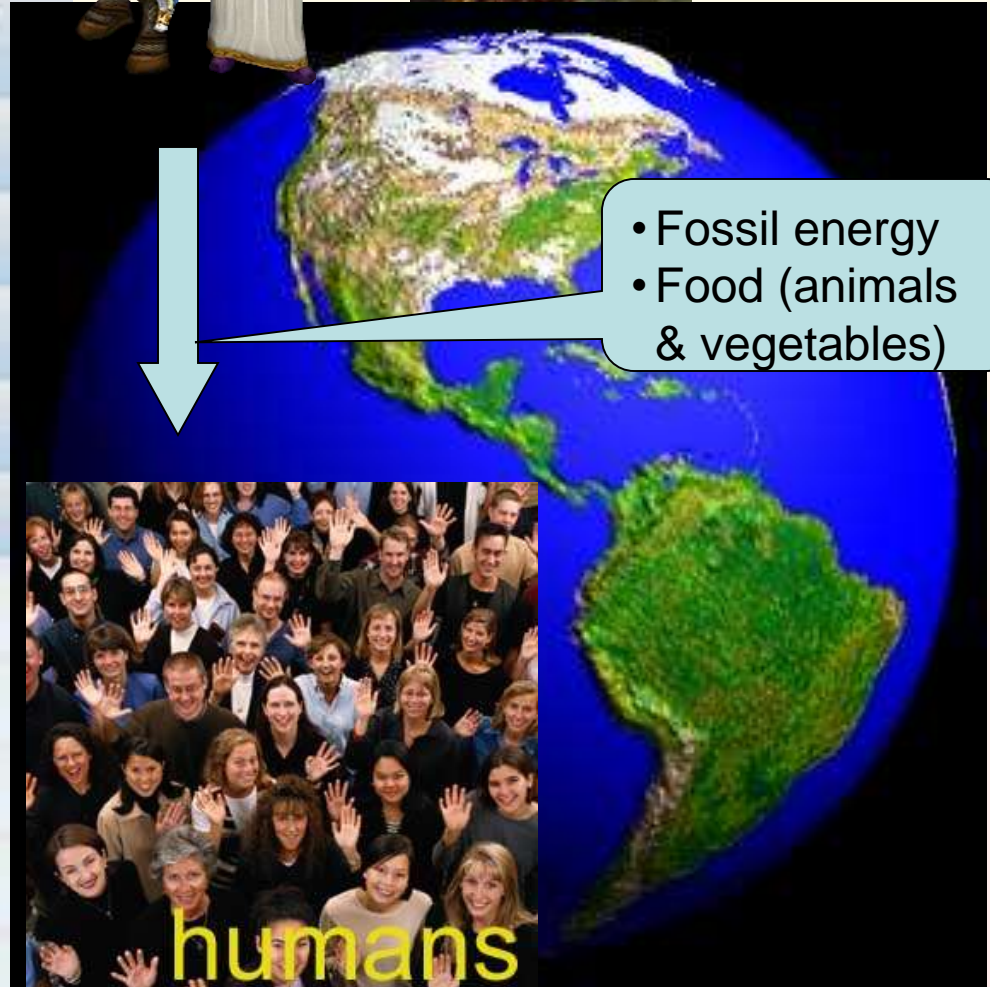
World Population Growth Through History



Number of Years Required to Add One Billion People to the Population of the Earth with Current Projections into the Future

Date Achieved Years Required

	Date Achieved	Years Required
First Billion	1800	All of Human History
Second	1930	130
Third	1960	30
Fourth	1974	14
Fifth	1987	13
Sixth	1998	11
Seventh	2009	11
Eighth	2021	11
Ninth	2035	14
Tenth	2054	19
Eleventh	2093	39



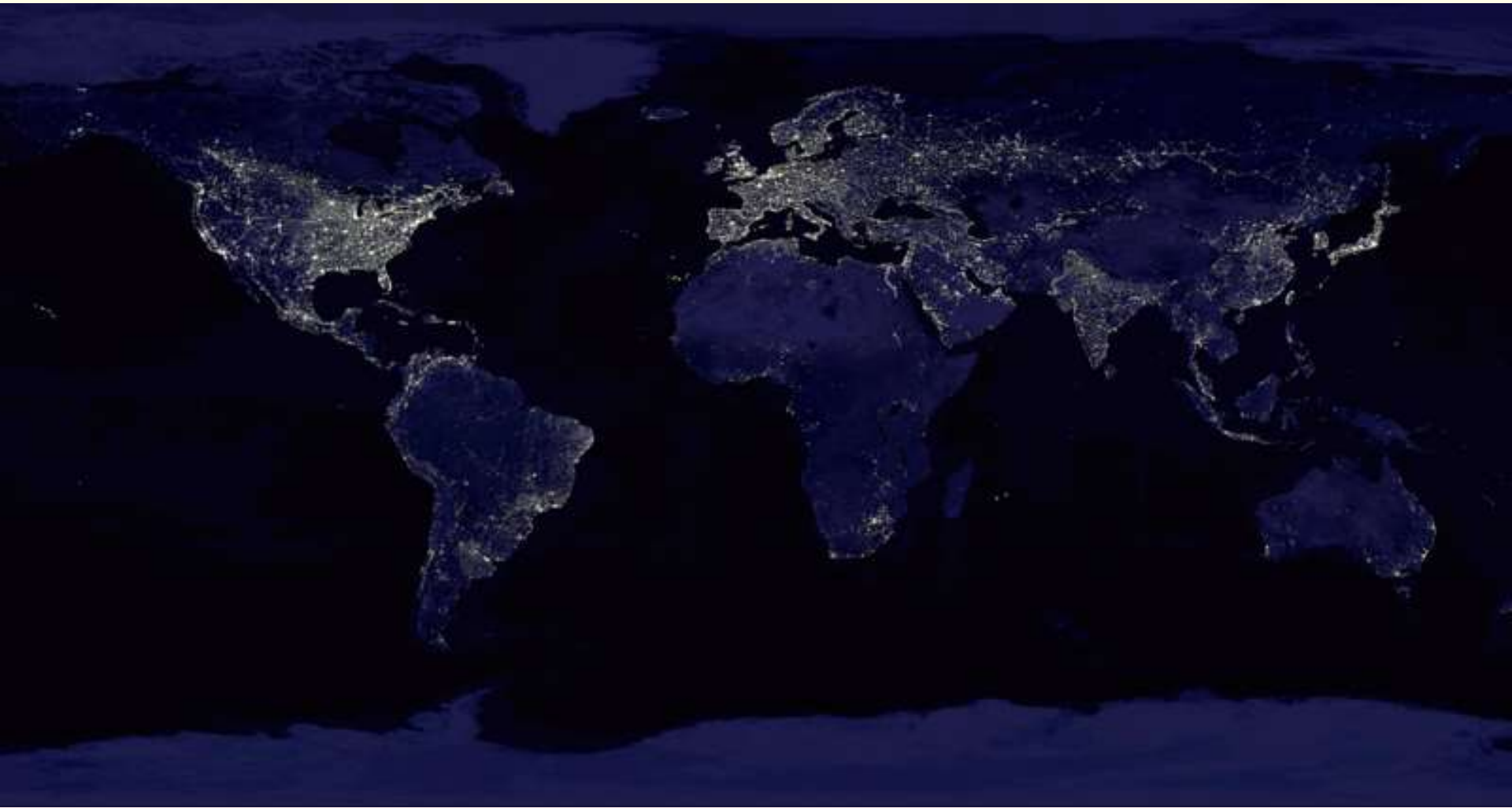
- Fossil energy
- Food (animals & vegetables)

humans

Unprecedented Sustainability Challenges

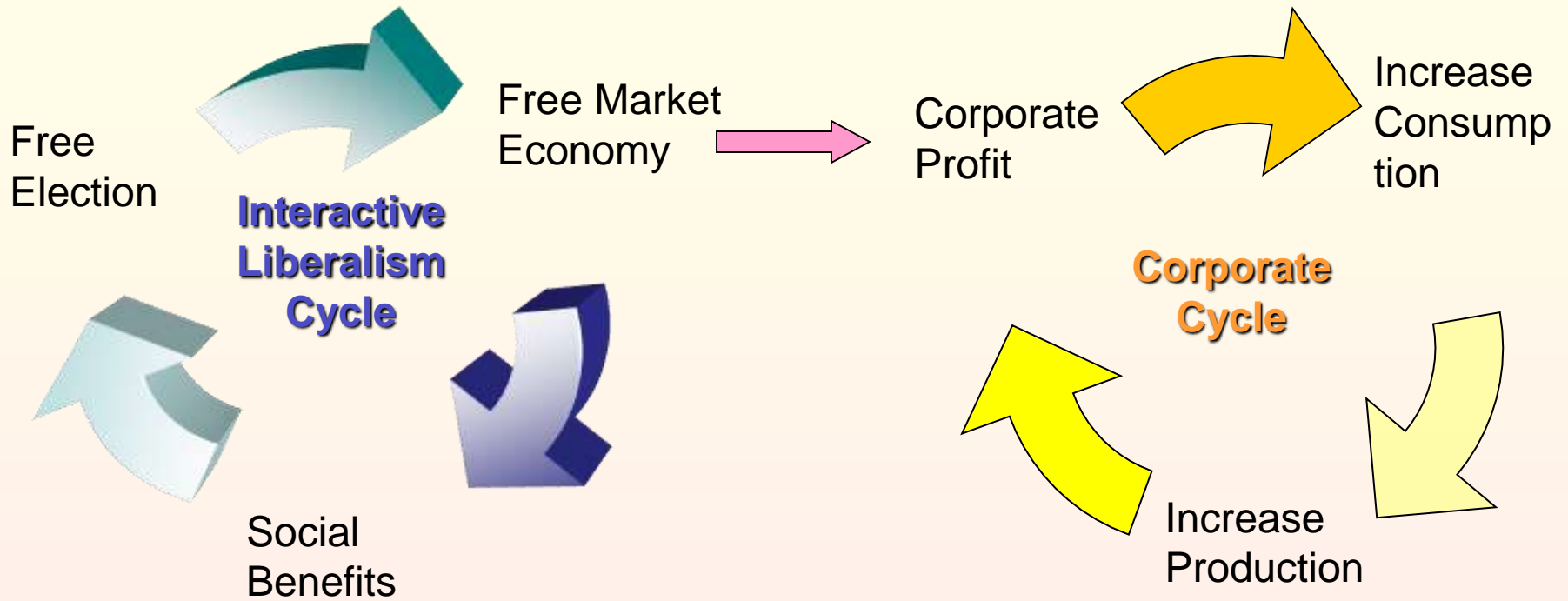
- Solar energy sustains <1 billion humans
- Pre-industrial revolution up to 2 billions
- Population doubled in the past 40 years to 6 B
- Technology allows transform world energy and biomass into human biomass
- Half the world is living on < \$2 a day
- 20% of the global population is consuming 86% of the world's goods

Satellite Image of Global Light Pollution

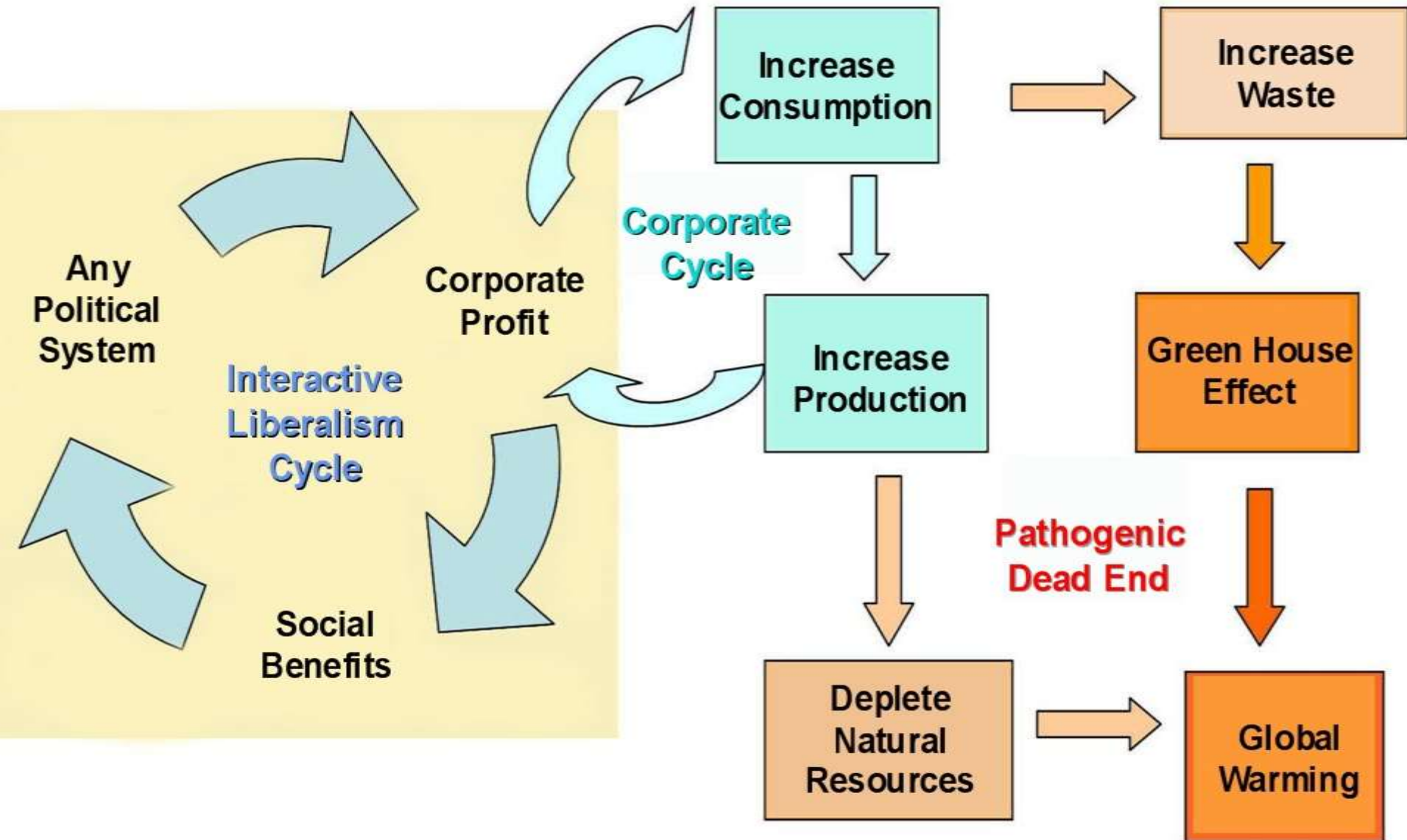


Sustainability with limited resources ⁵⁶

Root causes



Global warming root-cause analysis





Dominant Civilization is destructive to humans & nature

1. Tobacco 1940's – 1990's
 2. Acid rain 1950's – 1980's
 3. Ozone hole 1960's – 1990's
 4. Global Warming 1970's – future
- Big money – big evil
 - Small money – can be fixed
 - Band aid solution, fix one, the next problem arise, root cause not addressed

Central Value System of the dominant civilization



Critical thinking steps:

Root-causes of global warming

- Humans pursue happiness
- Happiness is an abstract quality
- Humans do not know how to make consistent decisions based on abstract quality
- Decisions are easy when based on quantity, number
- Money (currency) is the only number available and universally recognized
- Consequently, people pursue money in their attempt to pursue happiness
- Money translates into consuming power. Over-consumption demands over-production, creates wastes, depletes natural resources, pollutes the environment and causes global warming (rising sea level, flood, water shortage, food shortage, climate change, diseases...)

A new science to establish a new value system alternative to money

The real solution to change the central value of the dominant civilization is to provide an alternative, quantifiable measurement of happiness, a “Happiness Index”



Green Think Tank

Global warming – Section Three

1. No more uncertainty
2. Root Cause Analysis
- 3. Solutions**

How can civilization change?

Quantify qualitative abstracts

Who is happier, “the material girl” or the Saint?



Qualitative versus Quantitative Descriptions

QUALIFY	QUANTIFY
The air is bad	Air Pollution Index is 7
Sun is very hot	UV index is 11
She studied hard	Her exam score is 35
Seat belt saves lives	63% of people killed in car accidents did not wear seat belts
Economy good	Stock indexes are up
Smoking is bad for health	Smoking causes 21% of all heart disease deaths, 86% of lung cancer deaths, 81% of deaths from chronic lung disease. 4,000 chemicals, 43 carcinogens

Quantification data objectives

- Quantity is measurable by number and unit
- The number need not be perfect or accurate to the n^{th} degree, just need to be a relative index
- The calculation maybe extremely complicated but the end number is easily understood
- Majority will react to the number predictably, even if the numbering system is premature (e.g. First stock market in China a decade ago)

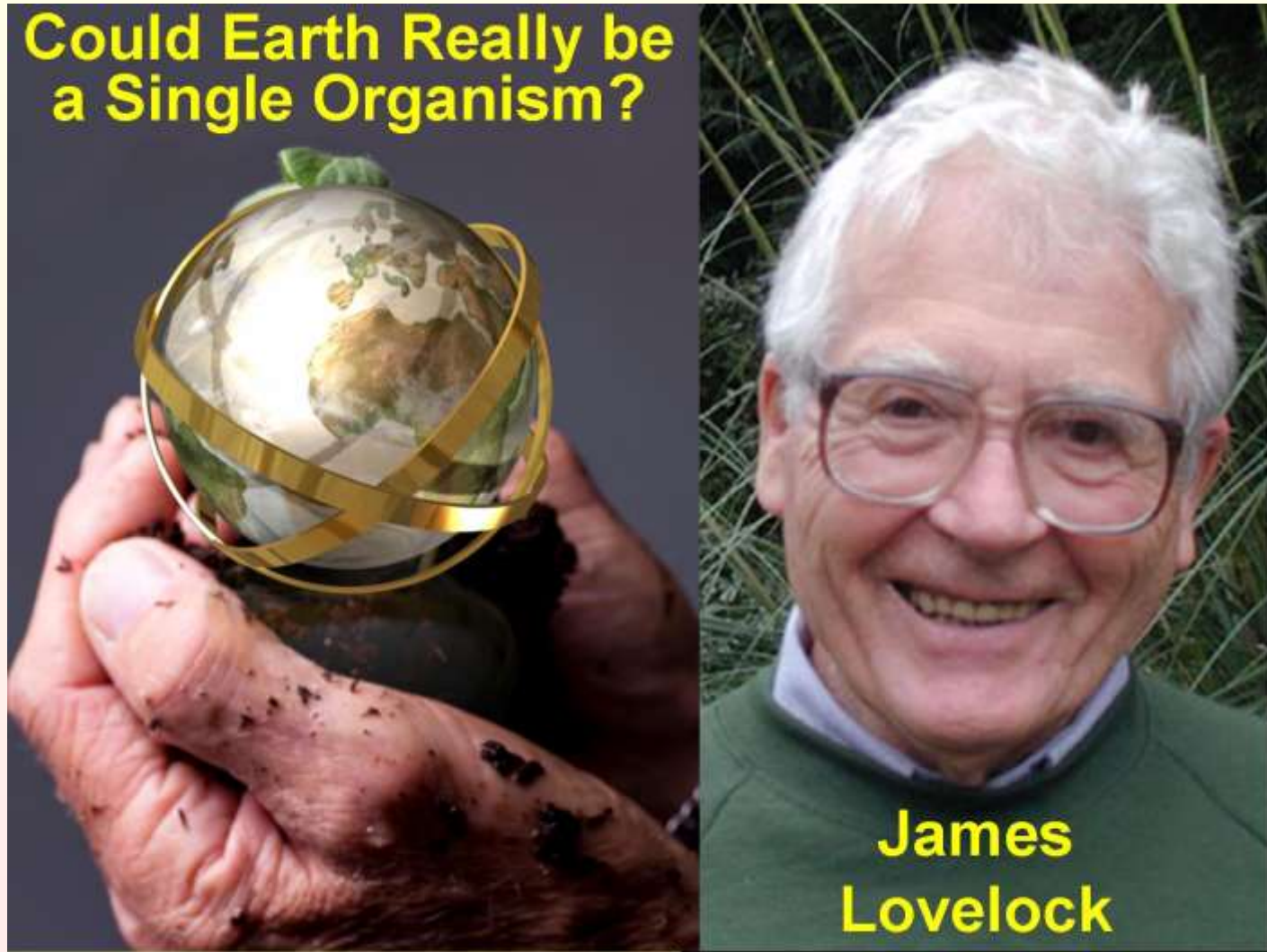
Evolution of “Happiness Index” first-generation

1972 Bhutan's former King Jigme Singye Wangchuck proposed gross national happiness (GNH) concept to supplement the gross domestic product (GDP) concept {religion + political/social science + economics }

Earth Hall
of Fame,
Kyoto
2009



How can Environmental Scientists save the world? {Science + “religion”}



Gaia: a new look at life on Earth, 1979

Evolution of “Happiness Index” second-generation

2006 a second-generation GNH concept, treating happiness as a socioeconomic development metric, was proposed by Med Jones, the President of International Institute of Management



7-parameters of 2nd-generation GNH by direct survey and statistical measurement of respective matrices

- 1. Economic Wellness:** economic metrics such as consumer debt, average income to consumer price index ratio and income distribution
- 2. Environmental Wellness:** environmental metrics such as pollution, noise and traffic
- 3. Physical Wellness:** physical health metrics such as severe illnesses
- 4. Mental Wellness:** mental health metrics such as usage of antidepressants and rise or decline of psychotherapy patients
- 5. Workplace Wellness:** labor metrics such as jobless claims, job change, workplace complaints and lawsuits
- 6. Social Wellness:** social metrics such as discrimination, safety, divorce rates, complaints of domestic conflicts and family lawsuits, public lawsuits, crime rates
- 7. Political Wellness:** political metrics such as the quality of local democracy, individual freedom, and foreign conflicts

Implementation of the 2006 2nd-generation GNH

- <http://www.guardian.co.uk/lifeandstyle/2010/nov/14/happiness-index-britain-national-mood>
- National Post Tue Nov 16, 2010

Preliminary GNH Rank

- 1. Denmark
- 2. Finland
- 3. Norway
- 4. Sweden
- 4. Holland
- 6. Costa Rica
- 6. New Zealand
- 8. Canada
- 8. Israel
- 8. Australia
- 8. Switzerland
- 14. USA
- 17. Britain
- 44. France
- 70. Taiwan
- 81. Hong Kong
- 125. China

卡梅倫出新招 評估民心取向 英擬設「快樂指數」助施政

經濟增長是否與國民的快樂感成正比？英國首相卡梅倫將對此進行評估

【本報倫敦訊】英國首相卡梅倫昨日宣佈，將在今年內對國民的「快樂指數」進行調查。卡梅倫表示，這項調查將與英國的經濟增長數據進行對比，以評估國民的快樂感是否與經濟增長成正比。

卡梅倫在議會表示，這項調查將由英國統計局負責進行。調查將包括國民對生活滿意度、工作滿意度、社會福利、教育、醫療、環境、交通、治安、犯罪、健康、生活壓力、工作時間和收入等方面的滿意度。

卡梅倫表示，這項調查將是英國歷史上規模最大的一次。調查結果將用於制定政府的政策，以改善國民的生活。

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你的快樂指數

其指數可能包括以下問題：

【你對你的工作滿意嗎？】

【你對你的收入滿意嗎？】

【你對你的社會福利滿意嗎？】

【你對你的教育滿意嗎？】

【你對你的醫療滿意嗎？】

【你對你的環境滿意嗎？】

【你對你的交通滿意嗎？】

【你對你的治安滿意嗎？】

【你對你的犯罪滿意嗎？】

【你對你的健康滿意嗎？】

【你對你的生活壓力滿意嗎？】

【你對你的工作時間滿意嗎？】

【你對你的收入滿意嗎？】



倡明委實行 每季公布

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加拿大亦研指數可行性

加拿大亦在研究這項指數的可行性。



最快樂國家/地區

1	丹麥	8	澳洲
2	芬蘭	74	美國
4	瑞典	77	德國
6	香港	84	法國
6	新加坡	79	日本
6	新西蘭	83	英國
8	加拿大	125	荷蘭
8	以色列		

資料來源：世界幸福指數報告

北歐五國最快樂

根據世界幸福指數報告，北歐五國（丹麥、芬蘭、瑞典、挪威和冰島）被評為世界上最快樂的國家。報告指出，這些國家的國民在經濟、社會福利、教育、醫療、環境、交通、治安、犯罪、健康、生活壓力、工作時間和收入等方面都表現出色。

報告指出，北歐國家的國民生活滿意度很高，這與他們的社會福利制度、教育、醫療、環境、交通、治安、犯罪、健康、生活壓力、工作時間和收入等因素有關。

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經濟諾獎得主：執著增長致「災難」

諾貝爾經濟學獎得主、美國經濟學家羅伯特·索洛昨日表示，執著於經濟增長可能導致「災難」。索洛指出，過度追求經濟增長可能會導致環境破壞、社會不平等、生活壓力增加和資源短缺等問題。

索洛表示，經濟增長並不一定能帶來幸福。他呼籲政府應該更加關注國民的生活質量，而不是僅僅追求經濟增長。

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Canada ranks 23rd tied with Japan in world happiness

Toronto Star Friday, December 30, 2011

- <http://www.thestar.com/news/canada/article/1108520--canada-ranks-23rd-in-world-happi...>
- 1,000 people in each of 58 countries; 52,913 people globally, score up to 100%; margin of error ± 3.5 % points 19-times/20.
- Top 5: Fiji 85, Nigeria 84, Netherlands 77, Switzerland 76 and Ghana 72.
- Bottom 5: Romania negative-10, Egypt 0, Palestine 7, Serbia 8 and Lithuania 9.
- China 25 (struggling hard to move up the economic ladder) versus Spain 55, despite its debt crisis.
- Afghanistan 35, versus U.S. 33
- Globally, the middle-aged (51 to 65 years old), 33 compared with 44 for the under-30 set and 43 for the over-65s
- Catholics and Protestants were happiest at 54; Jews 50, Hindus 43, Muslims at 42 and Orthodox Christians 28; no religious 27. Many Orthodox Christians are in economically challenged Eastern Europe

Shortcomings of the 2006 2nd-generation “Gross National Happiness”

1. The questionnaires type of measurements are highly subjective, opinionated and culturally influenced.
2. The holistic result does not challenge and empower the individual participants surveyed.

2010 a third-generation medical solution is hereby proposed

To quantify happiness using reliable and reproducible laboratory analysis of human body metabolites combined with physiological and psychological measurements

Ching Lo (2010) *Global Warming: Realities, Root-cause Analysis, and a Happy Solution*. eBook ISBN: 978-0-9867943-1-5. *Green Think Tank Organization, Ontario, Canada.*
<http://www.amazon.com/Global-Warming-Realities-Root-cause-ebook/dp/tags-on-product/B003XKNDY4>

Happiness/Stressor Measurements

Non-invasive techniques

1. Subjective Evaluation

1. Psychological self assessment

2. Objective Evaluation

1. Questionnaires assessment by social circle
2. Lie detector – heart beat, skin conductivity, perspiration, respiration.
3. Nuclear magnetic resonance imaging (MRI), CT scans
4. Infrared Spectrum

Invasive techniques

1. Metabolomics

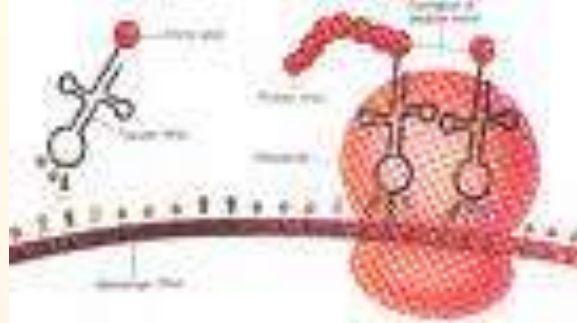
DNA
Genomics



25 thousand Genes



RNA
Transcriptomics



100 thousand Transcripts

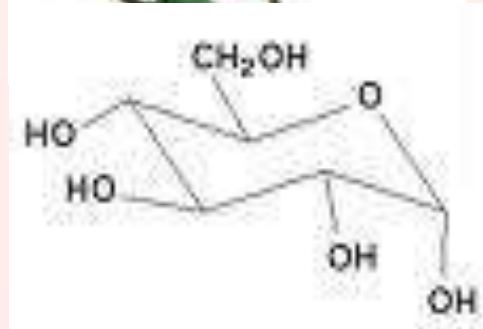


Proteins
Proteomics



1million Proteins

Metabolites
Metabolomics



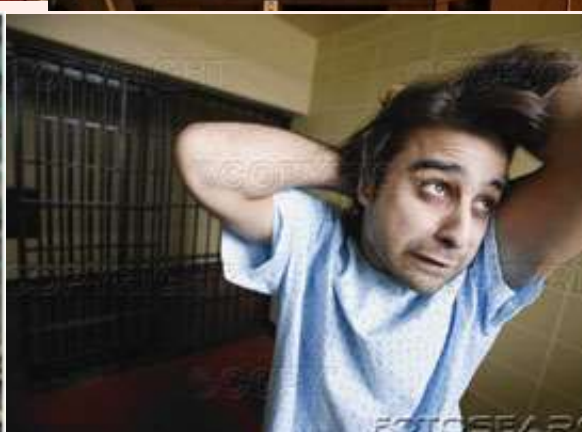
<2,000 compounds

Metabolomics Lab



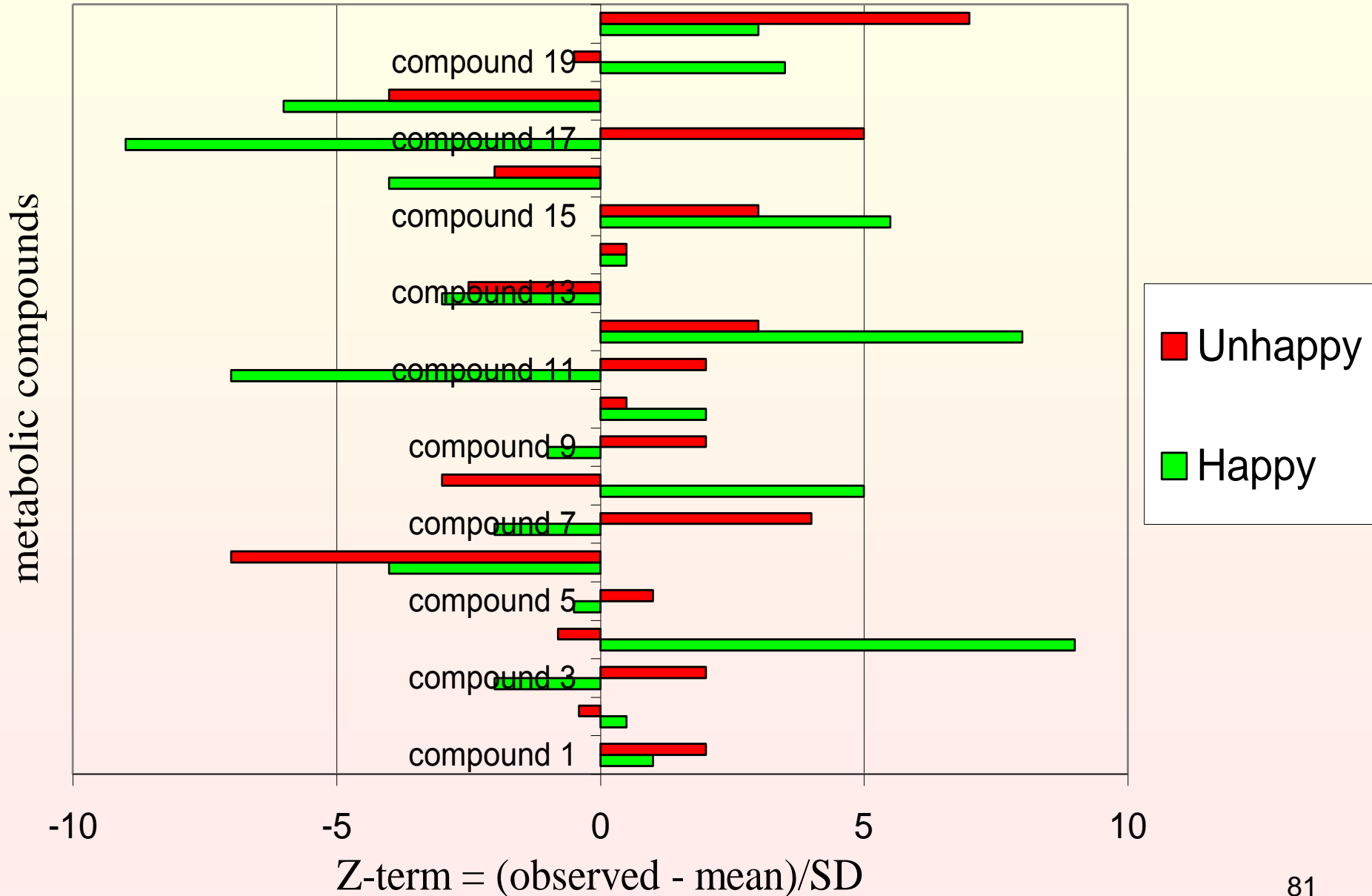
Subject Categories

10. Spiritual
9. Rich retired
8. Optimists
7. Celebrities
6. Financier
5. Average Joe
4. Poor people
3. Manic c
2. Suicidal
1. War vet



Identical twins

Hypothetical Metabolomic Profiles

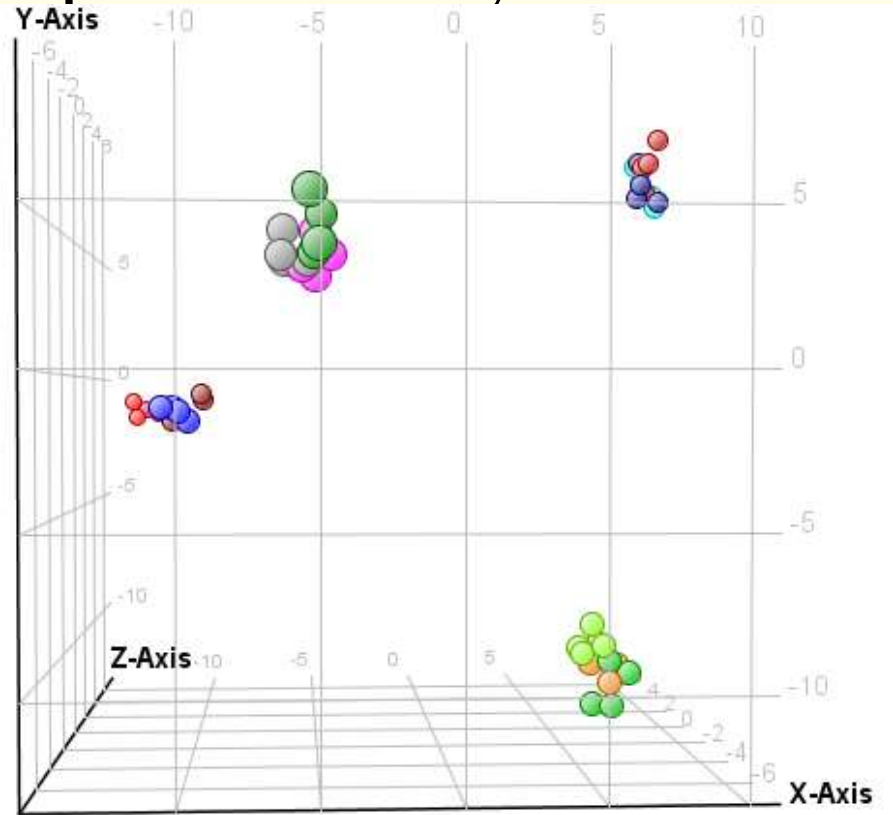


large molecule feature extraction software can detect and deconvolute the intact proteins followed by multivariate statistical analysis software to provide clustering and Principal Component Analysis

Four different strains of the same bacteria species distinguishable by proteomics/metabolomics

A1, A2 *Salmonella typhimurium*

A39, A40 *Salmonella Heidelberg*



X, Y and Z Axis represent deconvoluted protein masses, summed abundances of all the charge states reflecting those masses, and corresponding retention times

Happiness Index

- **Is:**
 - Objective
 - Neutral
 - Informative
 - Incentive
- **Is not:**
 - Confrontational
 - Dogmatic

Function of the Happiness Index

- **Will:**

- Measure the well being of society.
- Entice and guide policy makers.
- Redefine quality of life.
- Help individuals to make lifestyle choices in the short and long term.
- Be a powerful alternative to the mighty dollar. and other economic indexes.

- **Will not:**

- Be tradable.
- Be falsify.

Advantages of the 3rd-generation Happiness Index

1. The measurement methodology is entirely objective, scientific, quantifiable, based on established physiological, psychological and medical technology.
2. The index is both national and individual.
3. It offers a value system alternative to money for the fundamental decision-making process of the human mind. The Pursue of money causes Environmental Disasters.
4. It does not rely on changing behaviour by education, persuasion, morality or legislation
5. {Nirvana research and validation brings Science and religion together rather than antagonistic. This is evolution of human collective consciousness.}

Conclusions **Yes, we can...**

1. Third-generation approach to create quantifiable “Happiness Index” is technically feasible
2. {Scientific approach to religion
3. Spiritual value system to change materialistic social values
4. Religious nourishments to fulfill human needs }
5. Save the planet: Happiness Index → change value system → decision-making process → human behaviour

Never doubt that a small group of thoughtful, committed citizens can change the world. Indeed, it is the only thing that ever has.

Margaret Mead

US anthropologist (1901 - 1978)

Global Warming Realities

Root-cause analysis

and



**a Happy
Solution**

Ching Lo, PhD



<http://www.amazon.com/Global-Warming-Realities-Root-cause-ebook/dp/tags-on-product/B003XKN DY4>

\$9.95

Conclusion

1. Third-generation approach to create quantifiable “Happiness Index” is technically feasible
2. Scientific approach to religion
3. Spiritual value system to change materialistic social values
4. Religious nourishments to fulfill human needs
5. Changing human behaviour to save the planet

Acknowledgements

- Dr. Dr. Jane Hao
- Green Think Tank staff and volunteers
- Audience



THE 11TH HOUR

TURN MANKIND'S DARKEST HOUR INTO ITS FINEST

RYERSON UNIVERSITY