Integrated Economic and Environmental Planning: Introduction and international experiences

综合经济环境规划:简介与国际经验

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   下一步工作：加强环境风险管理（2013-2015）

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Norwegian project partners / 挪威合作方

- Vista Analysis, a research institute and consultancy on economics, environmental economy and policy.
- CICERO, Center for International Climate and Environmental Research, Oslo
- 挪威远景分析研究所;国际气候与环境研究中心，奥斯陆

Vista Analysis' representative in Taiyuan:

- Rasmus Reinvang, PhD, senior researcher.
- 12 years experience with environment and sustainable development policy work, in Scandinavia, the EU, China, India.
- Lecturer at Copenhagen University (Denmark), University of Gdansk (Poland), BI Norwegian Business School (Norway)

- Rasmus在欧洲、中国和印度拥有12年环境与可持续发展工作经验
- 同时担任丹麦哥本哈根大学、波兰格但斯克大学、BI挪威商学院讲师

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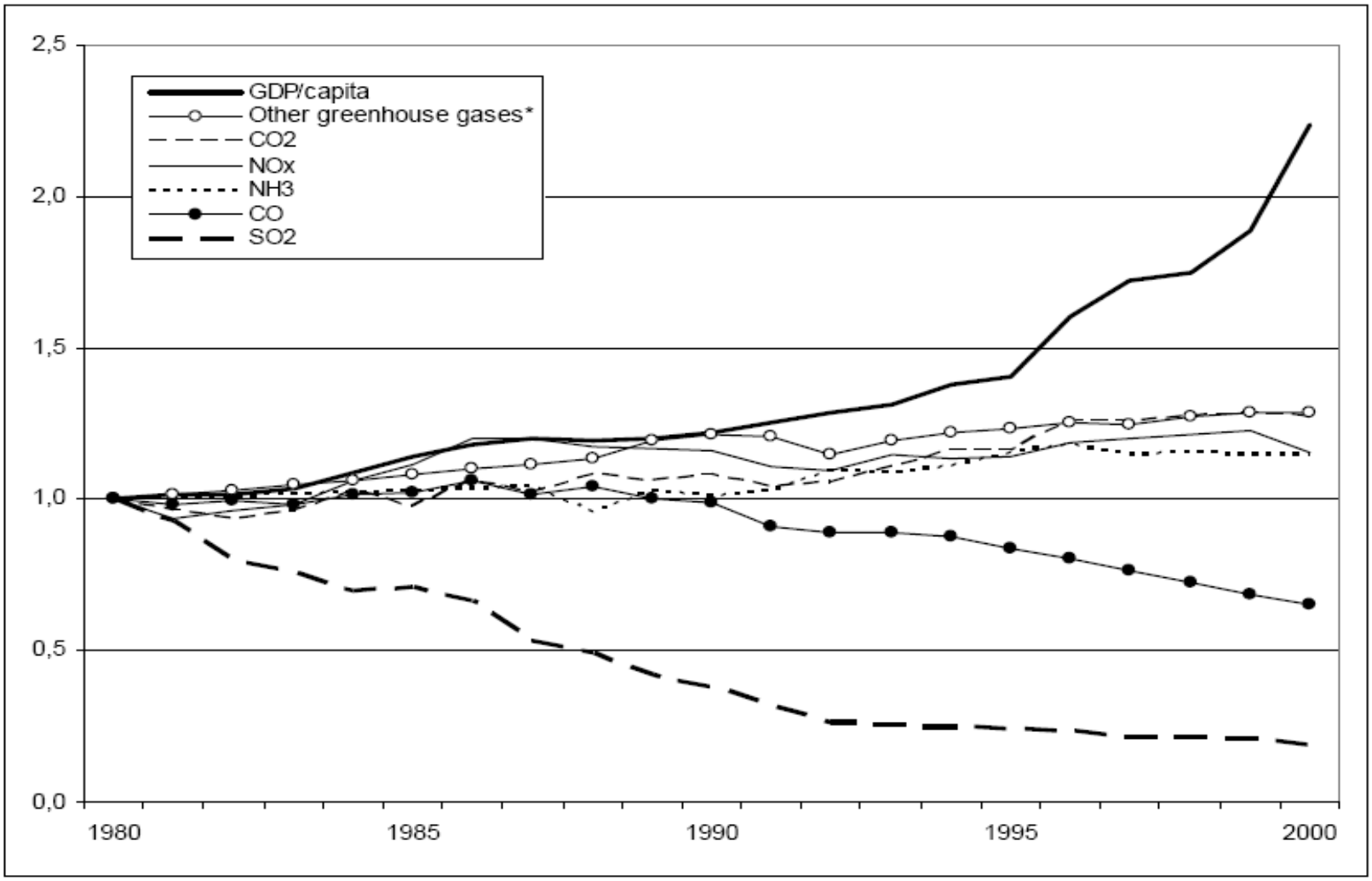
An example of decoupling: Air pollution in Norway 1980 - 2000

脱钩:挪威大气污染（1980-2000）



* CH_4 and N_2O.

Source: Statistics Norway.

Phase I project (2009-2012)
一期项目(2009-2012): 提高环境保护五年规划的执行效果

- Project: ”Improving the effectiveness of environmental 5-Year Plans in China” (2009-2012) – Phase I
- Partners in China: 中方合作伙伴
  - MEP Planning Division, CAEP（环保部规财司，CAEP）
  - Pilot provinces: Jiangsu, Hubei, Guizhou, Yunnan
  - 试点省份:江苏、河北、贵州、云南

- Goal: To assist in improving environmental planning in China
- Main outputs: 主要产出
  - Documentation of Chinese and International best practise in Environmental Planning
  - Guidebook in the use of Cost-Benefit Analysis (CBA) and Strategic Environmental Assessments (SEA)
  - Training of EPB staff from pilot provinces
  - Policy recommendations
  - Final seminar and publication of book in Chinese (2012)

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Recommendations of Phase I
一期项目建议结论

- Enhance coordination and strengthen horizontal and vertical collaboration of provincial planning departments in the preparation stage of 5-Year Plans.
  加强省级规划部门的协作

- Prioritize key points and weak links and improve competence at the provincial level
  优先加强重点和薄弱环节，提高省级能力
  - Strengthen planning research method and inventory
  - Strengthen technical training, short-term and long-term

- Emphasize the importance of data collection and lay a foundation for establishing the planning work platform, incl.
  - Establish an economic and environmental data center
  - Accelerate the research on pollution emission inventory and prediction

  重视数据收集，为环境规划奠定基础

- Innovate policy measures and strenghten public participation in planning research and preparation process, incl.
  - Increase participation of enterprises and the public in planning preparation

  政策创新，加强规划编制过程中的公众参与

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Cost-Benefit Analysis (CBA)

- Pioneered in the USA since the1980's 美国率先使用
  - Since 1981 mandatory use of CBA to assess *new policy* initiatives and programs.
  - Also requiring CBA to evaluate performance of *existing* policies
- Also common in other Western countries 西方国家普遍使用

- Widespread use for transportation projects 交通领域广泛
  - New roads, railway lines, airports etc.
  - Well suited to assess environmental impacts, time savings etc.
- Increasingly used for environmental policies and projects
  - Eg. Waste treatment projects 环境政策项目中应用逐渐增加

- Are relied on by decision makers 供决策制定者使用
  - But they also rely on other inputs in the decision making process

CBA 费用效益分析

- A formal analysis of the impacts of a project, regulation, programme, plan or policy

  对于项目、法规、规划或政策的正式影响分析

- Designed to evaluate whether advantages (“benefits”) are greater than the disadvantages (“costs”)

  用于评估项目优势(效益)和劣势(费用)

- Used to choose among several projects with benefits larger than costs

  用于多种效益>成本的方案比选

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Key questions answered in a CBA
CBA解决的关键问题

- **What are the available projects for solving the problem?**
  解决问题的可用项目有哪些？
  - Often many alternative projects

- **Should project X be undertaken at all?**
  项目X是否应当执行？
  - Only if benefits > costs

- **What is the optimal scale of the project?**
  项目执行的最优尺度？
  - Can inform about the desirable level of environmental quality

- **When should the project be implemented?**
  项目当何时实施？

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CBA - one of several similar tools
CBA – 众多相似工具之一

- Cost Effectiveness Analysis（成本有效性分析）:
  a systematic mapping of the costs of potential projects that could reach the same goal
  - The goal is given - choose the cheapest project

- Cost Impact Analysis（成本影响分析）:
  a systematic mapping of the costs of potential actions, but where the effects of each action are not equal
  - Cannot necessary choose the action with lowest costs

- Cost Benefit Analysis（费用效益分析）:
  a systematic mapping of costs and benefits of potential projects
  - Valuate these in monetary terms as far as possible
  - Choose the project with the largest cost/benefit ratio

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Steps in a CBA 步骤

1. Identify relevant projects
   明确相关项目
1. Describe a reference scenario
   描述参照情景
2. Identify and estimate relevant physical impacts of each project
   明确相关影响
3. Evaluate physical impacts using monetary terms when possible
   货币化评估
4. Compare benefits and costs for each project
   1. 比较收益和成本
5. Conduct a sensitivity analysis
   1. 敏感性分析
6. Recommend a project or projects
   1. 推荐可执行项目

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Some CBA advantages 优势

- Facilitate stakeholders in systematically identifying, discussing, quantifying and comparing the trade-offs of proposed projects

  协助利益相关方识别比较不同方案

- Allow policy makers to unitize (in RMB) and compare otherwise wide-ranging benefits and costs which accrue to various group

  各类成本效益统一化比较

- Allow policy makers to compare and prioritize competing uses of public funds

  优化公共资金使用

- Inform policy makers in formulating economically sensible and defendable public investment programs

  为公共投资项目提供决策支持

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Some potential CBA disadvantages / 潜在劣势

- Requires a lot of data and investigation

  数据与调查需求

  - What would be the impacts of the project?
  - How uncertain are they?
  - What would it cost to implement the project?

- How to value the impacts?

  如何货币化影响？

  - Several methods exist, but they could be time consuming and require special skills

- CBA is mostly relevant for larger public projects with potentially big impacts

  主要应用于具有潜在巨大影响的大型公共项目

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Winners and losers from a project

- Traditionally, CBA does not include analysis of distributional effects
  - But important for policy makers to see who gains and who pays
- Usually not everyone benefits from a project…
  - … and someone may lose
- Those who benefit are not necessary those who pay
- Insight in stakeholder positions could be crucial to ensure implementation of a project
- A first step would be to identify the effects on various groups and provide detailed information about them
  - Then eventually the issue of equity could be considered in the CBA by assigning implicit and explicit distributional weights to calculate net benefits received by individuals

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For policy makers… 政策制定者…

- How do the B/C ratios compare? (Ranking of projects)
  项目B/C比排序
- Is the preferred project economically viable?
  推荐项目经济可行？
- How confident are we in our estimates?
  评估可靠性？
  - Assumptions? All benefits and costs? Robustness?
  - Do those that are affected agree with our results – or would they prioritize differently?
- Do we have or can we get the financing?
  资金来源？
  - Would one project be more difficult than the other?
  - Is the population willing and able to pay for all or part?
- Are the conditions in place for the given project in the specific place?
  项目地理条件？
  - Construction risks?
  - Legal, institutional and administrative frameworks in place?

Strategic Environmental Assessment (SEA)
战略环境评价

- The purpose of the SEA is to systematically evaluate environmental impacts of a plan/programme designed for motivating a collection of projects – before the plan/ programme is started up
  - SEA can be seen as an extension of Environmental Impact Assessment (EIA), moving from individual projects to policies, plans and programs
  - An important purpose of the SEA is to bring forward the indirect impacts of projects. Often, the aggregate impact of many projects is *not* found by adding the impact of each project.
- SEA目标:系统评价规划的环境影响

- The EU directive 2001/42/EC makes SEA mandatory in the EU for plans/ programmes that are prepared for agriculture, forestry, fisheries, energy, industry, transport, waste/water management, telecommunications, tourism, town & country planning or land use.
- EU指令(2001/42/EC)规定涉及农业、林业、渔业等领域的规划须做SEA

- SEAs can be conducted in different ways. Some of these ”ways” have their own name, such as ”Country Environmental Assessment” or ”Regional Environmental Assessment”.

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The steps of SEA / 步骤

1. Screening: Is an SEA necessary?
   筛选：是否有必要进行SEA？
2. Scoping: Set objective and scope of the SEA
   确定范围和背景
3. Describe the baseline or reference scenario
   参照情景
4. Identify and assess impacts of plans/programs
   识别与评估影响
   - *Incl. assessing main alternatives and their impacts*
5. Environmental reporting
   环境报告
   - *Describe environmental impacts, mitigation and monitoring options*
6. Consultation and participation
   咨询与参与
7. Monitoring of the env. impact of the plan/program
   监测

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Why conduct an SEA? / 必要性

- SEA is a means to safeguard environmental assets and promote sustainable development
- SEA保障环境财富、促进可持续发展

- It can improve decision-making by
  - Providing environmental-based evidence to support informed decisions
  - Preventing costly mistakes
  - Facilitate public engagement in decision making
  - Highlighting broad environmental and social issues, giving a framework for specific EIA-studies
  - Facilitating transboundary cooperation
- 决策支持

Environmental economic model in Norway: MSG 6
挪威环境经济模型-MSG 6

- MSG 6 = Multisectoral Growth Model, version 6

  多部门增长模型
- Belongs to a model family called Computable General Equilibrium models, CGE-models

  属于一般均衡模型
- Long-term economic and environmental forecasts, recognizing

  长期经济与环境预测模型
  - that long-term economic development is shaped by investment, labour supply and technology
  - That long-term industry composition is also shaped by prices and income

- Covers 60 commodities and 40 industries / 40个行业的60种商品

- Covers emissions to air / 涵盖大气污染排放

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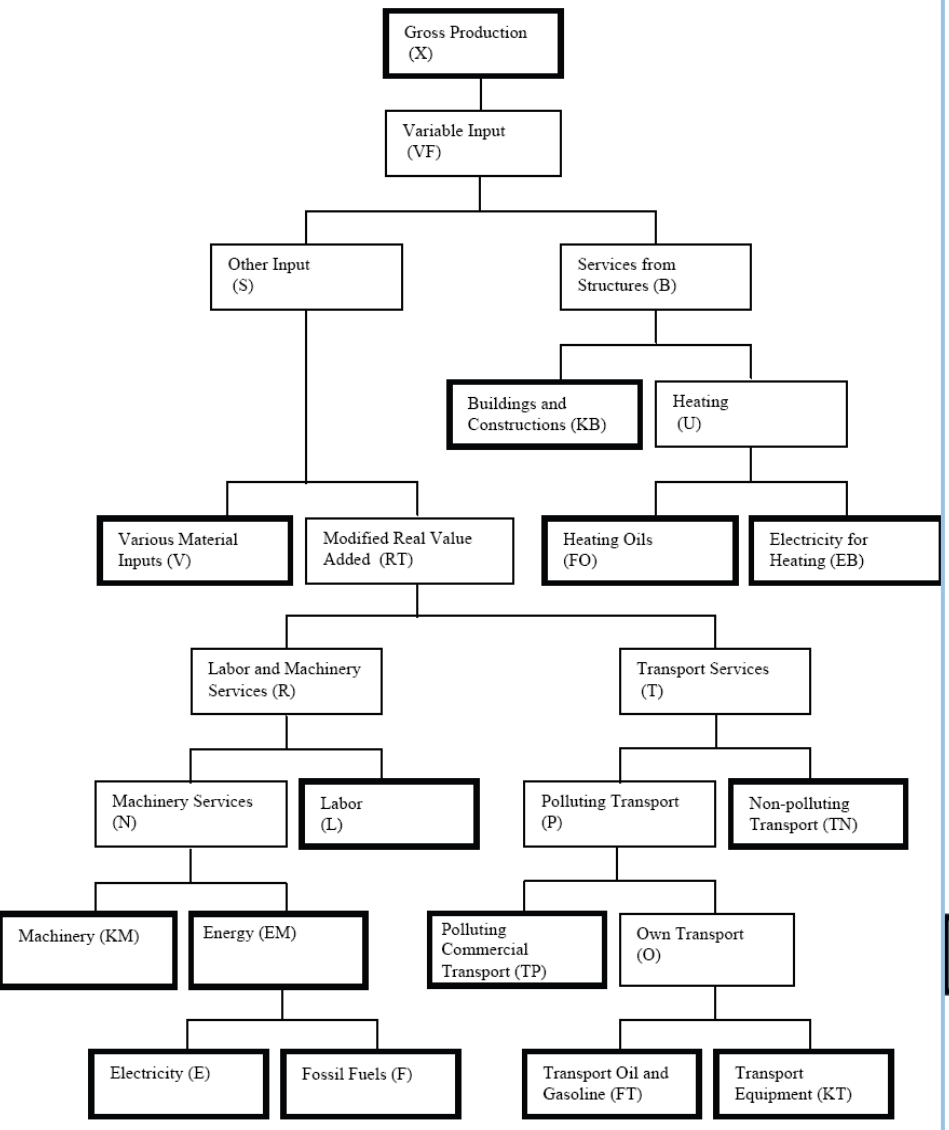
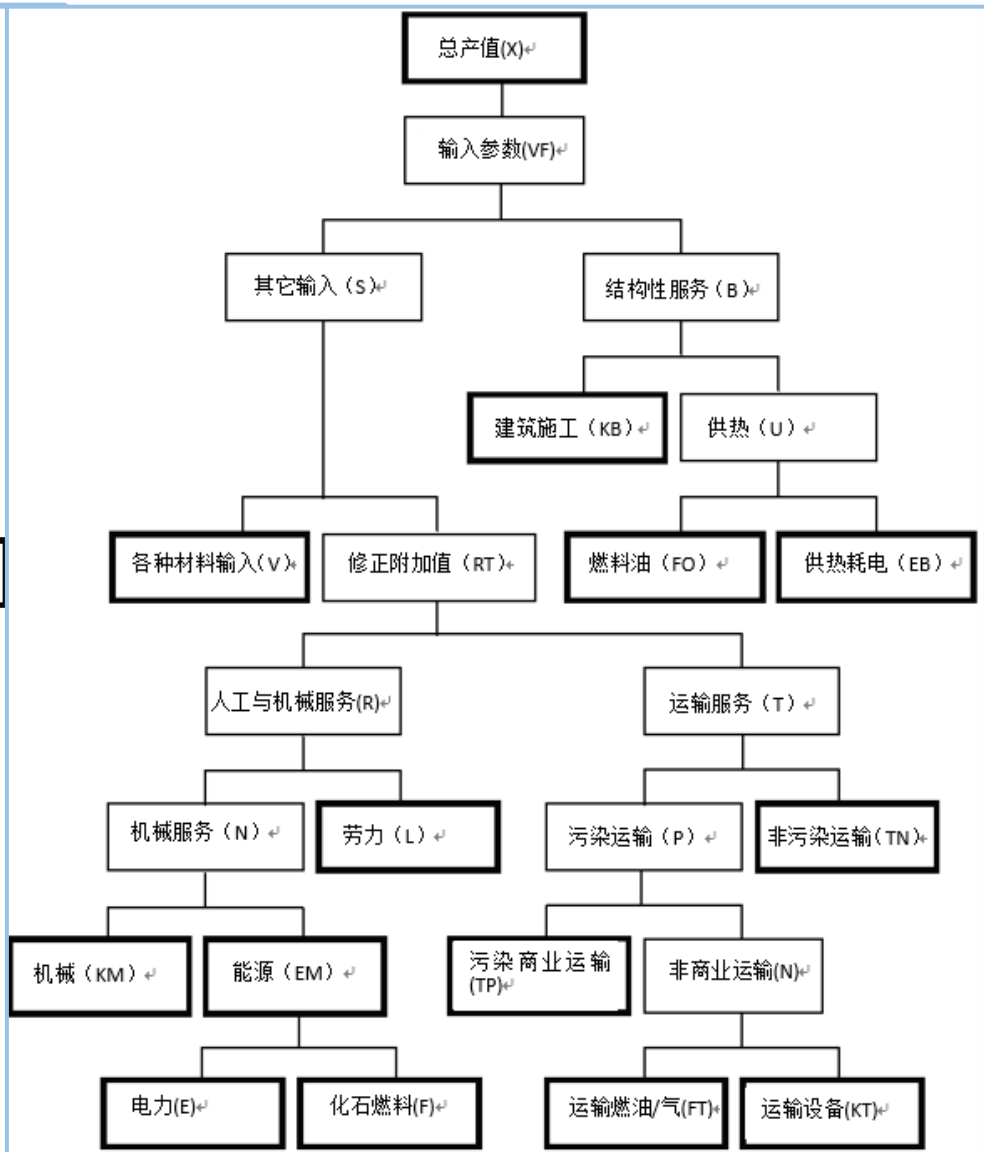
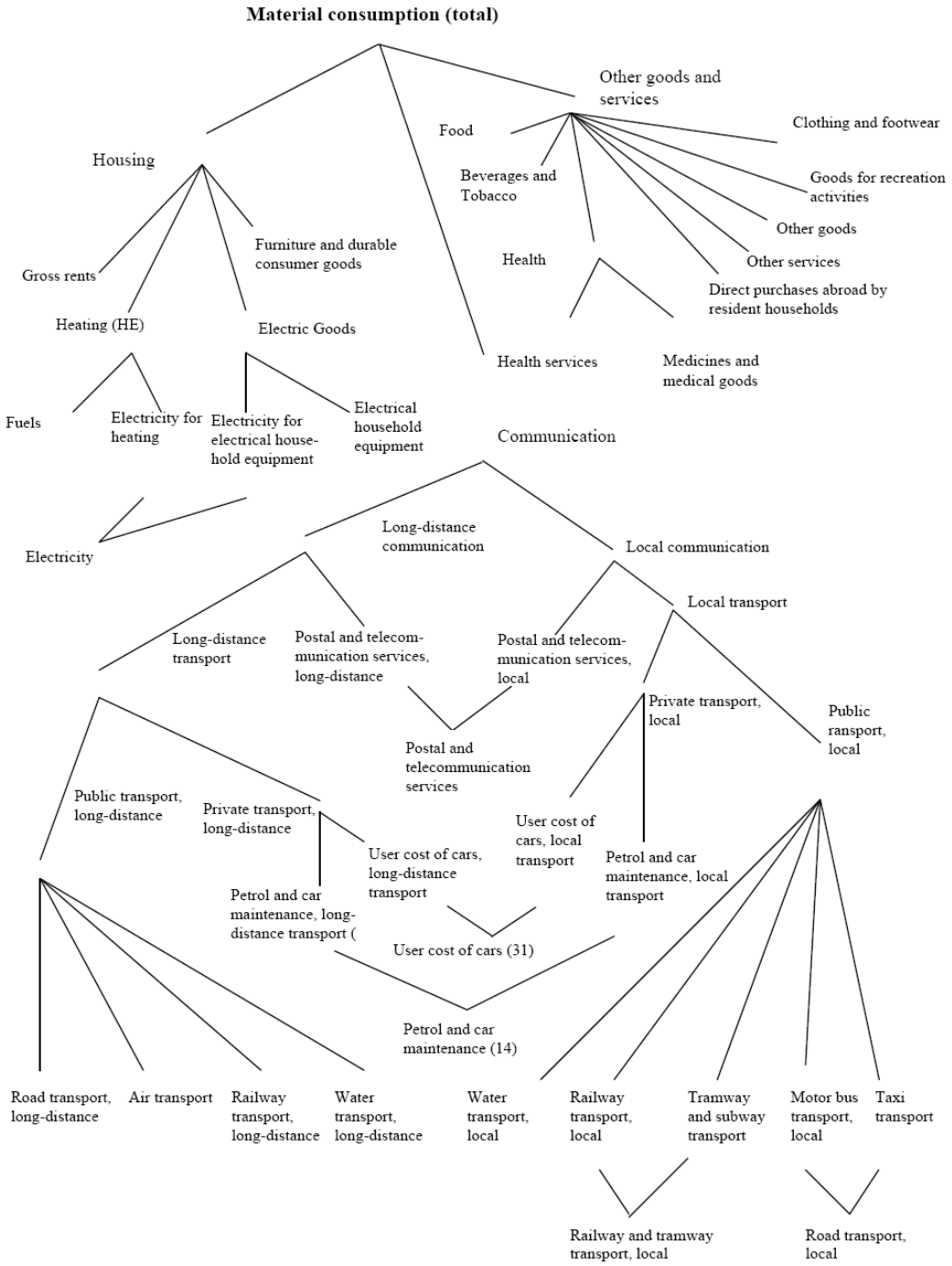
Production per industry / 行业生产力





Meets household demand
家庭需求



MSG-6中大气污染及其主要来源

Table 1: Air pollutants and important sources in MSG-6

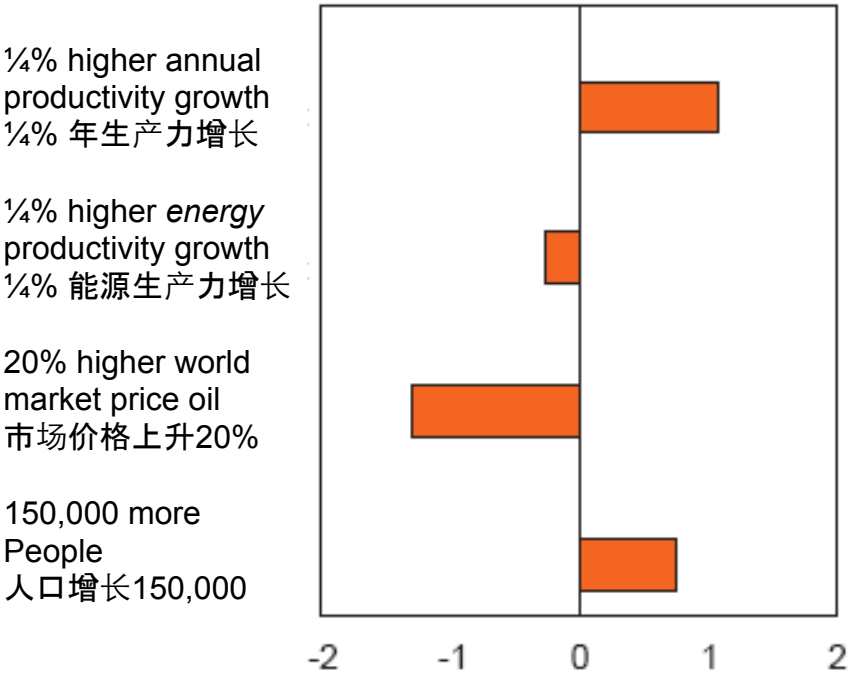
Pollutant	Important sources MSG-6 industry in parenthesis
Kyoto gases	
Carbon Dioxide (CO_2)	Combustion of fossil fuels (Several) Reducing agents (Manufacture of Metals) Gas power generation (Production of Electricity, Oil and Gas Extraction) Flaring (Oil and Gas Extraction)
Methane (CH_4)	Livestock, manure management (Agriculture) Landfills Production and use of fossil fuels and fuel wood (Several)
Nitrous Oxide (N_2O)	Fertilising (Agriculture), fertiliser production (Manufacture of Industrial chemicals) Road traffic (Road Transport)
Perflourocarbons (PFCs)	Aluminium production (Manufacture of Metals)
Sulphur Hexafluoroides (SF_6)	Magnesium production (Manufacture of Metals)
Hydrofluorocarbons (HFCs)	Cooling fluids (Several)
Other pollutants	
Sulphur Dioxide (SO_2)	Combustion (Several) Process emissions (Manufacture of Metals)
Nitrogen Oxides (NO_x)	Combustion (Several)
Carbon Monoxide (CO)	Combustion (Several)
Non-Methane Volatile Organic Compounds (NMVOCs)	Oil and gas-related activities Road traffic Solvents (Oil Refining, Road Transport, Households)
Ammonia (NH_3)	Road traffic (several) Fertilising (Agriculture)
Suspended Particulates ($PM_{2,5}$ and PM_{10})	Road traffic (Households, Agriculture, Road Transport) Fuel wood (Households)

Source: Bruvoll et al (2003)

Application in Norway / 挪威应用

- Economic scenarios started in 1960s / 1960年代开始经济情景应用
- First environmental scenarios in 1973 / 1973年开始环境情景应用
- Now routine to publish scenarios for emissions to air

  如今大气污染排放情景的常规构建方法



Impacts on greenhouse gas emissions 2020, mill tons.
2020年对温室气体排放的影响（百万吨）

Applications in Norway (examples)
挪威应用(案例)

- Costs of carbon taxation

  碳税成本
- Costs and benefits of environmental tax reform

  环境税改革成本效益
- Costs and benefits of quotas versus carbon taxes

  配额 vs. 碳税的成本效益
- Environment and trade: Carbon leakage

  环境与贸易:碳排放
- Analyses exploring the links between technology policy, innovation activity and environmental emissions

  技术政策、创新和环境污染排放相关性分析
- Analyses that describe damages of emissions

  污染损害分析

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Institutional coordination / 部门协调

- Ministry of Finance is responsible for economic policy, economic growth and sustainable development
  - *Uses models actively in economic planning and economic policy development*
- 财政部 – 经济政策、经济增长和可持续发展

- Ministry of Environment is responsible for environmental policy, environmental planning and environmental outcomes
  - *Use models to understand future environmental challenges and for environmental planning*
- 环境部 – 环境政策、环境规划和环境产出

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Institutional cooperation / 部门合作

- *Economic* environmental policy is formulated jointly, with Ministry of Finance having the last word
- 财政部具有决断权，经济环境政策联合发布

- Statistics Norway maintains and improves the models, maintains databases and conduct research-based analyses.
  - *Accepted as an impartial referee* 公正
  - *Transparency is essential* 透明
- 挪威统计局对模型进行管理和改进，维护数据库，开展研究

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Norway is full of waterfalls / 瀑布之国-挪威

- Hydropower has been used for centuries
- The first electric plant was built 1877
- 最早的电站-1877

- Today 99% of electric power in Norway is hydro
- 挪威99%的电站为水电站

Conflicts /冲突

- Over time, the level of conflict over hydropower projects became quite high
- 针对水电项目的矛盾日益增加

- Even leading to a hunger strike outside the Norwegian Parliament
- 甚至导致在挪威议会外绝食

Master Plan for Hydro Resources
水资源总体规划

- Developed from 1981 to 1984 / 编制于1981-1984
  - Follow up reports in 1986 and later
- Covered 540 potential hydropower projects
  - Often several per physical location
- 覆盖540个潜在水电项目
- Total 40 TWh development potential
  - Compared to about 100 TWh installed per 1980 and 20 TWh protected
- 共约40亿千瓦时发展潜能

Purpose of Master Plan / 总体规划目标

- To present to the parliament a proposal for a prioritised listing of hydropower projects for subsequent consideration for licensing.
  - 为议会提供后续水电项目发展优先清单

- Priority should be given to the projects that were most favorable from both an economic and an environmental viewpoint.
  - 从经济与环境的角度考虑优先项目

How it got there. The process.
形成过程…

- Led by the Ministry of Environment
  - *In cooperation with the Ministry of Energy and the Water Resources Board (similar to MWR China) and others*
- 环保部牵头，与能源部和水利部等合作

- One expert group per impact category
- National level
- County level

- A great number of people and stakeholders involved!
- 相当多的人员/利益相关方参与！

Methodology at plan level
规划方法学

- Key task is to compare economic cost
- 关键任务:比较经济成本

- And environmental+social non-monetary benefits
- 与环境+社会非货币收益

- Six cost classes were defined
- 定义了六种成本类型

- What about benefits?
- ——收益？

16 benefit categories / 收益类别

- Hydropower potential 电能
- Nature conservation (geology, botany, landscape, zoology) 资源保护
- Outdoor recreation (tourism related) 户外娱乐
- Fish and wildlife – (hunting and fishing) 渔业和野生动物
- Water supply 供水
- Water quality (pollution) 水质（污染）
- Cultural heritage 文化遗产
- Agriculture and forestry 农业和林业
- Reindeer husbandry (specific for the laps – indigenous people) 驯鹿驯养
- Flood protection 防洪
- Erosion control 防水土流失
- Transportation 交通
- Ice 冰冻
- Water temperature 水温
- Climate 气候
- Regional Economy 区域经济

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Aggregation of impacts and classification
影响累计和分类

- Stakeholders have different opinions about what is important: Give and take process

  利益相关方的不同意见
- Preliminary aggregate score based on 285 site reports: Adjusted and synchronised at central level by comparing projects
  - 地方打分，中央汇总

- Finally the 540 projects were classified into 3 categories:
  - Class I: Considered for licence immediately
  - Class II: Can be used for hydro power or other purposes
  - Class III: Should be protected
- 540个项目分为3大类：
  - 立即许可；用于水电或其它目的；被保护

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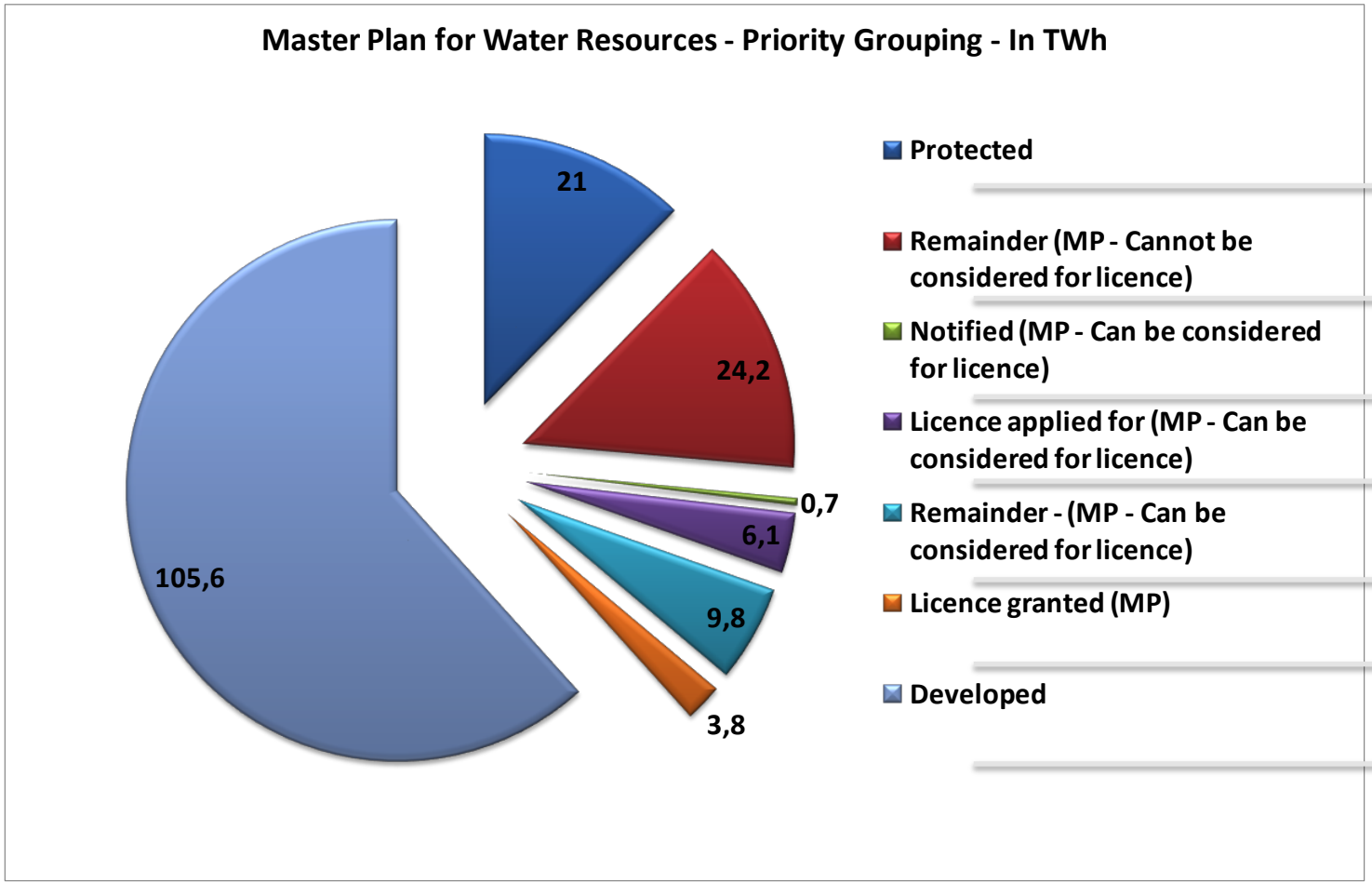
End result of Master Plan
总体规划结果…



Example: Consequence for Otta
奥塔河实例

- Upper Otta ('Otta') is a major river in Norway
- Drains higher elevations and is glacier fed
- 挪威上奥塔河，高海拔，多冰川

- High conflict level over development
  - Nature conservation zones, cultural heritage, endangered species….
  - Versus high hydropower potential, low cost and regular floods
- 自然保护区、濒危物种等 VS. 高水电能、低成本等

The story of hydropower in Otta
奥塔河的水力发电史…

- The first plan for hydro development in Otta is dated 1913
- 1913年开始规划

- A 40 m dam was built in 1940's
- 1940年建造40m大坝

- Increasing the dam to 100 m was discussed in 60's and 70's.
- 60-70年代讨论增至100m

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The story of hydropower in Otta
奥塔河的水力发电史…

- The 100 m dam was stopped by Master Plan
- 总体规划叫停100m大坝

- Out of max potential of 3TWh, 2 TWh were protected by plan
- 2TWh水电被保护

- In 1996 1 TWh was proposed for licencing. This was further reduced.
- 1996年, <1TWh建议开发

- After 90 years of discussion construction started 2002 and from 2007 0.7 TWh is produced.
- 2007年发电量0.7TWh

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Relevance for China / 与中国的相关性

- Large hydropower plans e.g., in Yunnan Province
  大型水电项目规划，如云南省
- Conflicts with biodiversity, agriculture etc
  - Plus with other nations! /与农业、生态、邻国等的冲突
- A hydro project that is constructed, can never be undone
  水电项目不可逆
- Calls for an integrated plan: An SEA, Master Plan etc.
  综合规划亟待出台

- The Norwegian experience is that a carefully designed plan integrating many stakeholders reduces the level of conflict and benefits everybody
  多方综合的规划福利天下

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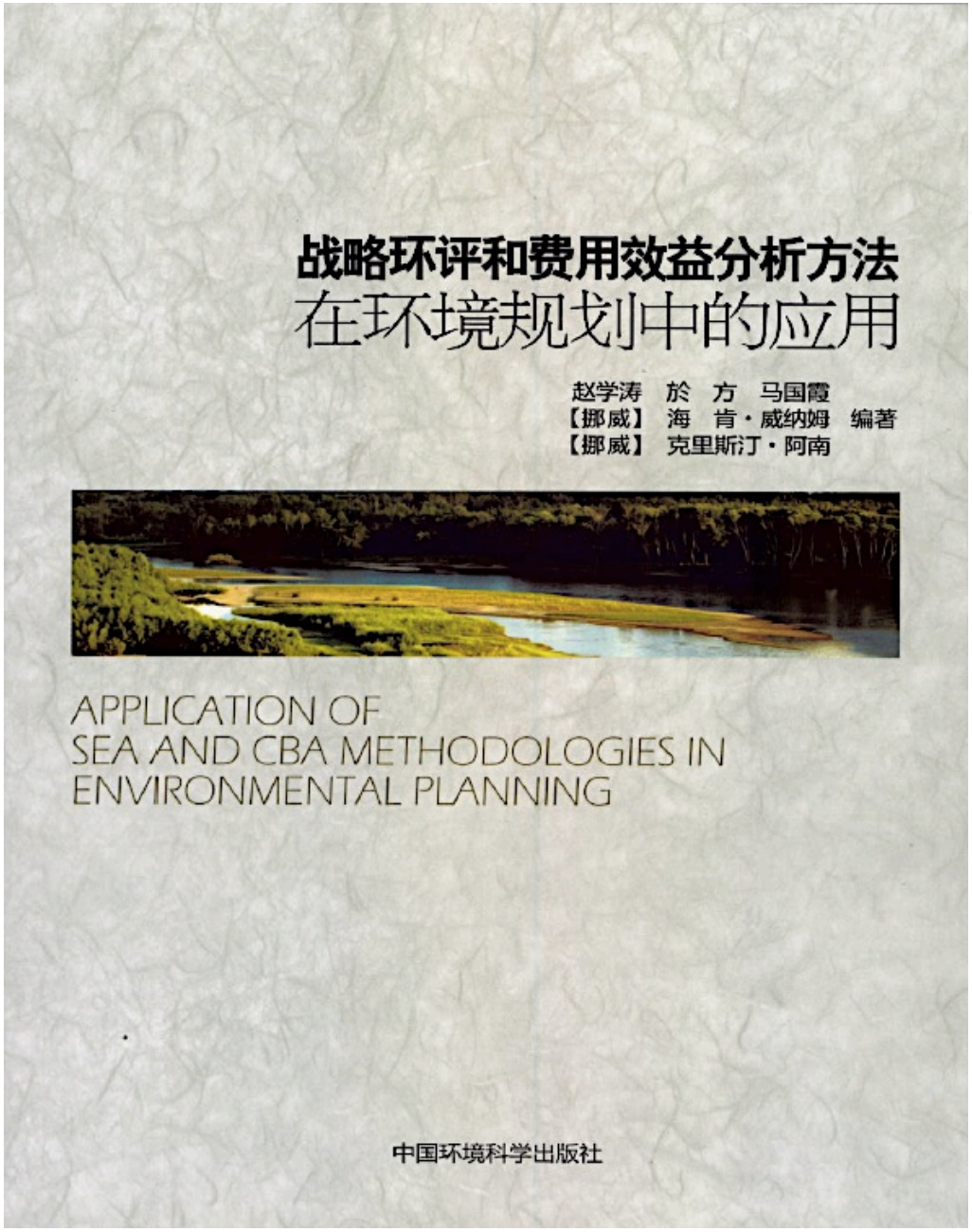

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Phase II project (2013-2015)
二期项目：构建高效的环境风险防范体系

- Project name: ”Planning for Cost-effective Environmental Risk Reduction in China” (2013-2015) – Phase II
- Project partners in China:
  - CAEP (lead), MEP departments,
  - Jiangsu and Guizhou province EPBs,
  - Tongling and Anshun city EPBs.
- 项目合作方：CAEP、MEP相关部门，江苏、贵州、铜陵、安顺

- Goal: To improve planning methods for cost-effective environmental risk prevention in China
- 目标：促进中国成本有效的环境风险防控规划方法
- Main outputs:
  - Mapping of international best practise on environmental risk management
  - Training on environmental planning and risk reduction methodologies
  - Methodological framework for environmental risk reduction planning in China
  - Policy recommendations

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Results of survey of project participants in China
中国项目参与方调查结果

- The anonymous mapping of knowledge level showed that:
  - 68% of respondents report that they have some knowledge of environmental risk reduction methodologies, but only 9% on a level where they are able to apply this knowledge in practical work.
  - 45% report that they have no knowledge of international experiences and best practice with environmental risk reduction methodologies.
  - When asked to what extent you are satisfied with the current methods and tools available for environmental risk prevention, control and response, 87% reported insufficiency in various ways.

  - Conclusion: The fundamental knowledge base in the target group is strong, but there is a need to move from theoretical knowledge to more practically applicable knowledge, expand the currently available methods and tools, and to learn from international best practices.

- 结论：需要增强环境风险防控方法的实际应用，拓展对方法和国际经验的了解

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Thank you for your attention

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