Baseline Development and Economic Analysis

基准线开发和经济分析

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Presentation Overview目录

- Introduction to RTI International **RTI**国际研究中心的介绍
- Magnitude of Methane Emissions Reduction Potential in the Oil and Gas Industry油气行业中甲烷减排潜力
- Measuring Baseline Emissions测量基准线排放量
- Evaluating Cost-Effective Emissions Reduction Opportunities评价有成本效益的减排机会
- Supplemental Funding Sources额外的融资来源

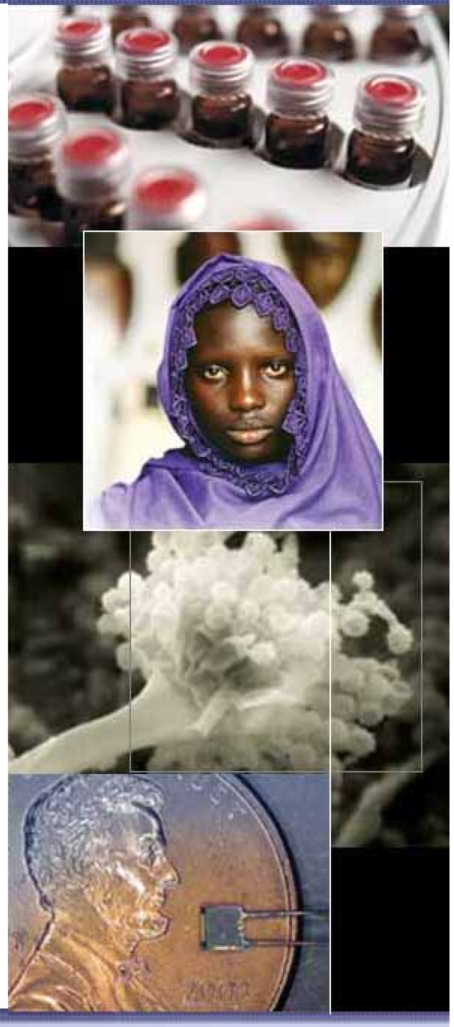
History and Mission 历史和任务

- Established in 1958 as a collaboration between state government, area universities, and business leaders 在州政府、地方大学和商业领导的合作下，于1958年成立
- Mission: to improve the human condition by turning knowledge into practice任务：将知识用于实践以提高人类生活条件
- One of the world’s leading research institutes世界主要研究机构之一

RTI Expertise **RTI的专项**

RTI is home to some of the world's greatest scientific minds, providing innovative research and technical services in RTI是世界上一些最伟大科学想法的发源地，在以下几个方面提供创新研究和科技服务

- Health and pharmaceuticals健康和制药
- Education and training教育和培训
- Surveys and statistics测量和统计
- Advanced technology先进科技
- International development国际化发展
- Economic and social development经济和社会发展
- Energy and the environment能源和环境



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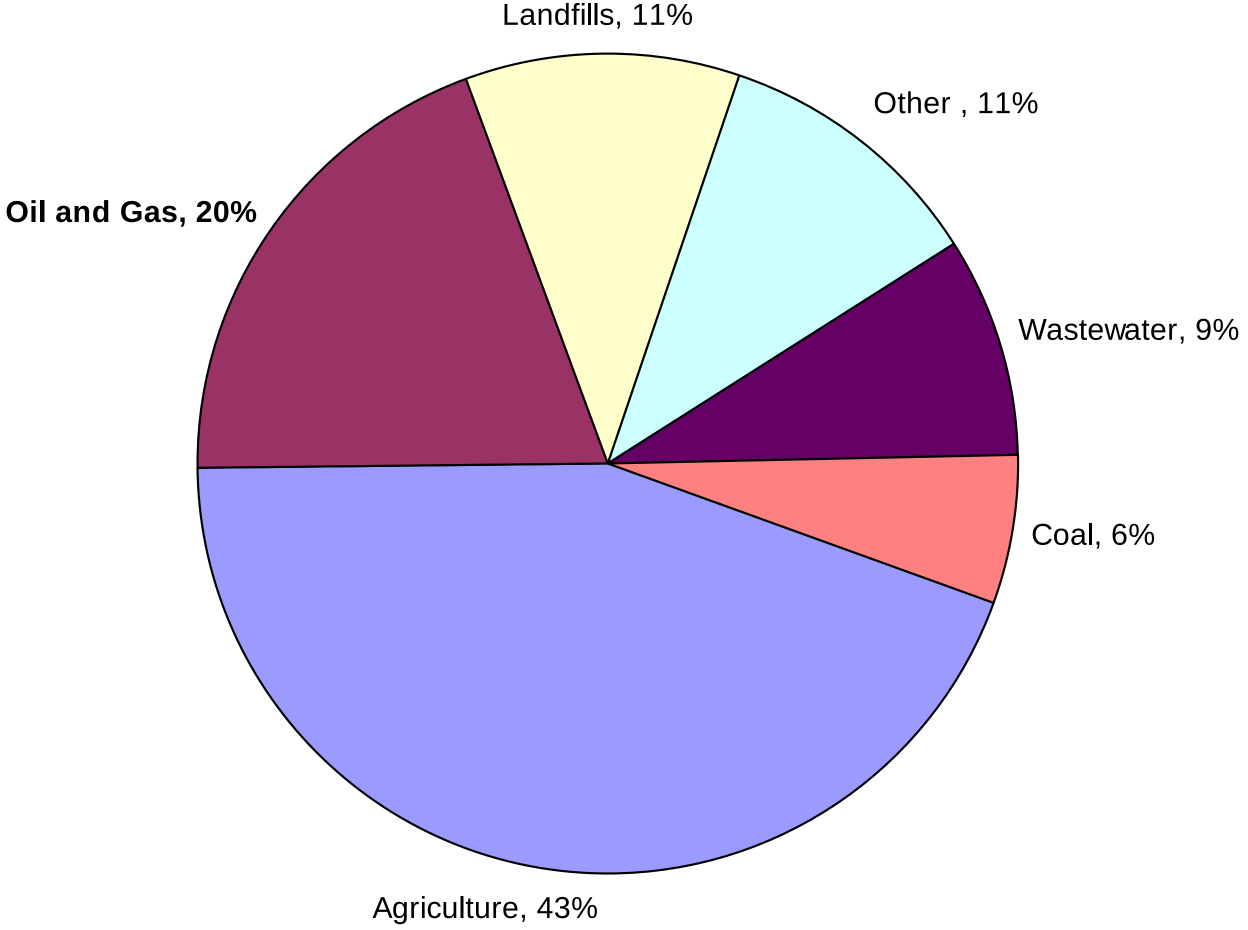
Importance of the Oil and Gas Sector
油气部门的重要性

Global CH_4 Emissions in 2010 = 6,875 $MtCO_2e$



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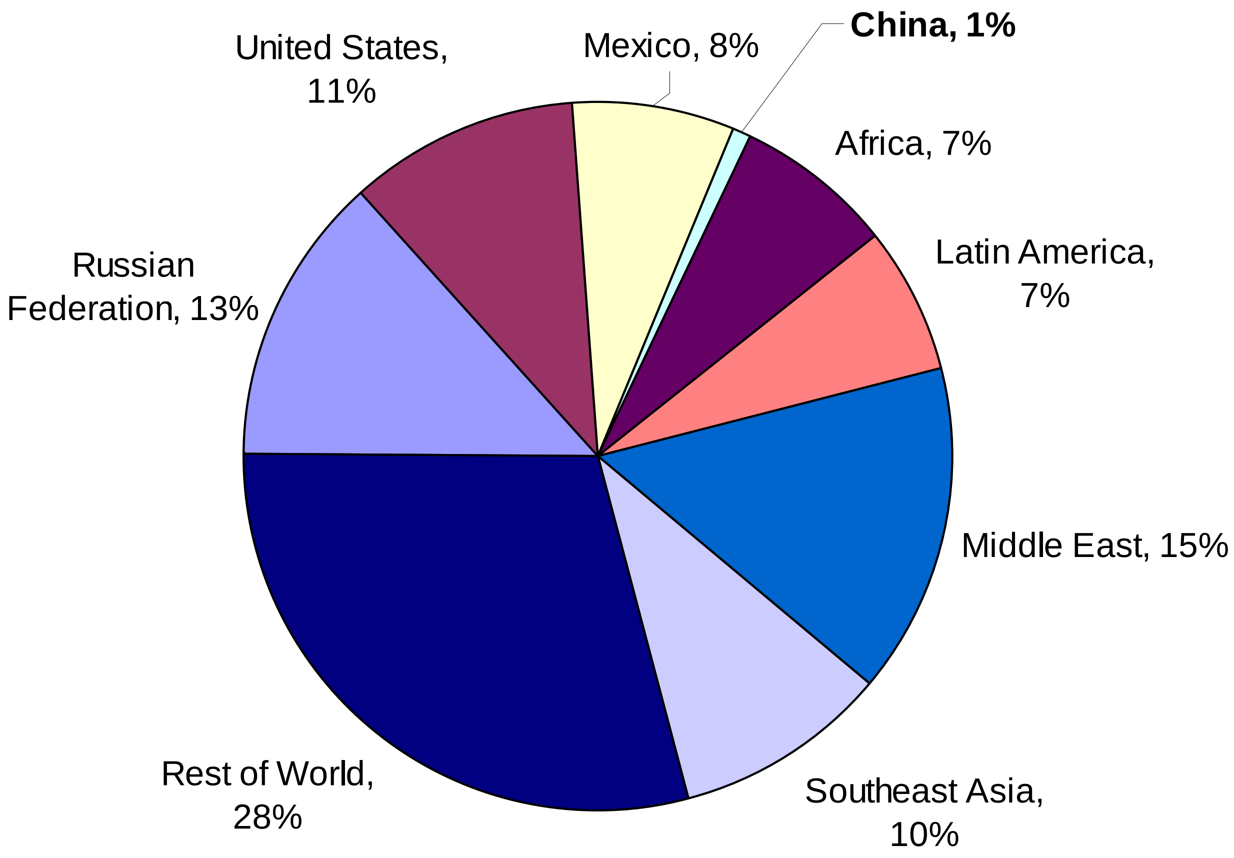
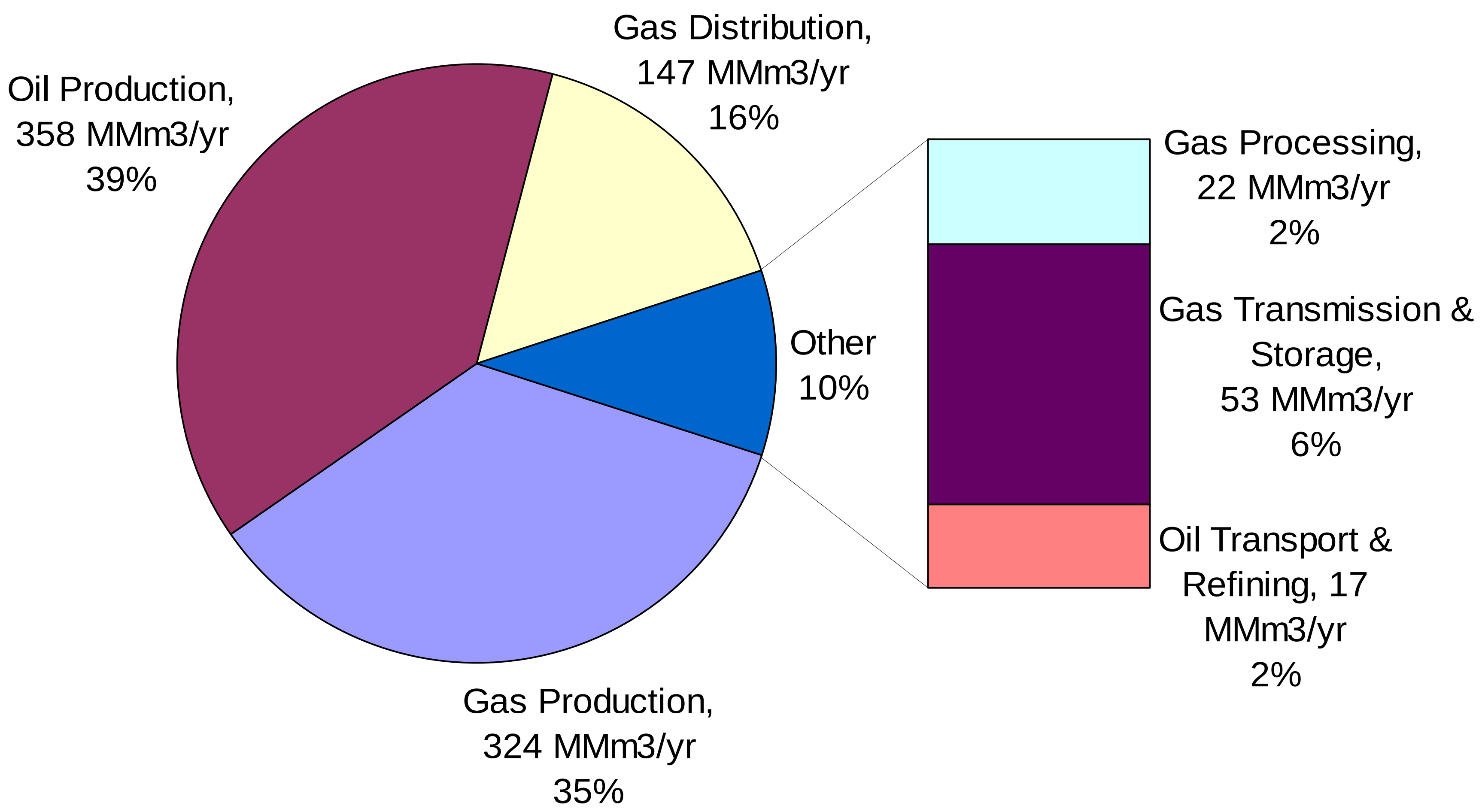
Methane Emissions Reduction Opportunities Exist in China and Many Countries Worldwide
在中国和世界许多国家存在的甲烷减排机会

Global CH_4 Emissions in 2010 = 1,354 $MtCO_2e$



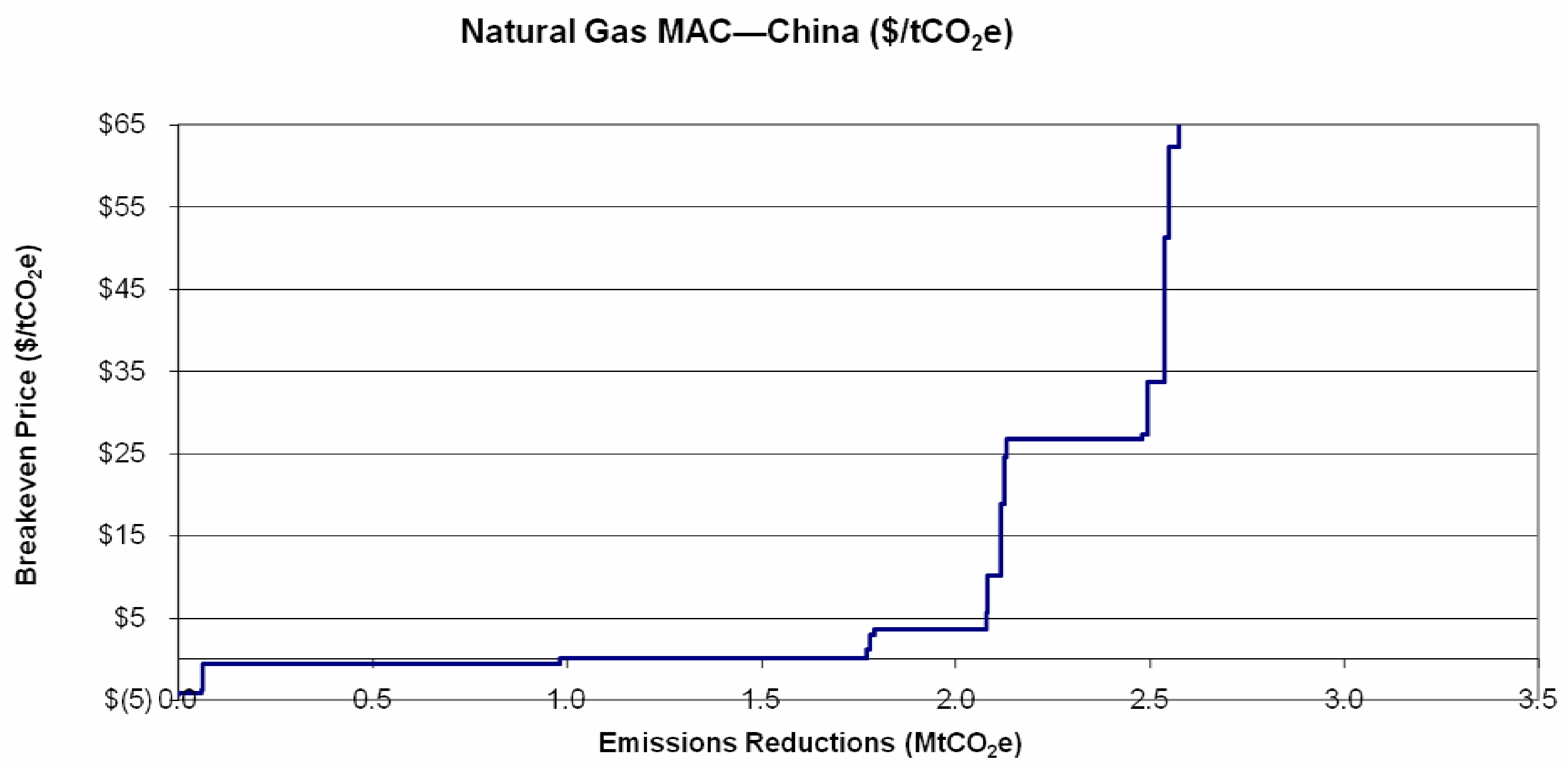
China's Methane Emissions In the Oil and Gas Sector
中国油气部门的甲烷排放



Cost-Effective Opportunities Exist
存有成本效益的机会

- It is estimated that ⅓ to ½ of methane emissions in the oil and gas industry are profitable.据估计油气行业中甲烷排放量的⅓ —½是有利润价值的。
- This means that the value of the captured methane as an energy source pays for the emissions reduction project (equipment and labor).这意味着俘获的甲烷可作为能源，进而用其价值来支付减排项目（设备和劳动力）的费用。
- Supplemental funds are available through carbon markets to make even more emissions reduction projects profitable. 可通过碳市场获得更多的减排项目以作为额外的资金来源

Estimated Cost of Methane Emissions Reduction in China
中国甲烷减排费用的预测



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Identifying and Evaluating Potential Projects
确认并评估潜在的项目

To identify and evaluate the profitability of potential emissions reduction projects, several steps are needed:

为了确认并评估潜在减排项目的利润，需要几个步骤：

- Estimate baseline emissions 预测基准线排放量
- Conduct benefit-cost analysis 实施效益成本分析

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Baseline Emissions Estimation
基准线排放的预测

- The baseline describes the level of methane emissions prior to the introduction of the proposed project activity基准线描述了在引入建议项目活动前的甲烷排放水平
- Typical emission factors are available from sources such as the 2006 IPCC Guidelines Tier 1 approach for countries with economies in transition 典型的排放因子可从资料中获得，例如2006 IPCC指南Tire 1方法适用于经济转型国家。
- However, uncertainty of Tier 1 emission factors is high (± a factor of 3) as emission factor ranges often span an order-of-magnitude due to system specific characteristics然而，由于系统的特殊性质使得排放因子跨度经常为一个数量级时， 所以Tire 1排放因子的不确定性较大（±3左右）。
- Field survey of selected equipment components are used to identify leaking components and then measure the emissions rate of selected leaks.对所选的设备组件进行现场调查以确定泄漏部件，然后测量所选泄漏部件的排放速率。

Baseline Emissions Estimation
基准线排放预测

- Many factors influence the accuracy of methane fugitive leak estimates, including 很多因素影响甲烷逃逸泄漏预测的准确性，包括：
  - the type of leak measurement technique used, 所使用的泄漏测量技术类型，
  - instrument calibration methods, 仪器校正方法，
  - how the leak measurement is performed (how far from the potential leaking areas the probe or device is, how background factors are accounted for, etc.), and 泄漏测量如何实施（探针或设备距潜在的泄漏区域多远，背景因素如何说明，等等），
  - how the instrument response is correlated to an emission rate 设备反应与排放速率关系如何。

Evaluating Potential Projects
评估潜在的项目

- To determine the cost effectiveness of a potential emissions reduction project, a simple benefit-cost analysis can be conducted. 为了确定潜在减排项目的成本效率，可实施简单的成本效益分析。
- This involves comparing the one-time (equipment) costs and the annual (operating and maintenance) costs of a project with the annual benefits (value of gas and carbon credits). 这包括将项目的一次性费用（设备），年度费用（运行和维护）和年度收益（气体和碳信贷的价值）进行比较。
- It is important to account for the full lifetime of the project and discount both benefits and costs appropriately.项目的整个寿命及对效益和成本近似贴现是很重要的。

Components of Benefits and Cost
收益和成本部分

Cost and benefit components relevant to the analysis will vary by emissions reduction project成本和收益相关分析是根据减排项目而变化的

Costs Include: 成本包括：

- One-time costs: equipment expenditures, labor hours for planning and installation, permits.

  一次性成本：设备开支，计划和安装的劳动力时间，许可证
- Annual costs: labor for maintenance and inspection, materials for operation, energy consumption, and other reoccurring costs.

  年度成本：维修和检查的劳动力，运转材料，能量消耗和其他费用

Benefits include: 收益包括：

- Value of methane captured as natural gas or as converted to electricity or heat.

  将捕获的甲烷作为天然气或转变为电力或热能的价值
- Value of carbon credits generated from reduced greenhouse gas emissions.

  通过减少温室气体排放带来的碳信贷的价值

Measures of Economic Return
经济回收的测量

Once the benefit and cost components have been quantified, several measures of economic return are available to evaluate potential projects. The most common are 一旦成本收益部分被定量下来，可使用几种测量方法来评估潜在项目的经济回收，最经常使用的为

- payback (PB) period, 回收周期(PB)
- benefit-cost ratio (B/C), 收益-成本比(B/C)
- net present value (NPV), and 净现值(NPV)
- internal rate of return (IROR). 内部收益率(IROR)

Each measure has its advantages and disadvantages.

每一种测量方法都有其优缺点。

Payback Period 回收周期

- The **payback period** is the number of years it takes for the annual net revenue to cover the initial one-time costs of the project and is expressed as

回收周期是指使用年度净收益来支付开始时的一次性成本所需的年数，可表示为

PB = (One-time costs)/(annual benefits – annual costs).

PB=一次性成本/（年度收益– 年度费用）

- Payback period is the simplest measure to calculate.

回收期法是最简单的计算方法

Payback Period 回收周期

- Acceptable project paybacks vary by company but typically range from 2 to 4 years.

  可接受的项目回收周期与公司有关，但一般为2-4年

- However, the payback calculation does not account for the life expectancy of the project and hence tends to undervalue capital intensive projects with long life expectancies.

  然而，回收计算不能说明项目的精确寿命，因此低估了预测寿命长的资金密集项目。

Discounting Future Benefits and Costs
未来收益和成本的贴现

- The B/C, NPV, and IROR measures of economic return all take into account the time value of money by discounting the time series of annual benefits and annual costs. 通过对一系列的年度收益和成本进行时间的贴现， 使用B/C，NPV和 IROR方法进行测量的经济回收都考虑了资金的时间价值。
- Discounting future benefits and costs is a standard practice in financial analysis and accounts for the opportunity cost (alternative investment opportunities) of capital funds. 未来收益和成本贴现在金融分析上是标准做法，说明了资本基金的机会价值（交替的投资机会）

Benefit-Cost Ratio 收益-成本比

The **benefit-cost ratio** is interpreted as the number of dollars returned per dollar invested, and is expressed as

收益-成本比 可解释为每投资一美元时所回收的美元数，可表示为

$$B/C = \Sigma\ (\text{annual benefits})/(1+r)^t\ /\ [\text{one-time costs} + \Sigma(\text{annual benefits})/(1+r)^t]$$

B/C = Σ (年度收益)/(1+r)^t / [一次性费用+ Σ(年度收益)/(1+r)^t]

where n is the life expectancy of the project and r is the discount rate.

其中n为项目的预测寿命，r为贴现率。

Net Present Value and Internal Rate of Return
净现值和内部收益率

- A project with a **net present value** greater than zero indicates a profitable investment. The NPV of a project can be expressed as

净现值大于0的项目表明投资是获利的，工程中的NPV可表示为

NPV = one-time costs + Σ (annual benefits – annual costs)/$(1+r)^t$.

NPV = 一次性成本 + Σ (年度收益– 年度成本)/$(1+r)^t$.

- The **internal rate of return** is the value of r that sets the NPG equal to zero.
内部收益率是指NPG为0时的价值

- Most companies have a “hurdle” rate of return (e.g., 7%, 10%) below which they will not pursue investments. In other words, they will not invest a project with an IROR below their hurdle rate because they have better opportunities for which to use their investment capital.

大多数公司有一个基准回收率(例如，7%, 10%) 。低于它，公司将不会进行投资。换句话说，他们不会投资内部收益率低于基准回收率的项目，因为他们可以使用这部分资金进行更好的投资。

Carbon Credits 碳信贷

- Emissions markets and carbon trading are international initiatives to mitigate global warming which can provide incremental funds to make projects more profitable. 排放市场和碳交易是国际上主动来减轻全球变暖的，进而提供增量基金以使项目获利更多。
- By assigning a monetary value to emissions, market mechanisms can be used to increase the cost effectiveness of reducing greenhouse gas emissions. 通过对排放分配货币价值，市场机制可用来增加温室气体减排的成本效率。
- Methane emissions reductions in China have the potential to be a significant source of greenhouse gas emissions credits, which in turn can be sold on international markets to help finance projects. 中国的甲烷减排有潜力成为温室气体排放信贷的重要来源，还可以在国际市场上销售以帮助金融项目。
- There are several market exchanges currently trading carbon credits, including the European Climate Exchange, the Chicago Climate Exchange, and Nord Pool. 当前的碳信贷交易有几个交换市场，包括欧洲气候交易，芝加哥气候交易和北欧电力库

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Thank You 谢 谢！

For more information on estimating baseline emissions or benefit-cost analysis, contact

若想在基准线排放或成本效益分析预测上获得更多信息，请联系：

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