What do we owe to future generations? Climate change &intergenerational justice

我们对后代亏欠了什么？——论气候变化与代际公平

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2013-09-18

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1. The Face of Climate Change
气候变化的表现

Here is a very rough sketch of what climate change could involve: 气候变化的基本表现包括：

By 2100 we could face: 到2100年时我们会面临：

- Rise in the global average temperature of 4° C or more compared to pre-industrial levels.与前工业时期水平相比，全球平均气温将上升4° C以上。
- Rise in sea levels of 60cm or more (indeed up to 6m if ice sheets melt) 海平面将上升60cm甚至更高（如果冰盖融化，那么海平面将升高达6米）。
- Acidic Sea due to absorption of CO_2 海水由于吸收了二氧化碳而变成“酸海”。

Evidence: Thermometer Records
证据：温度记录

Since the mid 1800s thermometers measuring air temperature have been placed in different spots around the globe. By combining these measurements one can calculate the average surface temperature of the earth. This has been done since the 1850s. 19世纪中期以来，测量空气温度的温度仪被放置在全球不同地点。通过对这些测量结果进行综合，可以计算出地球表面的平均温度。这一做法自19世纪50年代一直延续至今。

It shows clearly that the temperature has gone up. 这些温度记录清楚地显示出全球温度的上升趋势。

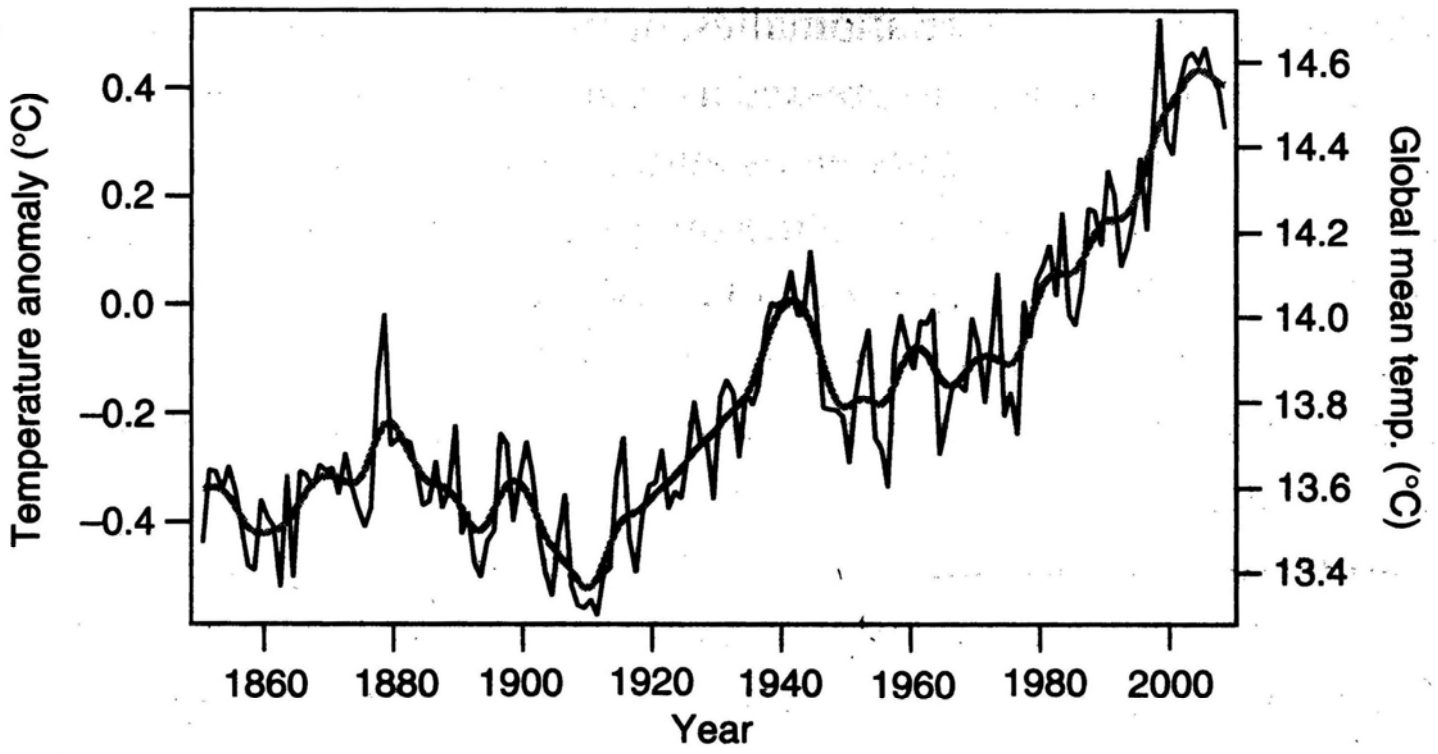


Figure 3.1 Global and annual average surface temperature anomalies (°C) from 1850 to 2007, measured relative to the 1961–1990 average. The black line is the annual average, while the gray line is smoothed to show longer-term variations. *Source*: data from the HadCRUT3v data set, Hadley Centre for Climate Prediction and Research.

Source: Dessler and Parson 2011, p. 63

The graph shows: 这个图显示：

- Between 1906 and 2005 the average surface temperature has risen by 0.74ºC (±0.18 ºC). 从1906年到2005年，地表平均温度上升了0.74ºC (±0.18 ºC)。
- The last two decades have been the warmest since measurements began. 过去20年是有历史记录以来最热的20年。
- The last 11 years are the warmest individual years on record. 过去的11年是有历史记录以来单个年份最热的时期。

(Similar conclusion can be drawn from satellite data, but these available only from 1979 onwards and hence less suitable to reveal long term trends.) （卫星记录可以得出类似的结论，但是卫星记录只记录了1979年之后的数据，难以呈现长期的气温变化趋势。）

Cause: Greenhouse gas emissions
原因：温室气体排放

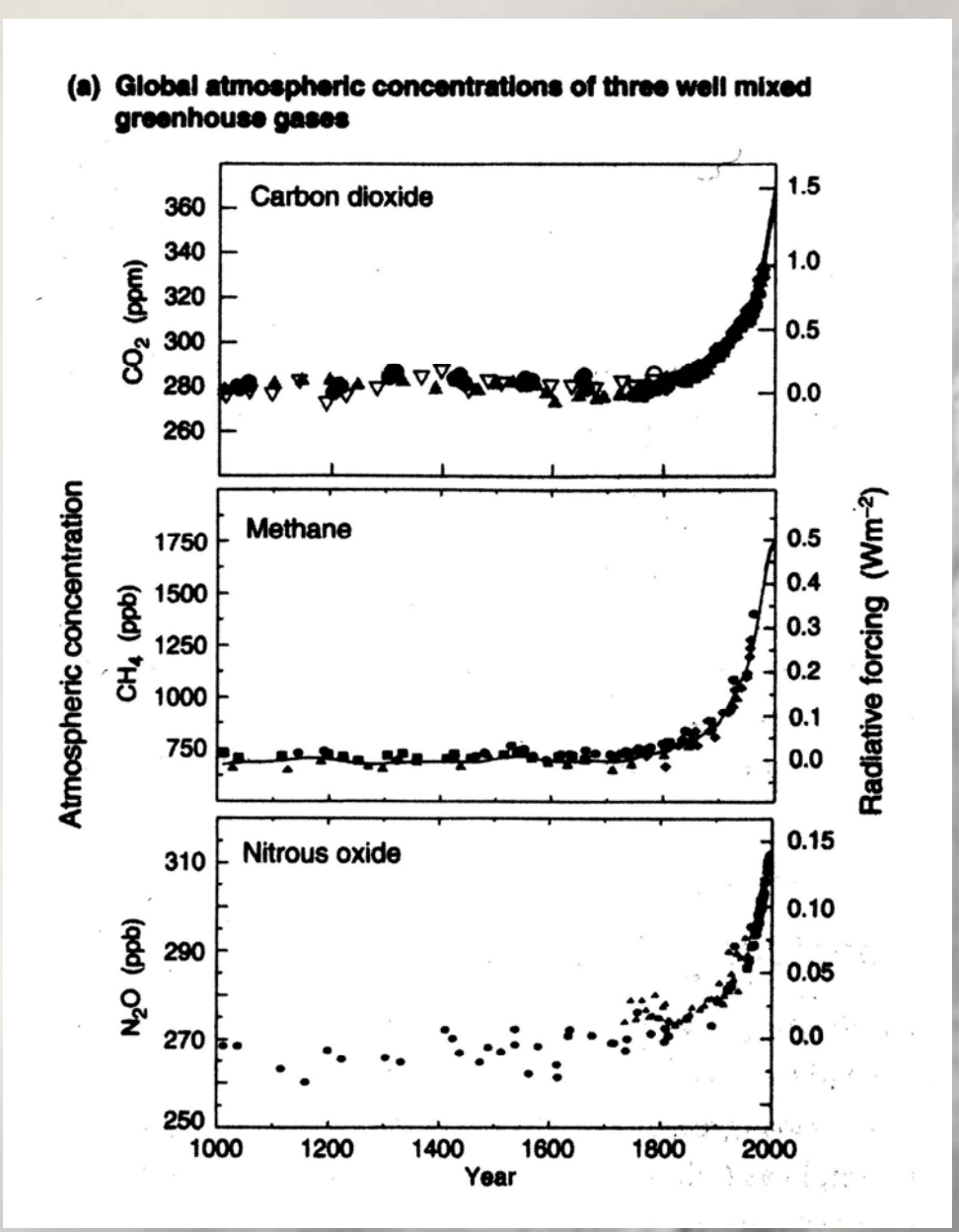
Systematic measurement of CO_2 started in 1958 on the summit of Mauna Loa on Hawaii (in order to be far away from local pollution). 对二氧化碳气体排放的系统性测量最早是1958年在夏威夷莫纳罗亚山的峰顶开始的（为了避开当地的空气污染）。

Facts: 事实是：

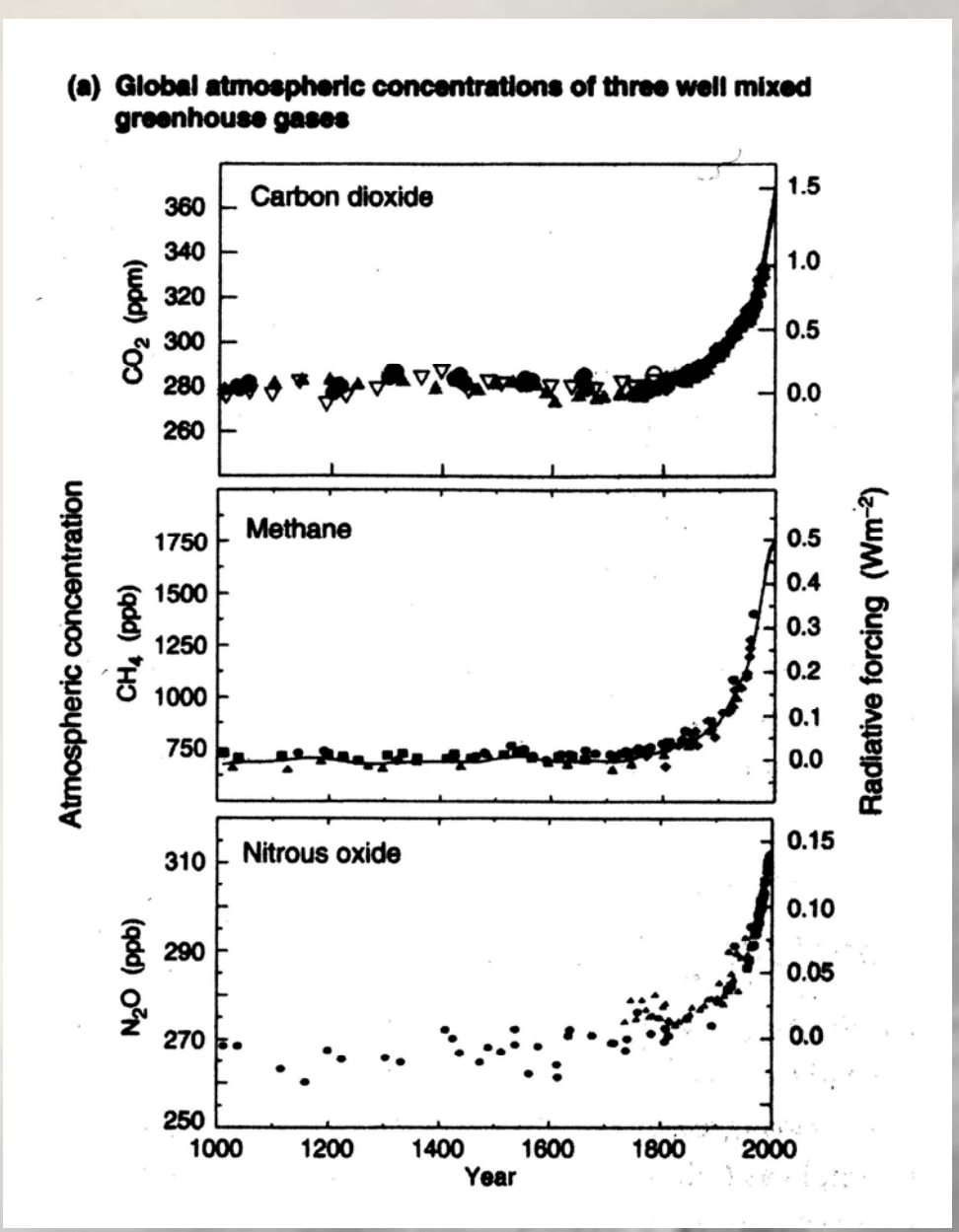
- Atmospheric concentrations of CO_2 has risen every single year since 1958. 自1958年以来大气中二氧化碳的浓度每年都在上升。
- The overall increase is 30% compared to pre-industrial levels, up to 380ppm from 280ppm. 与前工业时期的水平相比，整体增加了30%， 二氧化碳浓度从280ppm升高到了380ppm。

- Ice core data show that over the last 650,000 years levels of CO_2 were 180-300ppm; now we are at 380ppm 冰芯数据显示，在过去的65万年中，二氧化碳浓度的水平在180-300ppm之间，而现在则达到了380ppm。

- At the end of the last ice age an increase of 80ppm led to an increase of 6º in global mean temperature. 在最后一个冰川期结束时，二氧化碳浓度增加了80ppm，这使得全球平均温度上升了6ºC。



Source: Maslin 2009, p. 9



Source: Maslin 2009, p. 9

Furthermore:

We know that human activities are the source of the increase in greenhouse gases.

不仅如此：我们知道人类活动是温室气体增加的主要原因。

2. The Basic Question 基本问题

Climate Policies fall into two broad categories: 气候政策主要可以分为两类：

Adaption: take measures to protect ourselves against the effects of climate change, for instance by building flood walls and extending water reserves. 适应型：采取措施保护我们自身免受气候变化的影响，例如修建防洪堤或者增加蓄水量。

Mitigation: Trying to prevent anthropogenic climate change from happening by taking measures to reduce CO2 emissions, for instance by replacing fossil fuel by alternative energies. 减缓型：采取措施降低二氧化碳排放，努力防止人为的气候变化发生，例如用替代性能源取代化石能源。

The basic question for climate policy is: 气候政策的基本问题是：

Mitigation now or adaptation later? 现在减缓还是日后适应？

On the one hand, it would be best for the present to mitigate as little as possible to minimise the impact on our socio-economic system. This implies that future generations have to adapt. 一方面，当下最好的方式或许是尽量不对气候变化采取减缓措施，以便把对社会经济系统的影响降到最低。这意味着我们的后代必须采取适应措施。

On the other hand, it would be better for future generations if we mitigated now to reduced our emissions quickly so diminished the negative effects and spare future generations adaptation.另一方面，如果我们现在就采取减缓措施，迅速降低二氧化碳排放量，减少负面影响，分担后代的适应，这将是更有益于后代的做法。

Which of these options should we chose? 我们应该选择哪种方式?

Caveat: this is not a strict dichotomy. As have seen, we are already committed to a certain amount of climate change due to past emissions. So the question is really one of balance: how much mitigation now against how much adaption later. 注意：这不是一个严格的二分法。正如我们所看到的，由于过去的排放，我们已经造成了一定程度的气候变化。所以这个问题其实是一个平衡：当下进行多大程度的减缓，以及日后进行多大程度的适应。

To keep the discussion simple I discuss the options as a dichotomy; gradation can easily be built into the argument if needed. 为了简化讨论过程，我用二分法的方式来讨论这些选择，如果需要的话也能很容易地引入渐变的方法。

3. The Discount Rate 折现率

In general terms, discounting is a method to compare the value of present and future goods. 一般说来，折现是用来对比物品在当下和未来价值的一个方法。

Important fact: Discounting occupies centre stage in the discussion over the morality of climate change. 一个重要的事实：在关于气候变化的伦理讨论中，折现处于核心位置

Indeed, the debate over climate mitigation commonly framed in terms of the discount rate (at least in the West), and the conclusions reached are seriously affected by the discount rate chosen.的确，围绕气候减缓的讨论通常集中在折现率这一方面（至少是在西方国家），由此得出的结论也受到所选择的折现率的严重影响。

Some suggest that the current generation should make significant sacrifices for the sake of future generations. 有些人认为，当前这代人应该为后代的福利做出重要牺牲。

Others urge us not to make any such sacrifices. 而另一些人则敦促我们不要做这种牺牲。

Their different recommendations are rooted in different discount rates. 这些不同的建议正是源于他们采用的不同的折现率。

→ We have to understand the concept of discounting in order to follow the discussion. 为了理解这些讨论，我们必须要理解“折现”这一概念。

Questions to warm up 热身题

- ¥100 now or ¥100 in a year's time?现在拿100元还是一年以后拿100元？

Questions to warm up 热身题

- ¥100 now or ¥100 in a year's time?现在拿100元还是一年以后拿100元？
- ¥100 now or ¥500 in a year's time?现在拿100元还是一年以后拿500元？

Questions to warm up 热身题

- ¥100 now or ¥100 in a year's time?现在拿100元还是一年以后拿100元？
- ¥100 now or ¥500 in a year's time?现在拿100元还是一年以后拿500元？
- You buy a solar powered car and have the choice pay ¥10,000 now or ¥11,000 in 5 years. Which one do you chose? 如果你买了一辆太阳能汽车，需要现在付1万元，或者五年后付1万1千元，你会选择哪个？

The Discount Rate 折现率

Observation: money changes its value over time.观察：钱的价值会随时间推移而变化

Question: by how much? 问题是：变化多少？

Discounting rate: *R* [in %] 折现率：R（百分比）

$$P = \frac{F}{(1 + R/100)^N}$$

F = Future value 未来的价值

P = Present Value 当下的价值

N = number of years 年数

Back to our examples with R=5% 再回到我们刚才的例子，假设折现率是5%

1.) ¥100 now or ¥100 in a year's time? 现在拿100元还是1年以后拿100元？

→ Present value of ¥100 in a year's time is approximately ¥95. Take ¥100 now! 现在的100元一年以后大约值95元，应该现在拿100元

2.) ¥100 now or ¥500 in a year's time? 现在拿100元还是一年以后拿500元？

→ The current value of ¥500 is approx. ¥476, so you should wait for a year. 500元的当下价值大约是476元，所以应该等到一年以后。

3.) Solar powered car: ¥10,000 now or ¥11,000 in 5 years.
太阳能汽车：现在付1万元，还是五年后付1万1千元

→ Current value of ¥11,000 is approx. ¥8620. So you should pay ¥11,000 in 5 years. 1万1千元的当下价值大约是8620元，所以应该五年后付1万1千元。

Conlusion: 结论：

Money in the future is worth less than money today. 金钱随时间推移而贬值。

The process of calculating the present value of a future expense is called "discounting". 计算未来费用在当下价值的过程就被称为"折现"。

General rule: for a given time period *n* and given future expense, the present is value of that future expense decreases with an increase in *R*. That is: the larger *R*, the less a future expense is worth in the present. 惯例是：对于给定的时间段n和给定的未来费用，未来费用的当下价值随着折现率的增加而减小。也就是说，折现率越大，未来费用在当下的价值越低。

4. Why Discount? 为什么折现？

1. Pure Discounting 单纯折现

- Impatience (or weakness of the will): 'Better now than later' 耐心不足（或者意志薄弱）："与其将来，不如现在"
- Risk: waiting involves the risk that you may not benefit from the goods at all. 风险：等待意味着有可能根本不能从中获益。

Also: 'pure time preference'. 以及出于"单纯的时间优先"

2. Economic Factors 经济因素

- Inflation: Commodities get more expensive as time passes, and so future money has less buying power than current money. 通货膨胀：随着时间的推移，商品变得越来越贵，所以货币在未来的购买力降低。
- Opportunity cost of capital: financing a project ties up resources that can't be used for another project. 资本的机会成本：对一个项目进行投资会占用资源，它就不能用于另一个项目。

3. Growth Discounting 增长折现

Premise: Economic Growth will continue and people in the future will be richer than people now. 前提：持续的经济增长，未来的人们比现在的人更富有。

Then: Extra commodities received by someone who has a lot already contribute less to her well-bing that they do for someone who has little. 那么：与已经拥有较多财富的人相比，额外的商品对于拥有较少财富的人具有更大的福利改善作用。

In other words: money or extra commodities have ***diminishing marginal benefits***. 换句话说：金钱或者额外商品的边际效益递减。

So extra commodities are worth less to future generations than to present ones. 所以额外的商品对于后人的价值比对于当代人的价值低。

But why is the premise true? Why will economic growth continue? 但是这个前提假设为什么成立？为什么经济增长能持续？

Technology is “fertile”: current commodities can always be turned into more future commodities. 技术是“多产的”：目前的商品总是能够转换成未来更多的商品。

Example: Timber production. 例子：木材生产

Generally: always some goods are consumed and others reinvested to produce more in the future. 一般情况下：总是有一些物品被消耗掉，另一些物品经过再投资之后用于生产更多产品。

5. Discounting and Climate Change
折现与气候变化

What does discounting have to do with climate change? 折现与气候变化有什么关系？

As we have seen, the basic question is: mitigation *now* versus adaptation in the *future*. 正如我们所见，基本的问题是：现在减缓还是日后适应。

→ This involves comparison between current and future values, which can be done with the help of discounting. 这涉及当下与未来价值之间的比较，这可以借助折现率来实现。

For instance, compare the two policies: 例如，对比这两种政策：

(1) Spend ¥100b *now* to reduce emissions, for instance by investing into bio fuel or electric cars. 现在花1千亿来减排，例如投资生产生物能源或者电动汽车。

(2) Spend ¥1 trillion *in 100 years* on dealing with impacts of climate change in 100 years, for instance to build flood defences. 100年后花1万亿用于治理这100年间气候变化造成的影响，例如修建防洪堤。

Which one should we chose? 我们应该作何选择？

Answer: calculate the current value of ¥1 trillion and compare it to ¥100 billion. 答案：计算一下1万亿的当下价值，跟1千亿做比较。

The conclusions depends on the discount rate: 结论取决于折现率：

R=3%: present value of ¥1 trillion is ¥52 billion. 若折现率为3%：1万亿的当下价值是520亿

→ Invest ¥1 trillion for adaptation in 100 years. 应该选择在100年后投入1万亿用于适应气候变化。

R=2%: present value of ¥1 trillion is ¥138b 若折现率为2%：1万亿的当下价值是1380亿

→ Invest ¥100 billion in mitigation now. 应该现在投入1000亿用于减缓气候变化。

Important: for large *n* future generations will pay the costs!
重要的是：n年之后我们的后代将为此付出代价！

So *R* expresses the preference for us to consume now over the preference of future generations being able to consume. 所以折现率R体现了我们在当下消费的偏好，而不是后代能够进行消费的偏好。

→Question of intergenerational justice. 代际公平的问题由此而来。

Nicholas Stern (LSE):

The discount rate for climate change damages is approximately 1.4%

(The “Stern Review” 2006)

尼古拉斯·斯特恩(LSE)：气候变化危害的折现率大约是1.4%（2006年的“斯特恩报告”）

Stern argues that a time preference discount rate of much more than zero to social policy choice is ethically inappropriate. 斯特恩认为，对于社会政策的制定，一个远高于0的时间优先的折现率是不合伦理的。

William Nordhaus (Yale):

“The Review’s unambiguous conclusions about the need for extreme immediate action will not survive the substitution of discounting assumptions that are consistent with today’s market place.

威廉·诺德豪斯（耶鲁）：“斯特恩报告清楚明确地指出要立刻采取紧急行动应对气候变化，而按照当前市场做出的各种折现假设来看，这一结论是不成立的。

So the central questions about global-warming policy – how much, how fast, and how costly – remain open. The Review informs but does not answer these fundamental questions."

所以全球变暖政策的核心问题——行动多少、速度多快、成本多高——仍然无解。斯特恩报告给了我们信息，但是并没有回答这些基本问题。"

Nordhaus suggests that we should use discount rates as we find them in current financial markets to asses climate change policy. 诺德豪斯指出，我们应该使用当前金融市场上的折现率来评估气候变化政策。

Therefore: R is approx. 5.5% 因此，折现率应在5.5%左右

(“A Question of Balance”, 2008)（“一个平衡问题”，2008）

6. Arguments for Market Rates
对市场利率的讨论

"People's Choice": Market prices reveal people's real choices and preferences, and these preferences should be respected. "人民选择说"：市场价格揭示了人民的真实选择和偏好，这些偏好应该得到尊重。

"Future Wealth": Future generations are richer and are therefore in a better position to pay for adaptation than we are to pay for mitigation. "未来财富说"：后代的人们更富有，相比于我们现在为减缓气候变化埋单，他们更有能力在日后对气候变化采取适应行动。

(a) People's Choice 人民选择说

The argument is that market interest rates represent people's true preferences.这一观点认为，市场利率体现了人民的真实偏好。

That is, the relative value people put on future and present commodities is reflected in the market discount rate. 也就是说，人们对未来和当下商品给定的相对价值体现在市场折现率中。

Furthermore: governments should use market rates to make decisions about future projects because governments should respect peoples' preferences. 而且：政府应该利用市场利率来对未来的计划做决策，因为政府应该尊重人民的偏好。

Therefore: the market rate is the correct rate. 因此：市场利率是正确的参照标准。

For this reason, decisions about climate change policies should be made on the basis of market discount rates. 基于这一原因，关于气候变化政策的制定应该以市场折现率为基础。

The crucial question is: which people's choice? 关键问题是：哪些人民的选择？

In thinking about climate change we must think 100s of years ahead 在面对气候变化问题时，我们思考的时间范围必须是今后的100年。

But future people are not represented in the money market! 但是，未来的人口并没有体现在货币市场上！

But if they are not represented, then their preferences cannot be reflected in the current discount rate. 但是如果他们没有得到体现，那么当前的折现率也就不能反映出他们的偏好。

This is a problem because the benefits of controlling future climate change will benefit people who live more than a century from now, so they will value future commodities very differently. 这是一个问题，因为控制未来气候变化将使生活在我们之后一个世纪的人受益，所以他们对未来商品的定价将十分不同。

Thought experiment: Imagine we set up the Future Trust who buys future commodities in the current market. 思维实验：假设我们建立期货信托，在当前的市场上购买期货产品。

To the Trust, future commodities would be worth much more than what they seem to us because they are beneficial to future people, which the trust represents. 对于信托来说，期货商品的实际价值会比它们在我们眼中的价值更高，因为它们有益于未来的人口，也就是信托所代表的人群。

Furthermore assume that the Trust is rich and can buy many future assets. 进而假设：信托资金充足，而且能够购买很多期货资产。

When Trust enters the market the demand for future good increases. 当信托进入市场时，对期货产品的需求将增加。

Law of supply and demand: with the increase in demand at constant supply the price increases. 供需定律：在供给不变的情况下，价格随需求的增加而增加。

Result: future goods become more expensive. 结果：期货产品价格更高。

Therefore: their discount rate goes down. 因此：它们的折现率降低。

Conclusion: If we want to represent the preferences of future people, then we must use discount rates that are lower than current market rates. 结论：如果我们想要代表未来人口的偏好，那么我们必须使用比当前市场利率更低的折现率。

Specifically, if the government aims to take the interests of future generations into account, it should use lower-than-market rates in its decision making about climate mitigation. 具体地说，如果政府要考虑后代的利益，就应该在关于减缓气候变化的决策过程中使用低于市场利率的折现率。

The crucial question is: should the government do so? → This is controversial. 关键问题是：政府应该这么做吗？这个问题是有争议的。

A. C. Pigou, writing in 1932, says yes: 在1932年的文章中，皮古认为：

“But there is wide agreement that the State should protect the interests of the future in some degree against the effects of our irrational discounting and of our preference for ourselves over our descendants [...]

“国家应该采取广泛措施，使后代人的利益不受我们非理性折现的影响，避免我们的利己偏好损害后人的利益……

It is the clear duty of Government, which is the trustee for un-born generations as well as for its present citizens, to watch over, and, if need be, by legislative enactment, to defend, the exhaustible natural resources of the country from rash and reckless spoliation.” 这是政府义不容辞的职责，它是当下民众和未来人民的受托人，要守护并且在必要时通过立法来捍卫国家可耗竭的自然资源不被轻率鲁莽地掠夺。”

Others disagree: 其他人持反对意见：

The government is responsible to their electorate, which does not include generations not yet born. 政府要对它的选民负责，这不包括还未出生的后世人口。

Stephen Marglin takes this view: 斯蒂芬·马格林就持这一观点：

“I want the government’s social welfare function to reflect only the preferences of present individuals. Whatever else democratic theory may or may not imply, I consider it axiomatic that a democratic government reflects only the preferences of the individuals who are presently members of the body politic.” “政府的社会福利功能应该仅仅反映当下人口的偏好。不管民主理论有没有指明，我认为一个民主政府仅仅反映当下全体人民的偏好，这是不证自明的道理。”

Notice: Marglin's point is not that future generations should be given no weight in a government's planning; his point is that they should only be given the weight that current generation attributes to it. 注意：马格林的观点并不是说政府的政策规划中不应考虑后代，而是说后代人口在政策中的重要性只能限定在当代人所限定的范围内。

So the discount rate is not a measure of a fair distribution. It is a measure of how much the current generation cares. 所以折现率不是一个公平分配的衡量方法，它只能体现出当代人口对后世的关注程度。

So: there are opposing views about the role of government. This is a question for political theory and not for economics. 所以，对于政府的角色也有很多不同看法，这个问题涉及政治理论，不是经济学所能解决的。

In other words: the issue has to be resolved in theory of government, which is outside economics. 换句话说，这个问题必须用政府理论来解决，它已经超出了经济学的范畴。

Conclusion: the appeal to people's choice does not justify the use of market rates in evaluating climate change policies. 结论：诉诸人民选择说并不能证明用市场利率来评价气候变化政策是正确的。

(b) Future Wealth 未来财富说

As we have seen, the view is that future generations will be richer and money has diminishing marginal benefit: The benefit of money is higher for people who have less. So future generations are much richer than we are, it is relatively less costly for them to pay for adaptation than it is for us to pay for mitigation. This justifies strong discounting.

如我们所见，这一观点认为后代人口会更加富有，而且金钱的边际效益递减，金钱对于拥有较少财富的人效用更高。因此，后代比我们更富有，相比于我们为减缓气候变化而承担费用，他们为适应气候变化所承担的经济负担相对较低。这一观点为更高的折现率提供了依据。

There are several serious problems with this argument.
这一观点存在几个严重问题：

First, we cannot just take it as a given that future generations will be richer. In fact climate change might reverse economic growth, and so future people could be poorer than we are. In which case the discount rate should be negative, giving more value to future commodities rather than less. 首先，我们不能将“后代更富有”作为一个既定事实。事实上，气候变化可能会逆转经济增长，未来的人口也可能比我们更贫困。在这种情况下，折现率应该是负值，应该给未来商品赋予更高价值，而不是相反。

Second, the arguments disregards issues of justice. Even if someone else is better off then we are, they are not ipso facto responsible for fixing our problems. 其次，这一观点没有考虑公正的问题。即使其他人比我们更富有，这一事实本身也不意味着他们对解决我们的问题负有责任。

It is not automatically the case that those with more resources should pay. In fact, basic justice would require that those who caused the problem should pay. 同样，那些拥有更多资源的人并不是自然而然地应该付出代价。事实上，基本的公正原则要求那些造成问题的人来承担代价。

If we think that this is not so in the climate case, then an argument for this conclusion is needed. But no argument is provided. 如果我们认为在气候问题中不应如此，那么就需要对这一结论展开讨论，但是目前并没有这种论证。

Furthermore: 而且

In fact, the marginal benefits argument is not inherently temporal. 事实上，边际效益的观点并不必然具有时间性。

If one believes that those who have should foot the bill of the problems of those who have less, then we should also discount the wealth of the current rich. 如果一个人相信那些富有的人要为不富有的人造成的问题埋单，那么我们也应该对当下富人的财富进行折现。

But then it follows that wealth should be redistributed from the rich to the poor (through aid, fair trade, direct payments, ….) 但是这样的结果应该是将财富进行从富人向穷人的再分配（通过援助、公平贸易、直接支付等方式）。

Dilemma for the rich: they oppose mitigation and (generally) don't give to the poor. 富人的困境：他们将反对采取减缓策略，拒绝向穷人转移财富。

Conclusion: 结论

There is no sound argument for the conclusion that discounting at market rates is the right tool to assess climate policy recommendations. 我们没有确凿的证据去证明，以市场利率进行折算是评估气候政策的正确工具。

In fact, there are good reasons to assume that it is not a good instrument to evaluate long-term projects that have large effects on future generations such as coping with the effects of climate change. 事实上，有充足的理由表明，对于那些对未来人口产生广泛影响的长期计划（例如应对气候变化影响的项目），折现率不是一个完善的评估工具。

7. Spatial Inequality 空间上的不平等

Partha Dasgupta (CB): 帕萨·达斯古普塔

The approach is inegalitarian in the space dimension (e.g. when comparing wealth of rich and poor countries) because the framework does not take the current wealth distribution into account. 这一方法在空间维度上也是不平等的（例如当对比穷国和富国的财富时），因为这个框架没有考虑到当下的财富分配。

If one is egalitarian between generations, then one also ought to be egaliatarian between parts of the world. 如果一个方法能实现代际平等，那么它也应该在全球不同地区间实现平等。

As we have seen above, this would imply the imperative to redistribute wealth. 正如我们前面所看到的，这意味着进行财富再分配的迫切需要。

But we are far away from that! 但是我们远没有做到这一点。

If, for instance, we would ask for the same per capita entitlement for all people alive now, a radical redistribution of resources would be necessary. 例如，如果我们要使现在所有活着的人获得相同的人均待遇，那就有必要进行彻底的资源再分配。

In 2005, global per capita emissions were at 1.23 metric tons of carbon. But national averages differ widely:

2005年，全球人均排放量是1.23吨。但国家之间差异显著：

United States（美国）: 5.32

United Kingtom（英国）: 2.47

China（中国）: 1.16

India （印度）: 0.35

Bangladesh （孟加拉）: 0.08

(Gardiner 2010, 59)

Assume we want to achieve two goals: (a) reduce total emissions by 20% and (b) distribute the remaining emissions fairly. 假设我们要实现两个目标：(a)将总排放量降低20%；(b)将剩余的排放量实现公平分配。

This implies the following emission reductions for each citizen: 这意味着接下来要对每一个公民进行减排：

United States: cut emissions by more than 80% 美国人减排超过80%；

UK: cut by nearly 60% 英国人减排近60%；

China: cut by 14% 中国人减排14%；

India: increase emissions by 285% 印度人增加排放285%；

Bangladesh: increase emissions by 1250%. 孟加拉人增加排放1250%。

8. Can Everything be Discounted?
所有东西都可以折现吗？

While the method of discounting has plausibility for market commodities, it seems implausible for non-marketable goods. 虽然折现的方法对于市场上的商品具有一定的合理性，但是对于非市场化的物品却是不合理的。

Some goods seem to have a value that is simply incommensurable to market goods. 一些物品的价值无法仅用市场上的物品来比拟度量。

Example: natural beauty, for instance a beautiful stretch of coastline. 例如：自然景观，美丽的海岸线

What is its price? Does it have a market price?

If not, then discounting is meaningless for it. 它的价格是多少？它是否具有市场价格？如果没有的话，那么对它进行折现就是没有意义的。

Assume for the sake of argument, that it does have a market value. Should it be discounted? 假设为了便于讨论，它获得了一个市场价值，但是它应该被折现吗？

The answer seems to be no! 答案是“不”！

A stretch of beautiful countryside is a commodity whose value ought not to be discounted. 美丽的乡村是一个其价值不该被折现的商品。

So R=0 for natural nature. 所以大自然的折现率是零。

Nature ought not to be discounted because none of the reasons for discounting apply to it! 自然不应被折现，因为折现的理由完全不能应用在自然上。

1. Pure discounting: There is no reason to be impatient about it. We already have it. 单纯折现：没有理由对自然失去耐心，因为我们已经拥有了自然。
2. Economic factors: There is no interest, nor are there opportunity costs. 经济因素：没有利息，也没有机会成本。
3. Growth discounting: Nature per se is not “fertile” in the technical sense; you can’t turn it into a greater amount if you wait. So diminishing returns reasoning does not apply. 增长折现：从技术上来说，自然就其本身不是“多产的”，你无法使它数量增加，所以边际效益递减的推理不适用于自然。

There is a deeper reason, still, why we should not discount Nature. 除此之外，还有一个更深刻的理由解释了我们为什么不应该对自然进行折现。

Discounting only ought to apply to commodities, goods produced in an economic system. 折现只能应用于商品，应用在经济系统中生产出的物品上。

But well-being should not be discounted. Future well-being is as valuable as current well-being. 但是福利是不应该被折现的，未来的福利与当下的福利同样重要。

9. Beyond Utilitarianism
超越功利主义

The ethical background theory to all these discussions is utilitarianism, roughly the view that a good action is one that maximises utility. 所有这些讨论背后隐含的伦理基础是功利主义，它的基本观点认为，能使效用最大化的行动就是好的行动。

The arguments would change fundamentally, though, if one adopted a different point of view: 然而，如果我们采用另一种观点就会使讨论发生根本变化：

Kantian ethics 康德伦理学

Confucianism (???) 儒家思想

10. Conclusion 结论

Policies on climate change should be evaluated using a relatively low interest rate because arguments in favour of market interest rates fail. 应该采用相对较低的利率对气候变化干预政策进行评价，因为支持市场利率的论证是不成立的。

If taken seriously, this implies that we should invest seriously into mitigation … 如果认真看待这一问题，这意味着我们应该为减缓气候变化进行大量投入。

… we are not currently doing enough and more decisive action is imperative. 目前我们所做的还远远不够，采取更果断的气候减缓行动迫在眉睫。