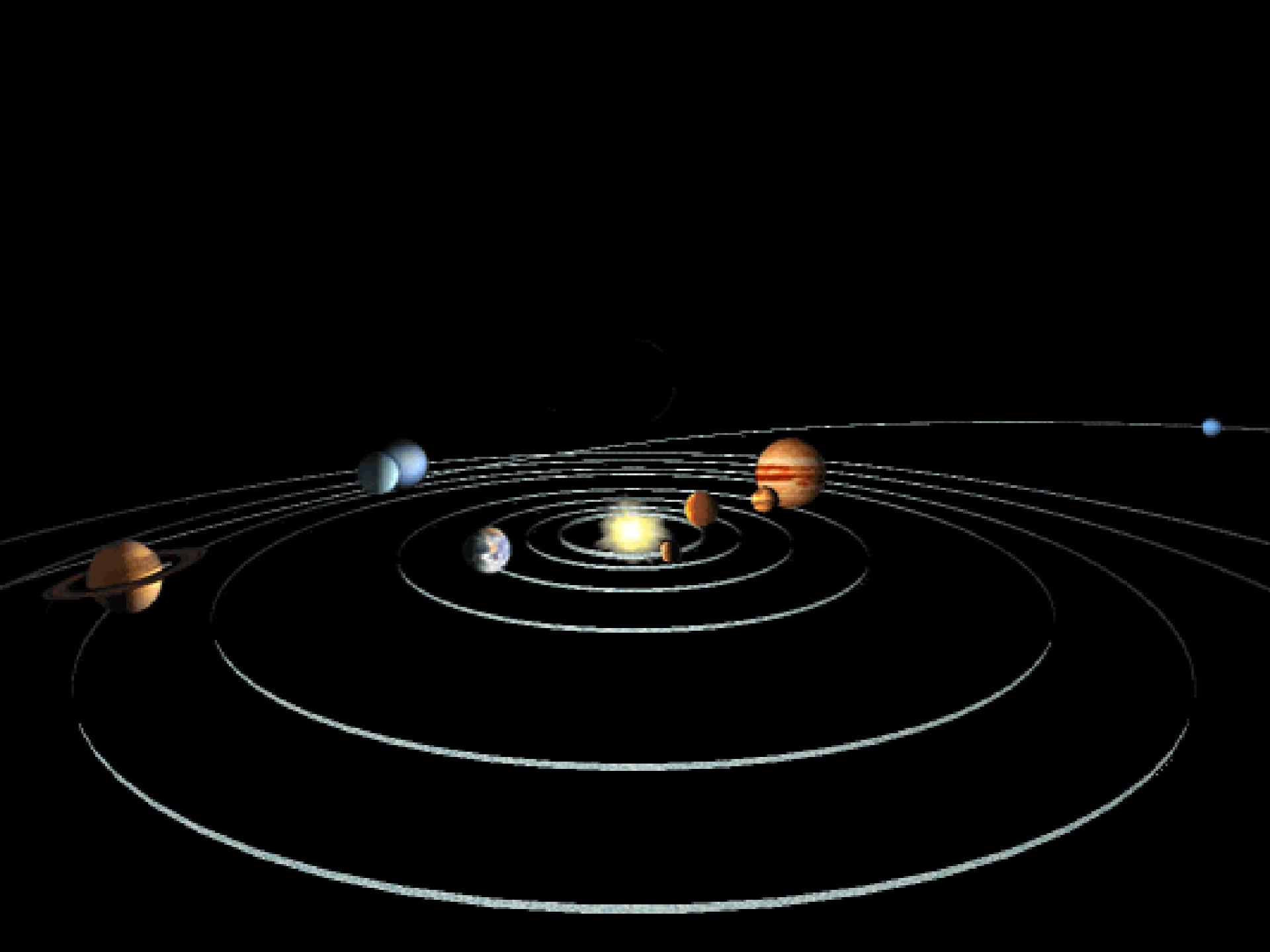


# 在交叉路口的人類社會



李遠哲





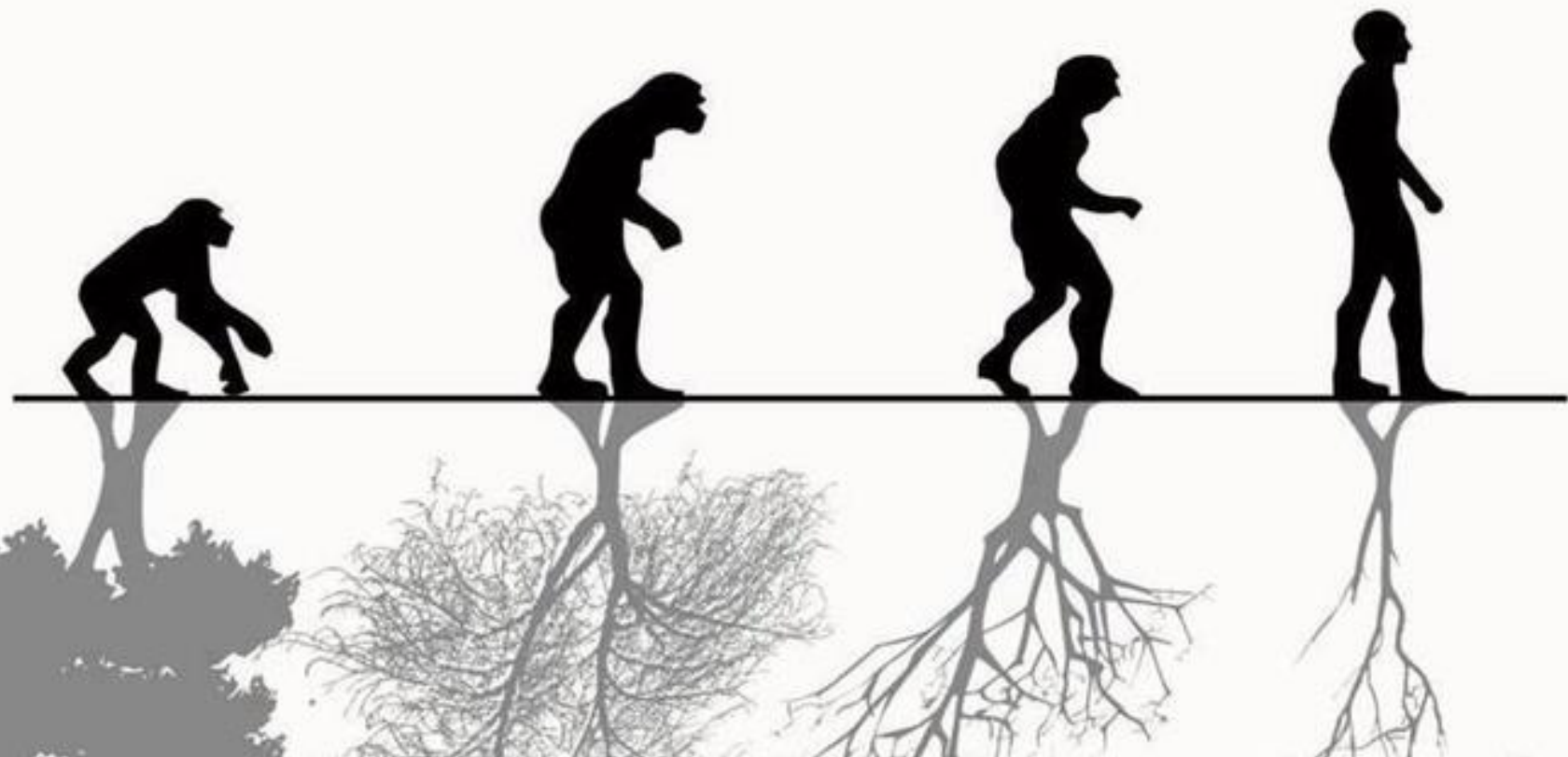


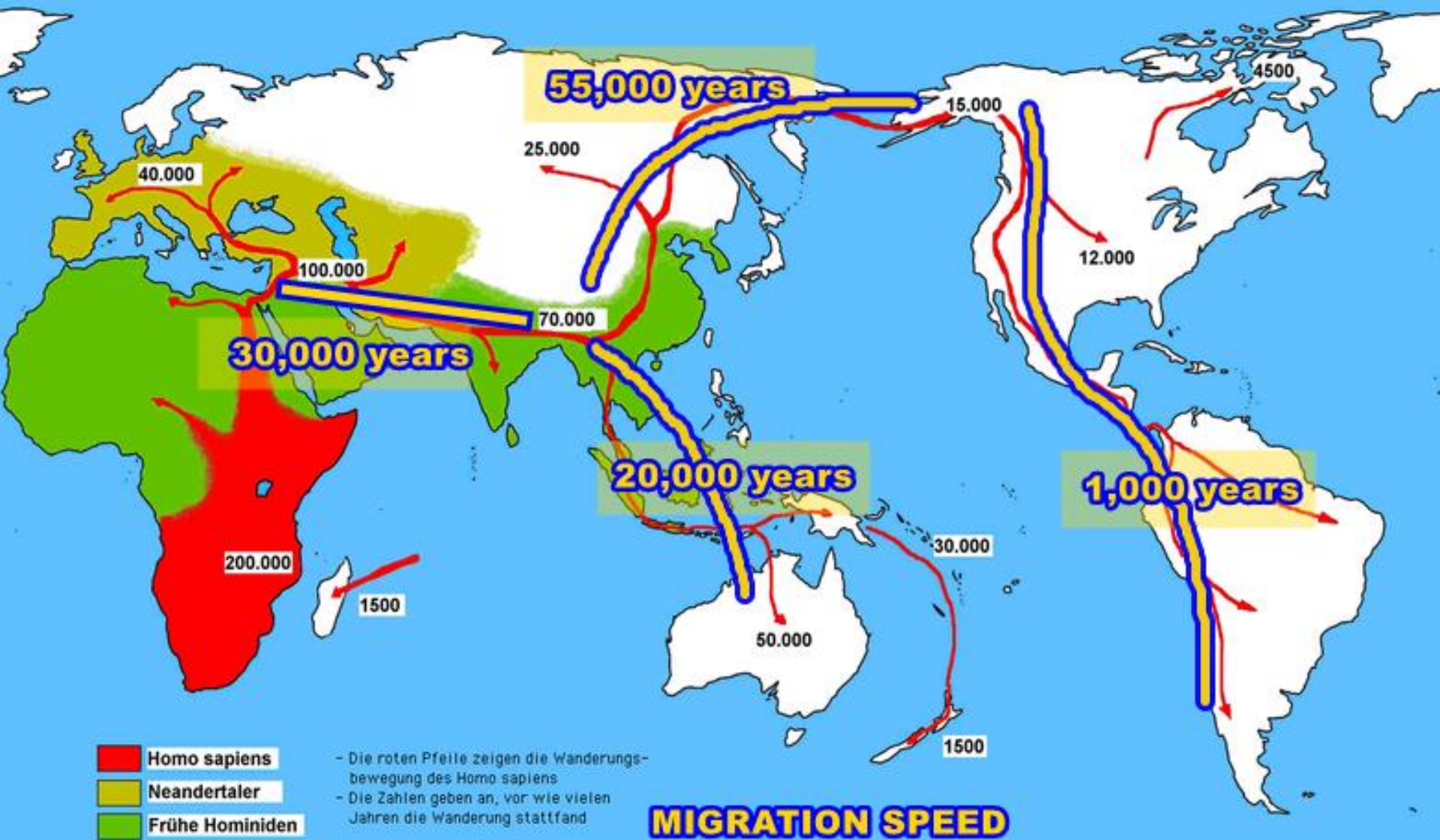




2004 Transit of Venus  
Ingress: 05:13 UT

*F. Espenak, NASA's GSFC*



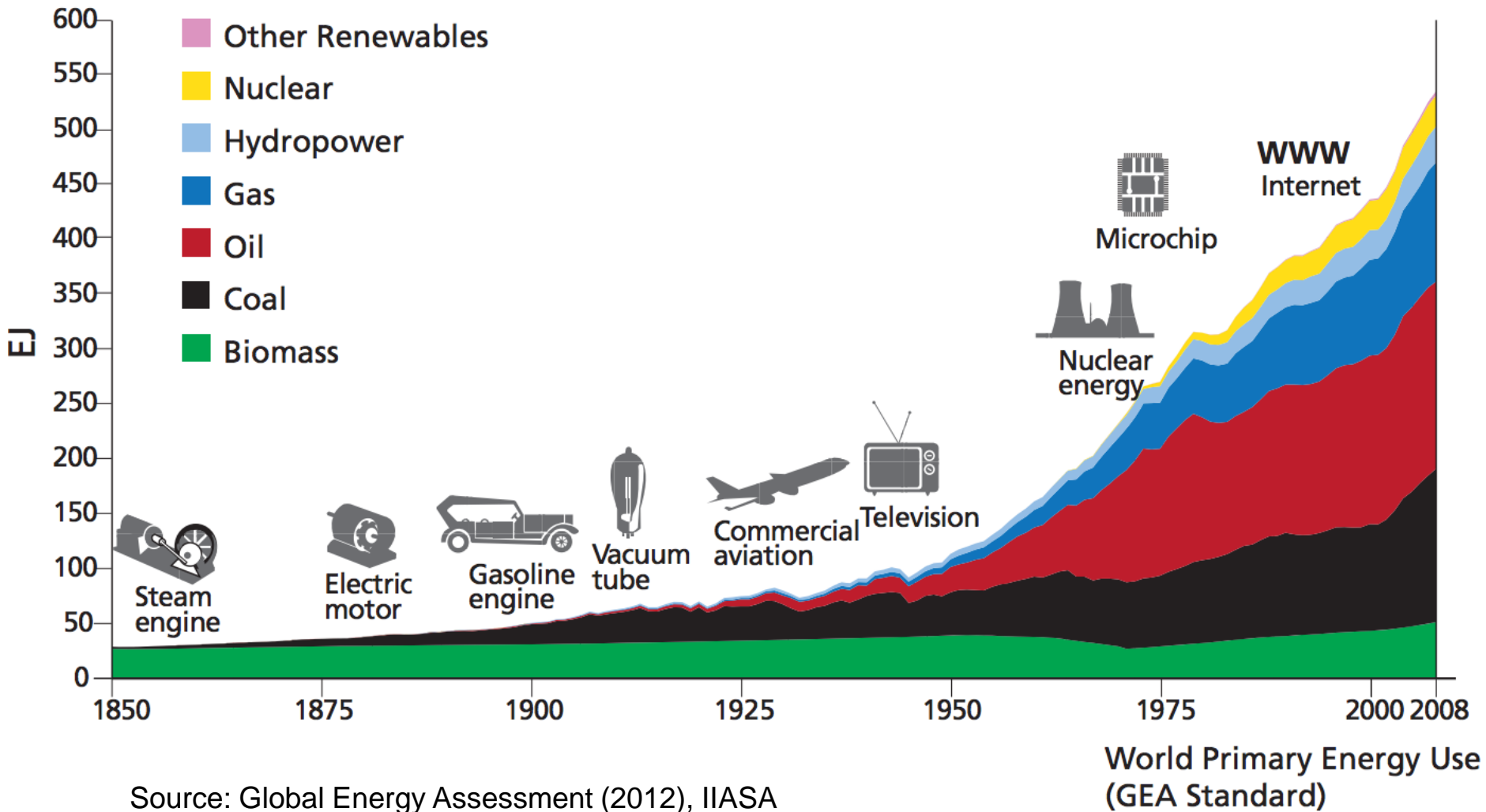




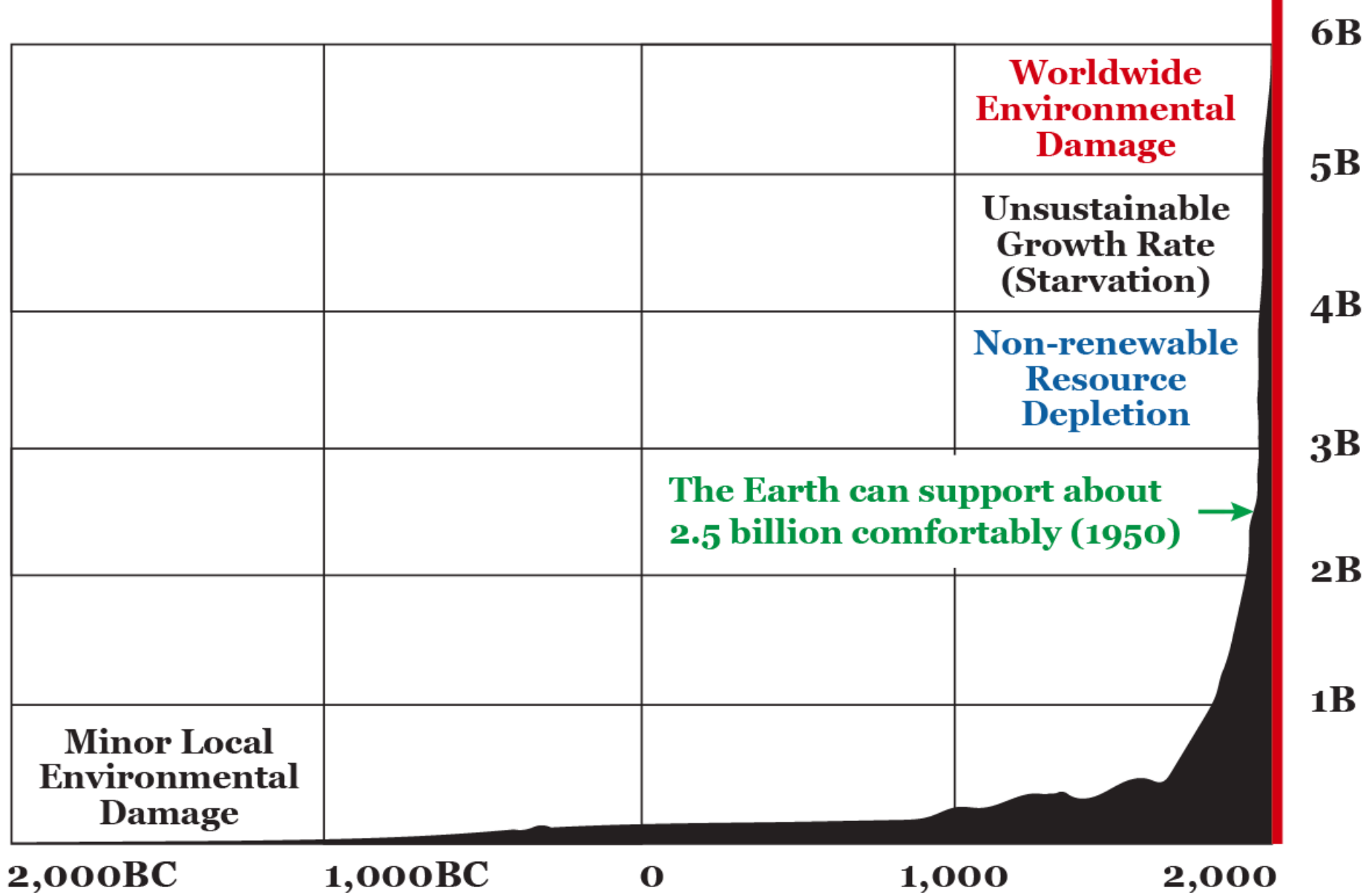




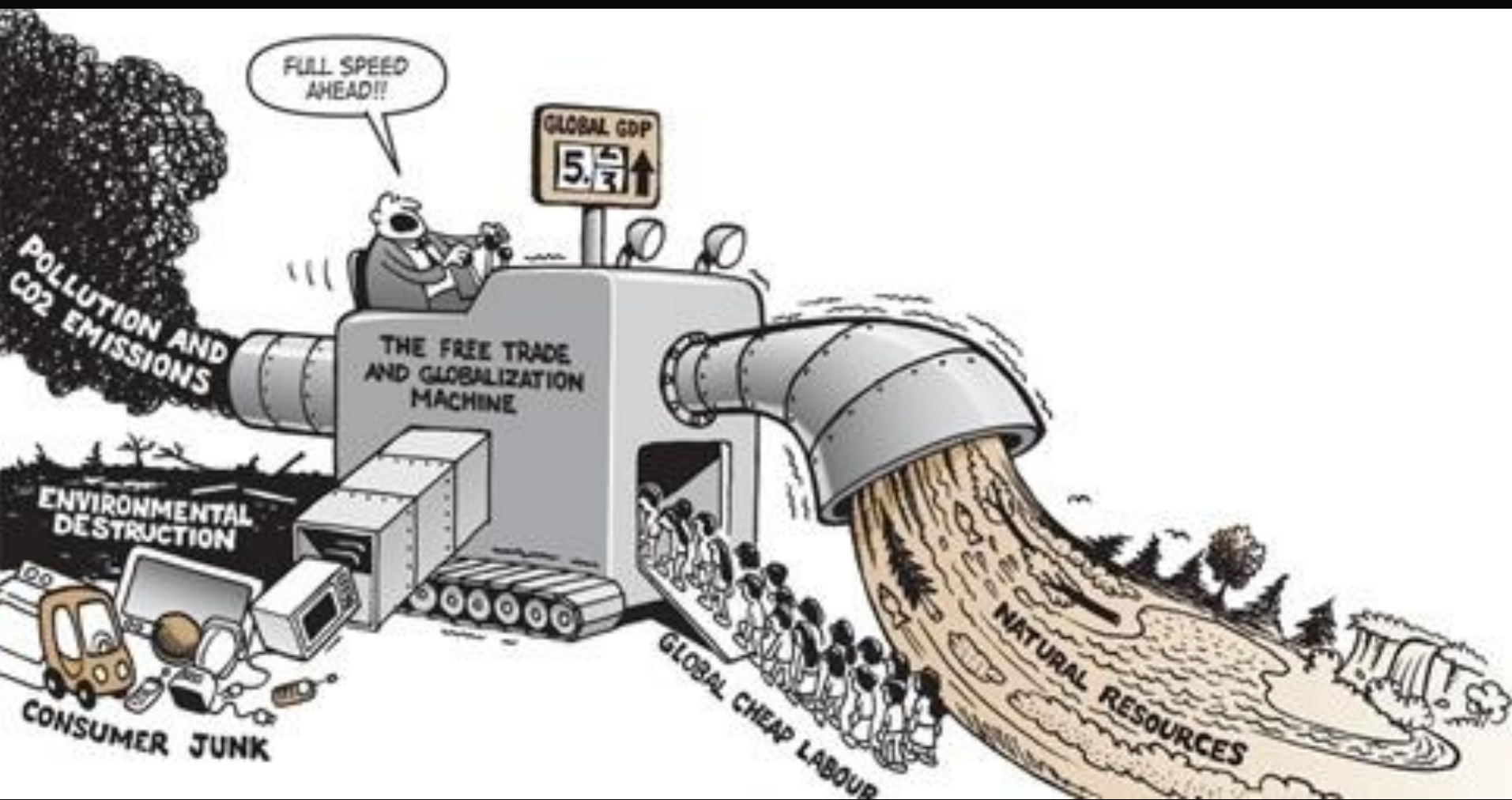
# The Rise of Fossil Fuels



# Worldwide Human Population Explosion (Billions)







# THE GREAT ACCELERATION

## SOCIO-ECONOMIC TRENDS

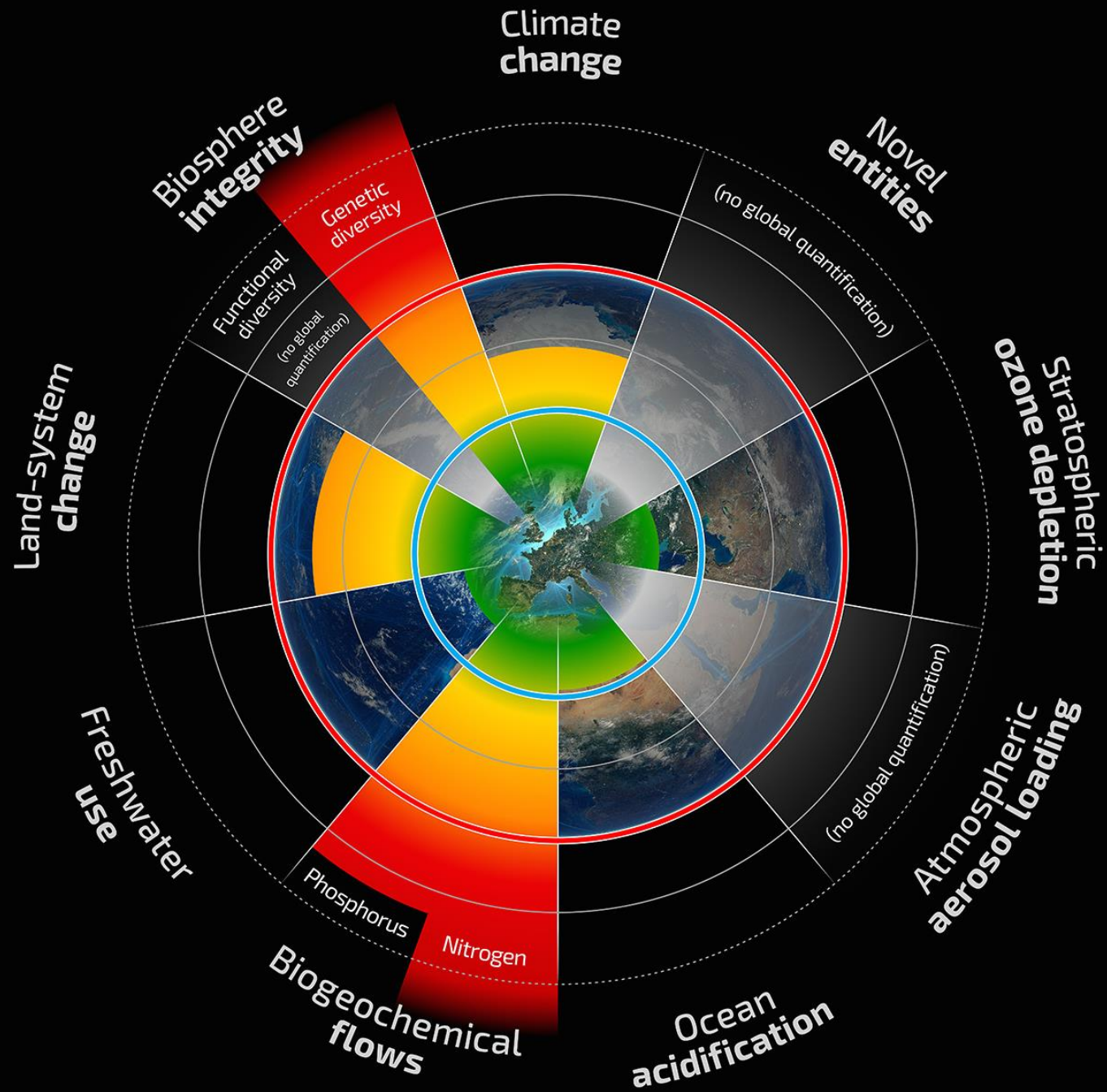


## EARTH SYSTEM TRENDS



REFERENCE: Steffen, W., W. Broadgate, L. Deutsch, O. Gaffney and C. Ludwig (2015), The Trajectory of the Anthropocene: the Great Acceleration, Submitted to *The Anthropocene Review*.

MAP & DESIGN: Félix Pharand-Deschênes / Globaia







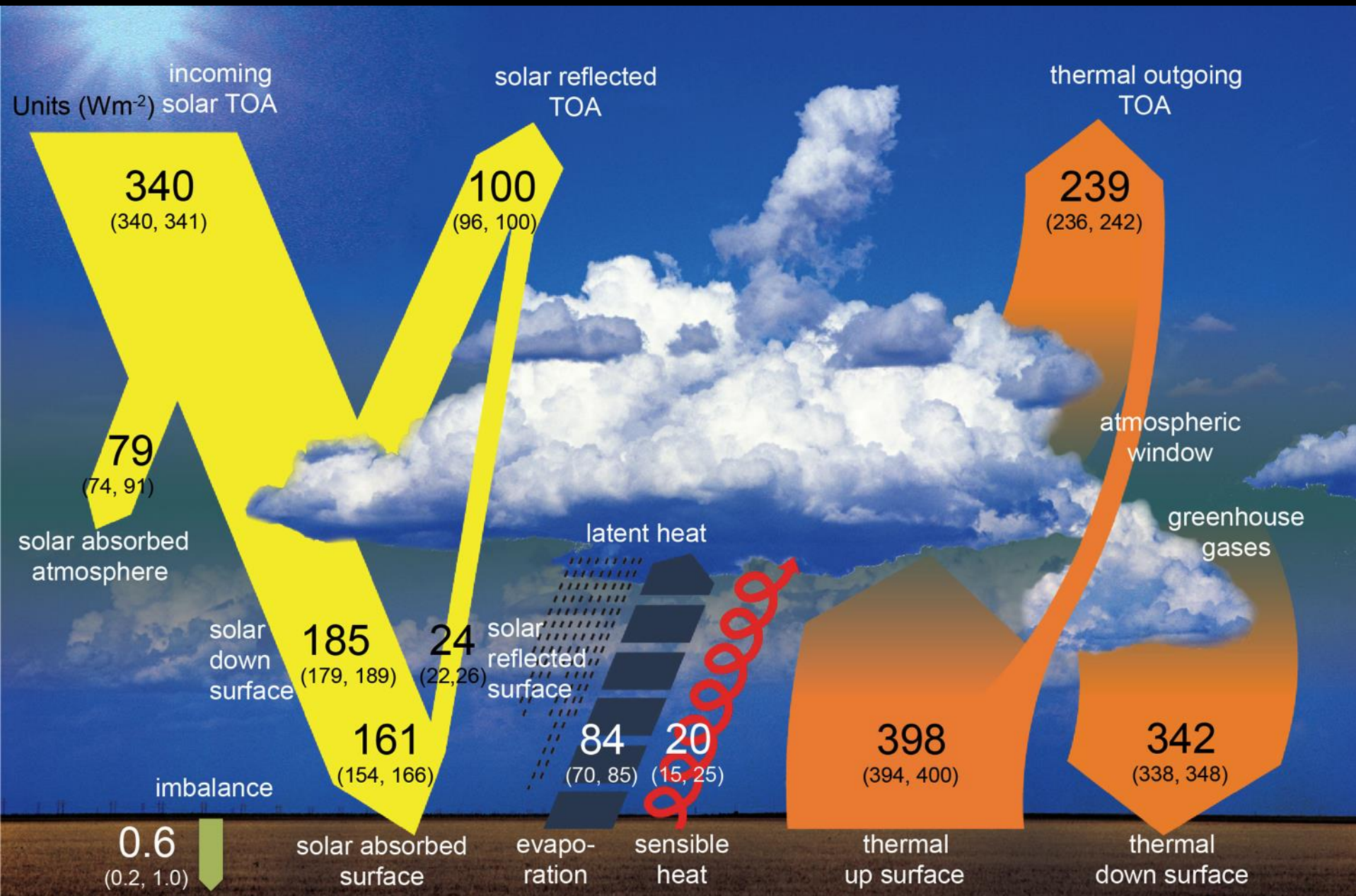


Figure 2.11, IPCC AR5 Working Group 1 Report (Adapted from Wild et al., 2013)

# Atmospheric CO<sub>2</sub> (ppm)



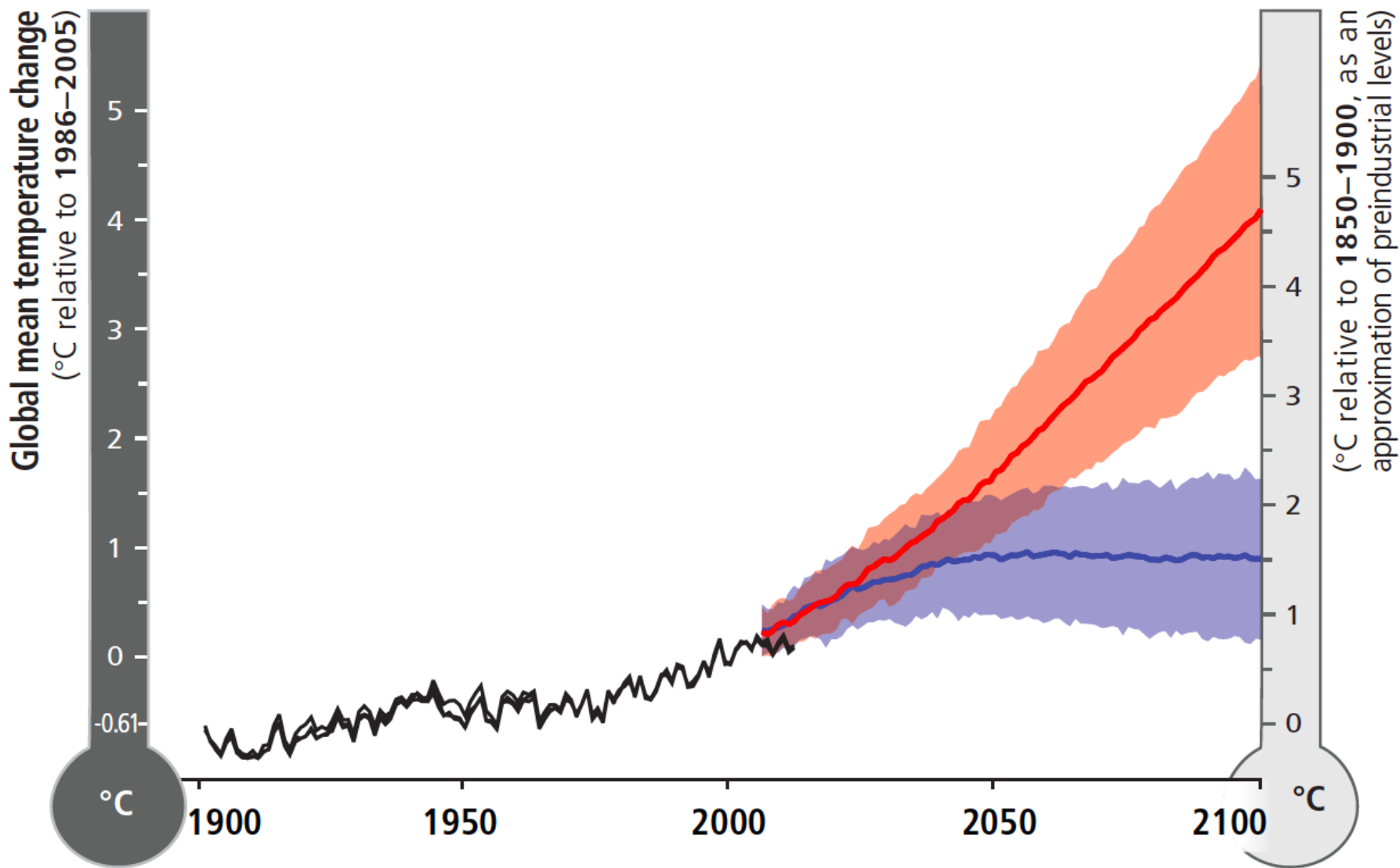
GLOBALVIEW-CO<sub>2</sub> (1979–2014); <http://www.esrl.noaa.gov/gmd/ccgg/globalview/>

● Mauna Loa ● South Pole  
Contact: [andy.jacobson@noaa.gov](mailto:andy.jacobson@noaa.gov)

**1979**



1979 1980 1981 1982 1983 1984 1985

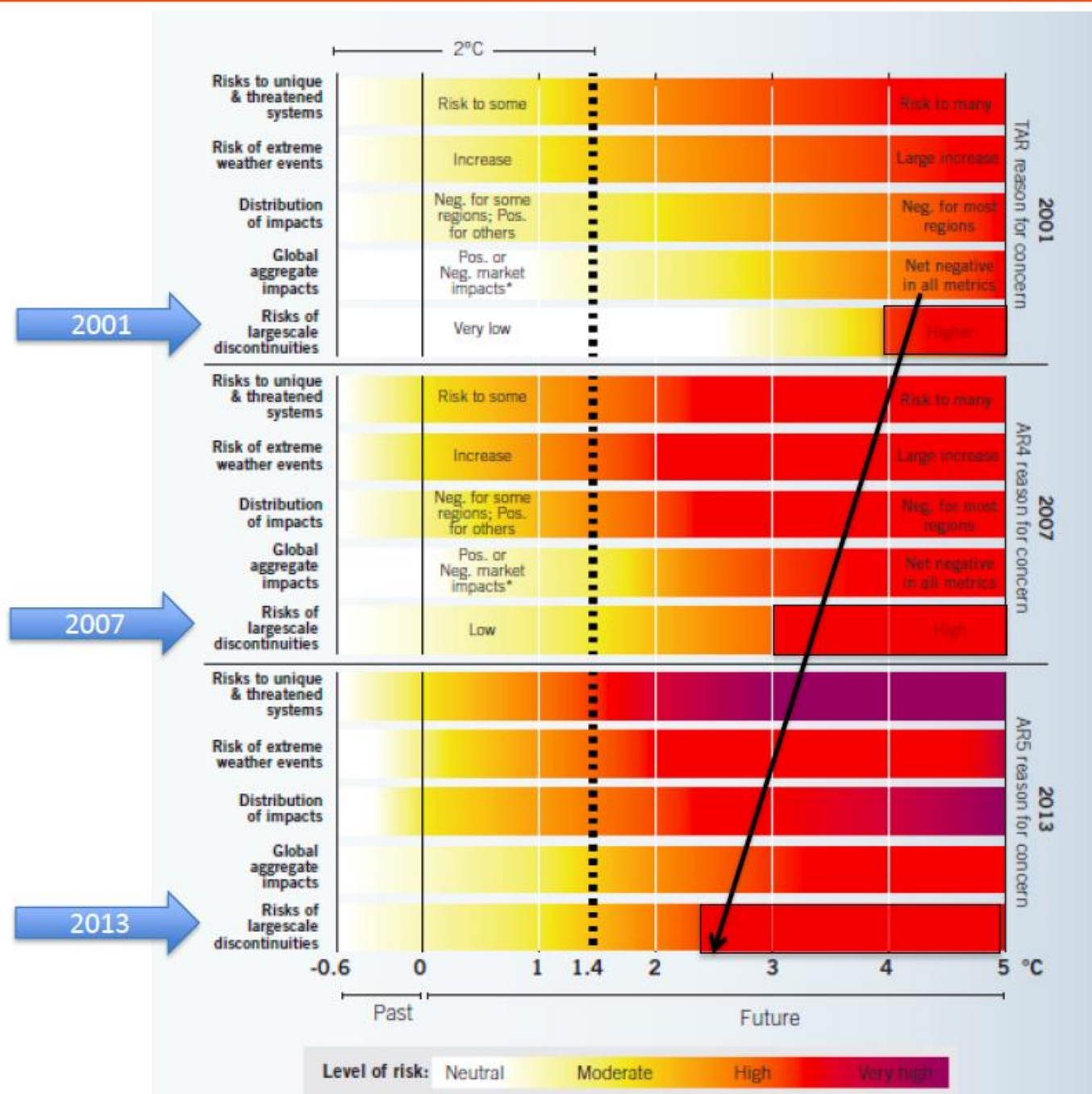


Source: IPCC 5<sup>th</sup> Assessment Report

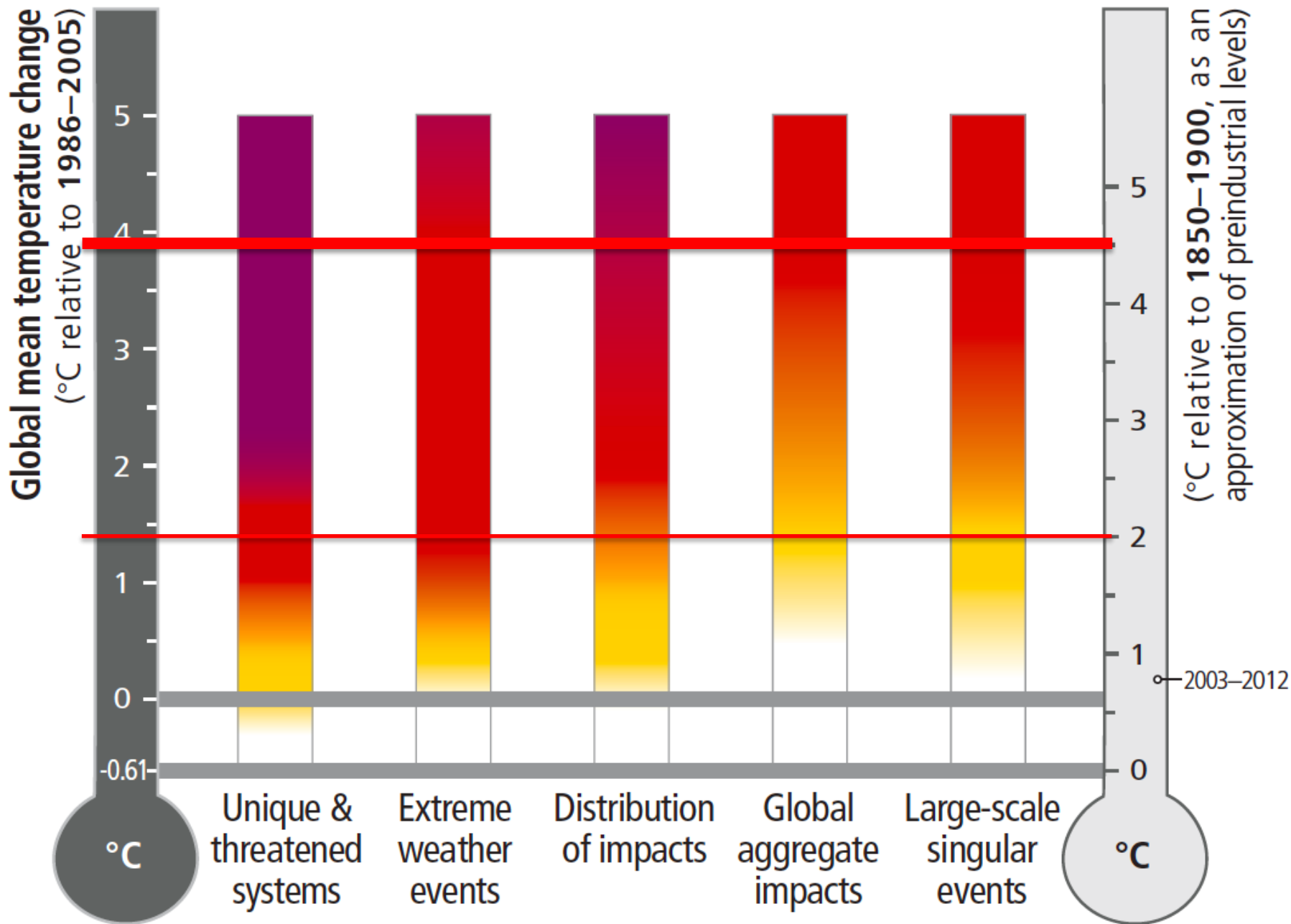
The background of the image shows a row of industrial smokestacks at the bottom, emitting thick, dark plumes of smoke that rise into the sky. The sky is filled with large, billowing clouds of smoke and steam, illuminated from below by a bright sun or light source, creating a dramatic, orange and yellow glow. The overall scene conveys a sense of industrial activity and environmental impact.

# 1000

**Billion Tons**



Source: Johan Rockstrom, "Abundance within Planetary Boundaries", at IIASA, March 2015



# The Future of Humanity is at Risk

Photo: Roscosmos

# 莫拉克颱風前後的小林村





Typhoon Haiyan (Yolanda), Source: World Vision

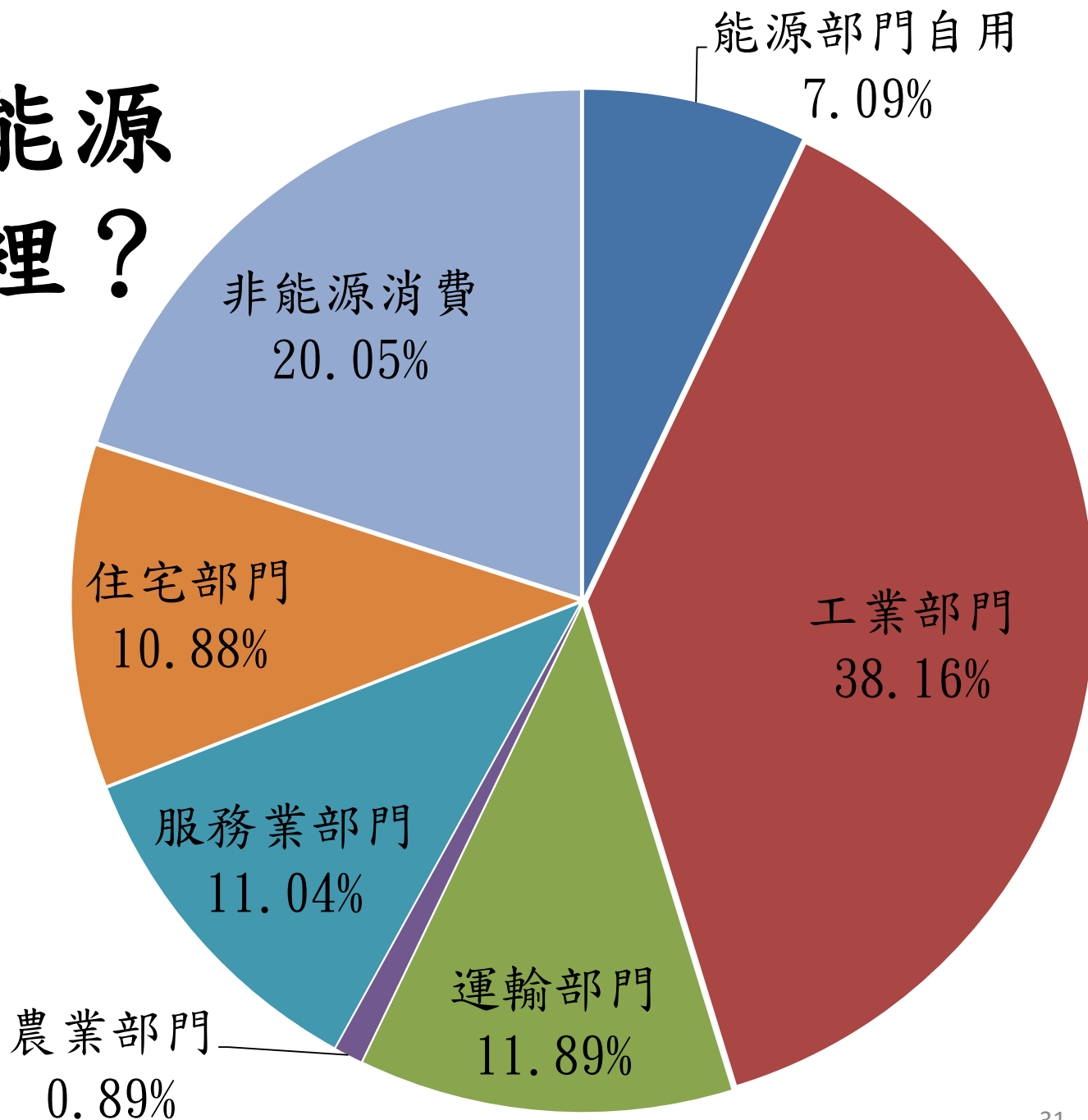


# 巴黎氣候大會 (COP21)

## 決議要點

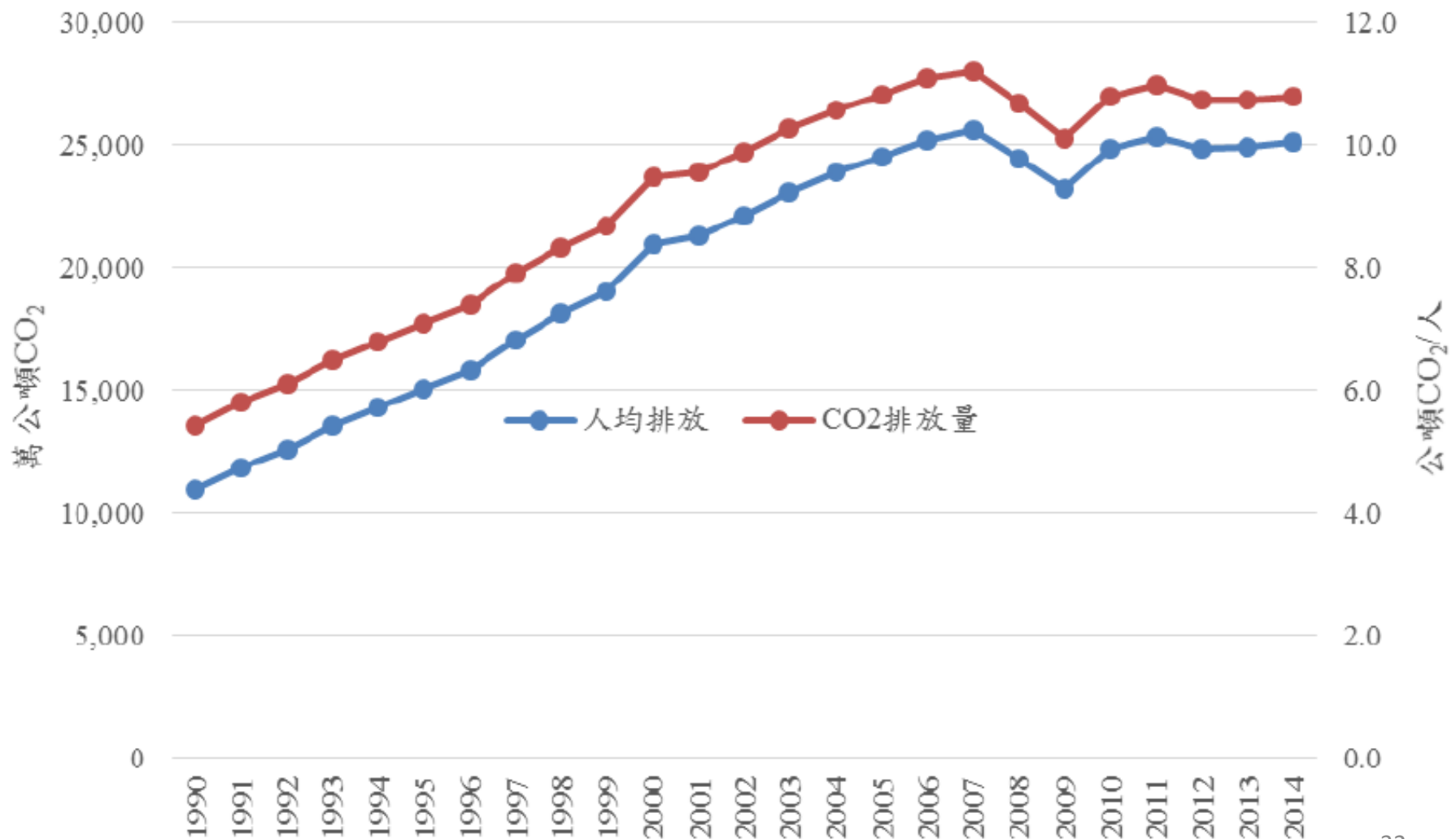
1. 限制全球平均溫度相較工業化前增加**2°C**以下，並盡可能達到**1.5°C**。本世紀下半葉，全球溫室氣體必須達到**淨零排放**
2. 富有國承諾2020開始每年提供**1千億美元資金**，且於2025年調高捐款金額
3. 於2020年調整修訂減碳計畫

# 台灣的能源 用在哪裡？

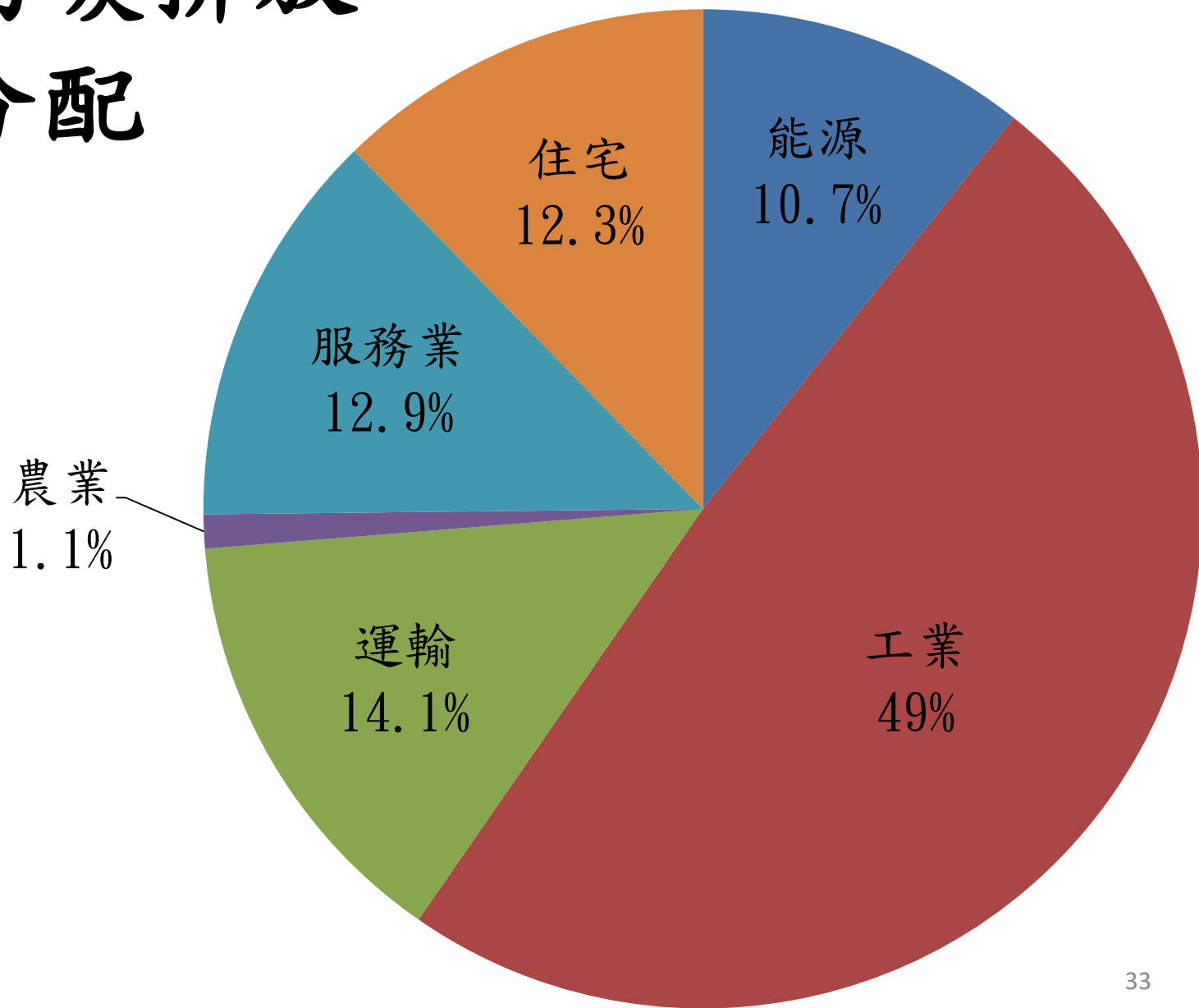


# 台灣CO<sub>2</sub>排放趨勢

## 總排放量 & 人均排放量



# 台灣的碳排放 來源分配

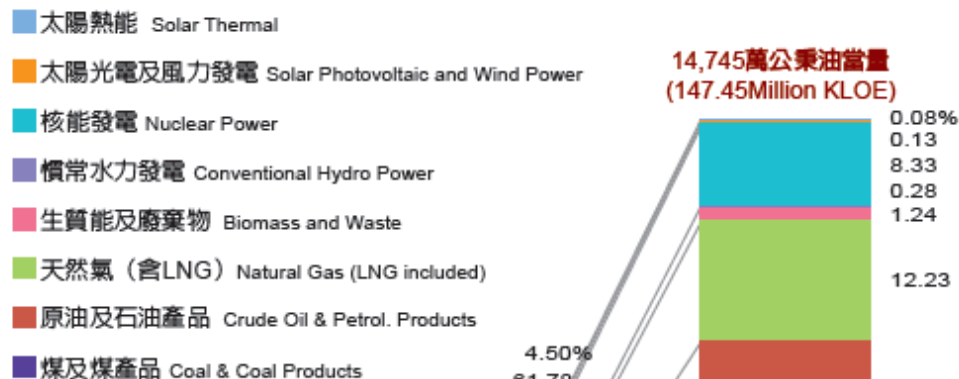


# 台灣再生能源 發展現況

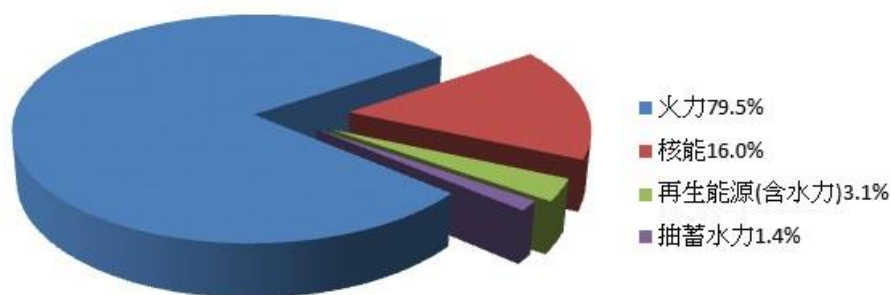
## 能源供給結構

## Structure of Energy Supply

- 我國能源供給快速成長，年平均成長率約3.71%。  
Energy supply increases rapidly with annual growth rate of 3.71%.



104年台電系統發電量占比

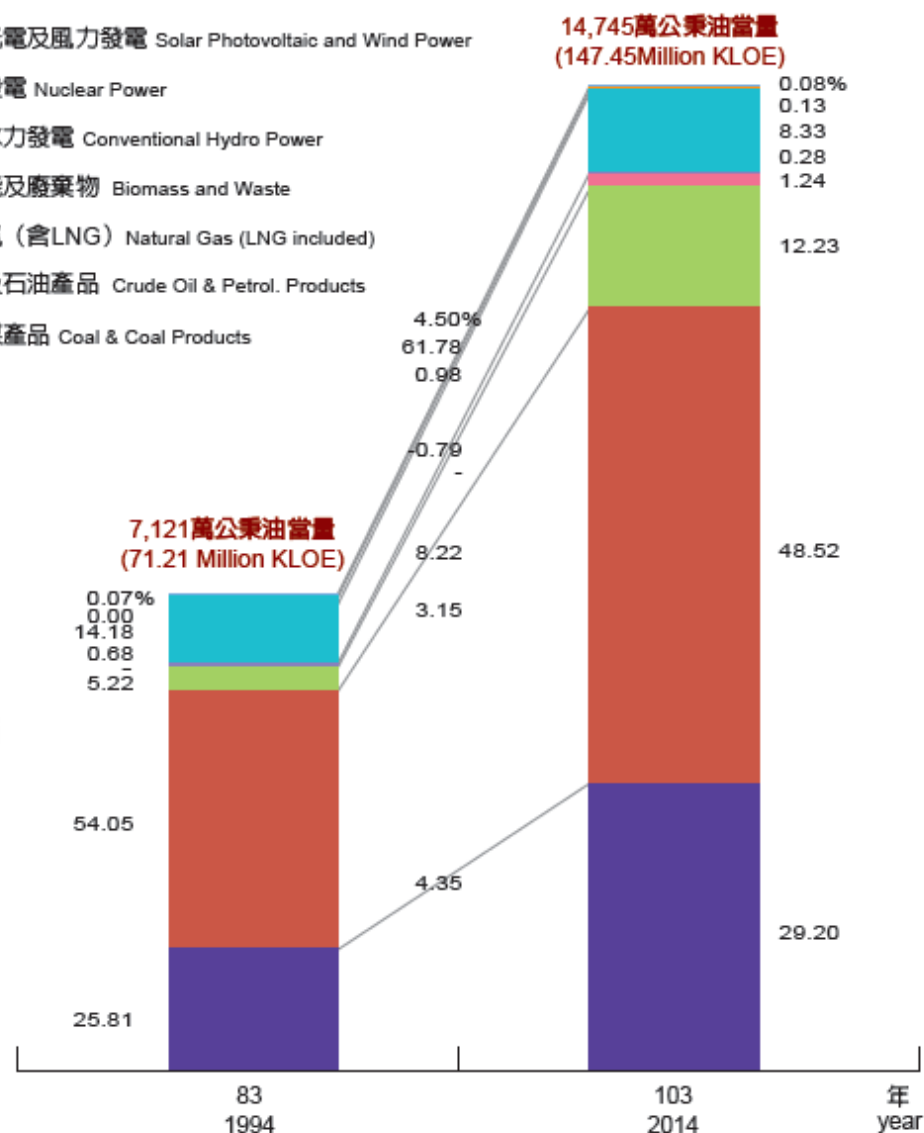


資料來源：

(右)經濟部能源局2015年能源統計年報

(上)台灣電力公司


[http://www.taipower.com.tw/content/new\\_info/new\\_info-b31.aspx?LinkID=8](http://www.taipower.com.tw/content/new_info/new_info-b31.aspx?LinkID=8)



# 台灣再生能源推廣目標－ 年發電量(單位：億度)

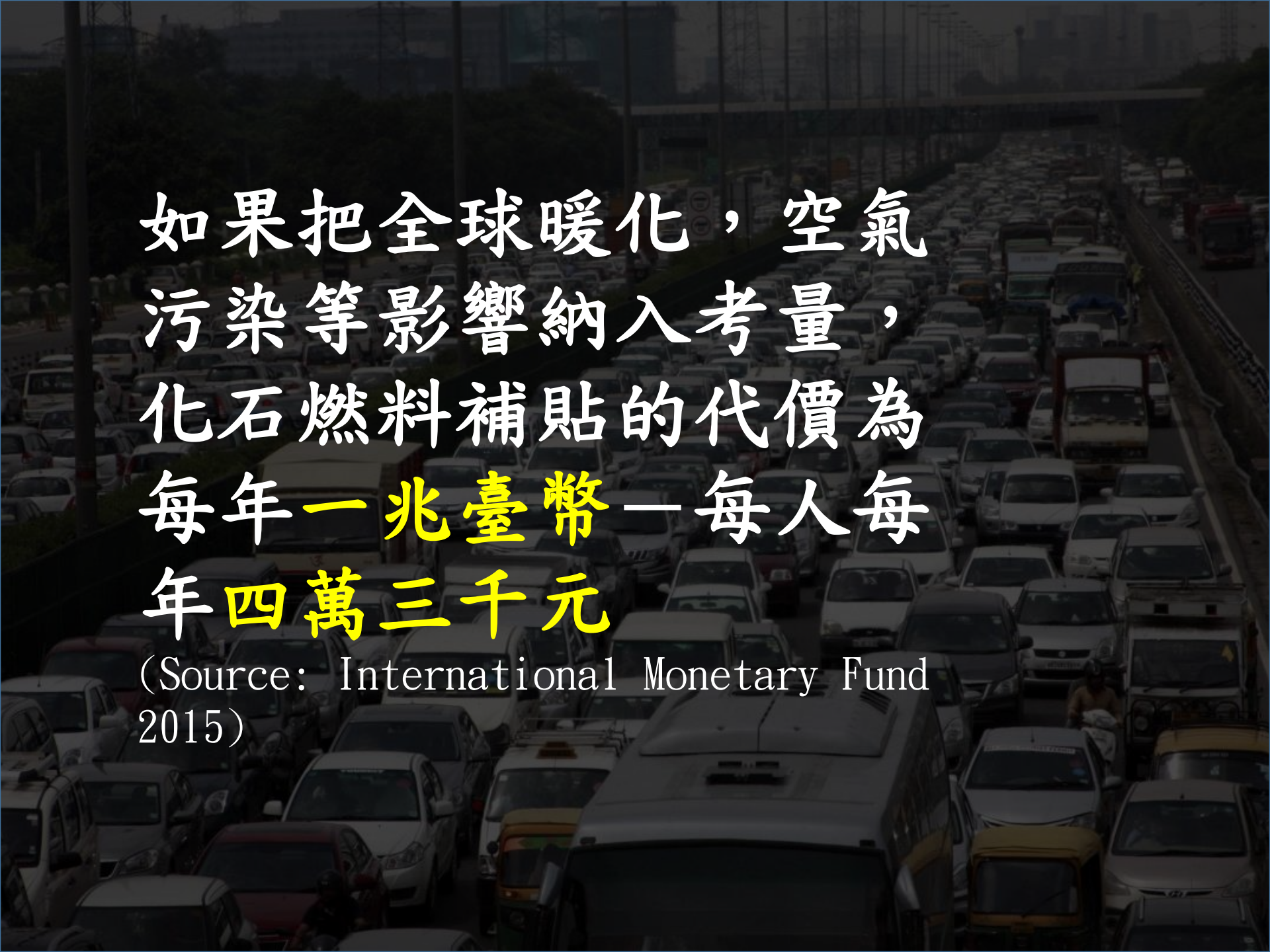
能源別	2015年	2020年	2025年	2030年
陸域風力	18	29	29	29
離岸風力	0	18	68	136
水力	46	47	48	49
太陽光電	14	45	78	109
地熱能	0	6	10	13
沼氣發電	54	56	59	69
合計	132	201	292	405

註：2015年8月31日修正



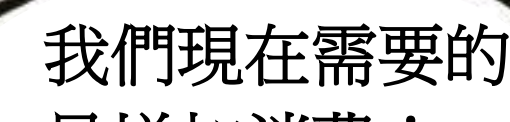
# 台灣每年給予化石燃料 將近**兩百億臺幣**的補貼

(Source: International Energy Agency  
2013)

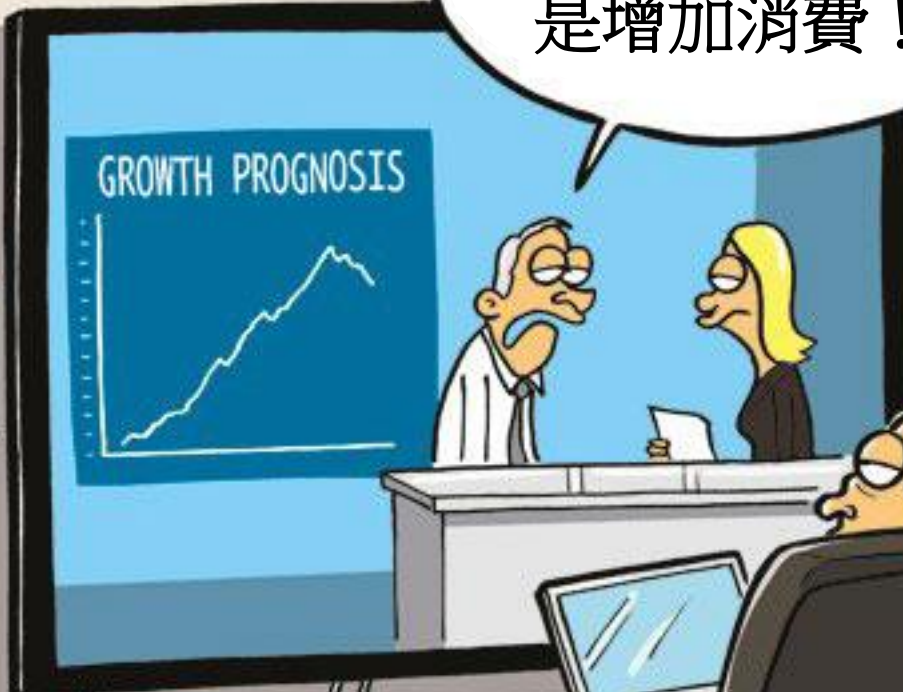


如果把全球暖化，空氣  
污染等影響納入考量，  
化石燃料補貼的代價為  
每年一兆臺幣—每人每  
年四萬三千元

(Source: International Monetary Fund  
2015)



我們現在需要的是增加消費！





'STEADY AS SHE GOES'



## Climate Change Performance Index for Newly Industrialised Countries

Rank	Country	Score	Rank	Country	Score	Rank	Country	Score
10	Morocco	63.76	39	Malaysia	53.49	50	Turkey	47.25
24	Indonesia	58.21	40	Algeria	53.30	52	Chinese Taipei	45.45
25	India	58.19	43	Brazil	51.90	55	Singapore	42.81
28	Mexico	57.04	47	China	48.60	57	Korea	37.64
30	Egypt	56.96	48	Argentina	48.34			
38	South Africa	53.76	49	Thailand	48.16			

© Germanwatch 2015

### Performance



Very good



Good



Moderate



Poor



Very poor

# 總而言之…

1. **政治：**這是一個全球性的危機，需要全球一起來解決
2. **社會：**我們絕對不能再盲目的追隨過度開發國家的腳步—而是要走一條新的永續之路
3. **科技：**我們必須學會如何將太陽的巨大能源儲存，轉換，和分享



2004 Transit of Venus  
Ingress: 05:13 UT

*F. Espenak, NASA's GSFC*